DRAFT ENVIRONMENTAL IMPACT REPORT

Railroad Avenue Station Area Specific Plan

City of Pittsburg

February 25, 2009

Table of Contents

1	EXECUTIVE SUMMARY	PAGE
1.1	Project Synopsis	1-1
1.2	Major EIR Conclusions	1-7
1.3	Areas of Controversy and Issues to be Resolved	1-20
1.4	Summary of Project Alternatives	1-24
1.5	Summary of Project Alternatives	1-26

2	PROJECT DESCRIPTION	
2.1	Introduction	2-1
2.2	Proposed Project	2-10
2.3	Consistency with Plans and Policies	2-30
2.4	Project Scheduling	2-30
2.5	Required Approvals	2-31

3	ENVIRONMENTAL SETTING AND IMPACTS	
3.1	Introduction	3.1-1
3.2	Transportation/Traffic	3.2-1
3.3	Air Quality	3.3-1
3.4	Noise	3.4-1
3.5	Cultural Resources	3.5-1
3.6	Public Services	3.6-1
3.7	Utilities	3.7-1
3.8	Climate Change	3.8-1

4	OTHER STATUTORY SECTIONS	
4.1	Introduction	4-1
4.2	Significant and Unavoidable and Significant Irreversible Impacts	4-2
4.3	Growth-Inducing Impacts	4-3
4.4	Cumulative Impacts	4-7

5	ALTERNATIVES TO THE PROPOSED PROJECT	
5.1	Introduction	5-1
5.2	No Project Alternative	5-2
5.3	75 Percent Residential Development Alternative	5-4
5.4	Relocated Residential Density Alternative	5-5
5.5	Environmentally Superior Alternative	5-8

6 LIST OF PREPARERS

6.1 Lead Agency 6-1
6.2 Environmental Impact Report Preparers 6-1
6.3 Transportation Impact Analysis Preparers 6-1
6.4 Sources Consulted 6-2

APPENDICES

Appendix A Initial Study
Appendix B Notice of Preparation and Comment Letters
Appendix C Transportation Impact Analysis prepared by Wilbur Smith Associates
Appendix D URBEMIS Air Quality and Noise Modeling Output Data
Appendix E Native American Correspondence
Appendix F Specific and General Plan Goals and Policies

LIST OF FIGURES

Figure 1-1 Project Location 1-2
Figure 1-2 Specific Plan Area 1-3
Figure 2-1 Project Location 2-11
Figure 2-2 Specific Plan Area 2-12
Figure 2-3 Proposed eBART Alignment 2-15
Figure 2-4 Proposed Land Use Plan 2-19
Figure 3.2-1 Regional Roadway Network 3.2-4
Figure 3.2-2 Existing Transit Network 3.2-10
Figure 3.2-3 Study Intersections 3.2-18
Figure 3.4-1 Noise Measurement Locations 3.4-4
Figure 5-1 Relocated Residential Density alternative 5-6

LIST OF TABLES

Table 1-1 Comparison of MTC Resolution #3434 Targets with Proposed Project Station Area Development 1-5
Table 1-2 Comparison of BART System Expansion Policy Ridership Target with Proposed Project Ridership Forecasts (weekday entries and exits in 2030) 1-5
Table 1-3 City of Pittsburg Railroad Avenue Specific Plan EIR Summary of Impacts and Mitigation Measures 1-8
Table 1-4 City of Pittsburg Railroad Avenue Specific Plan Initial Study Summary of Impacts and Mitigation Measures 1-21
Table 2-1 Railroad Avenue Station Area - Assumed Development Program 2-22
Table 2-2 Specific Plan Development Standards by Land Use 2-25
Table 3.2-1 Planned Roadway Improvements within the Specific Plan Area 3.2-3
Table 3.2-2 Study Intersection Operations – Existing Conditions 3.2-9
Table 3.2-3 Bicycle Facilities Near or Serving the Study Area 3.2-12

Table 3.2-4	Trip Generation Estimate – Year 2030	3.2-15
Table 3.2-5	Level of Service Criteria – Signalized Intersections	3.2-16
Table 3.2-6	Level of Service Criteria – Unsignalized Intersections	3.2-16
Table 3.2-7	Summary of Traffic Service Objectives for Regional Routes of Significance	3.2-20
Table 3.2-8	Study Intersection Operations – 2015 plus 25% Project Conditions	3.2-25
Table 3.2-9	Study Intersection Operations – 2030 plus Project Conditions	3.2-27
Table 3.2-10	City of Pittsburg Municipal Code - Existing Parking Requirements	3.2-30
Table 3.2-11	Railroad Avenue Specific Plan TOD Parking Requirements per Land Use	3.2-30
Table 3.2-12	Proposed Parking Supply – Civic Center Subarea	3.2-31
Table 3.2-13	Proposed Parking Supply – Transit Village Subarea	3.2-31
Table 3.2-14	Access Mode Split by Station, 2015 and 2030	3.2-33
Table 3.3-1	2006 Estimated Average Daily Emissions in Contra Costa County and the San Francisco Bay Area	3.3-3
Table 3.3-2	Summary of Ambient Air Quality in the Project Vicinity	3.3-5
Table 3.3-3	Projected Daily Operational Stationary and Mobile Source Emissions	3.3-15
Table 3.3-4	Carbon Monoxide Concentrations at Selected Locations	3.3-16
Table 3.4-1	Representative Environmental Sound Levels	3.4-2
Table 3.4-2	Ambient Noise Measurements, dBA	3.4-5
Table 3.4-3	Summary of Noise Levels Identified as Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety	3.4-6
Table 3.4-4	Noise Impact Criteria for Noise-Sensitive Uses (dBA)	3.4-7
Table 3.4-5	Ground-Borne Vibration (GBV) Impact Criteria for General Assessment	3.4-8
Table 3.4-6	Noise Ranges of Typical Construction Equipment	3.4-12
Table 3.4-7	Typical Outdoor Construction Noise Levels	3.4-13
Table 3.4-8	Vibration Source Levels for Construction Equipment	3.4-15
Table 3.5-1	Native American Tribal Representatives Contacted	3.5-6
Table 3.6-1	Schools within or near Specific Plan Area and Enrollment: 2007-2008	3.6-4
Table 3.7-1	Past, Current and Projected Water Use (af/yr)	3.7-3
Table 3.7-2	Project Water Supply 2010-2025	3.7-3
Table 3.8-1	Global Warming Potentials and Atmospheric Lifetimes of Select Greenhouse Gases	3.8-4
Table 3.8-2	California Greenhouse Gas Reductions Targets	3.8-6
Table 3.8-3	Annual Direct Area Source and Mobile Emissions	3.8-20
Table 3.8-4	Annual Indirect Electricity Emissions	3.8-20
Table 4-1	Cumulative Development	4-8
Table 5-1	Comparison of Alternatives	5-2

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Chapter 1
Executive Summary

1.1 PROJECT SYNOPSIS

This Environmental Impact Report (EIR) has been prepared to provide information on potential environmental impacts that would result from implementation of the City of Pittsburg's Railroad Avenue Specific Plan (the "proposed project").

The Railroad Avenue Specific Plan proposed project site (the "project area") is located in Pittsburg, in eastern Contra Costa County (see Figure 1-1, Project Location/Regional Map). Pittsburg is approximately 18.35 square miles (11,700 acres), and abuts unincorporated Bay Point to the west, the City of Antioch to the east, undeveloped lands to the south, and the Sacramento Delta and sloughs to the north. The City is generally an urbanized area, with residential, commercial, public, and light industrial uses in the eastern and central parts of the City, and heavy industrial uses in the northeastern portion of the City. The middle of the Specific Plan Area is generally located at the intersection of Railroad Avenue and California State Route 4 (SR 4) in central Pittsburg. Downtown Pittsburg, the Pittsburg Marina, and Suisun Bay are located just north of the Specific Plan Area.

The project area is located near the center of Pittsburg, and includes the City's civic center which houses City Hall, the Police Station, the Pittsburg Unified School District Offices, the Pittsburg Library and a Federal Armory. The project area surrounds the proposed location of the Bay Area Rapid Transit agency's (BART's) future Railroad Avenue eBART station[1] (see Figure 1-2, Specific Plan Area), which would sit in the median of State Route 4 (SR 4) beneath the Railroad Avenue overcrossing and would be accessible from both sides of the overcrossing. The project area boundary is set at a radius of approximately ½ mile from the eBART station. The boundary is extended further where necessary to enclose complete neighborhoods, in cases in which only part of a neighborhood falls within the ½-mile radius. The ultimate borders are defined primarily by railroads, subdivision boundaries, and Contra Costa County's Traffic Analysis Zones (TAZs). In total, the Specific Plan Area encompasses approximately 1,075 acres, which are divided into the 11 planning subareas (shown on Figure 1-2): Old Town Gateway, Parkside Manor Neighborhood, Civic Center, High School Village, Los Medanos Neighborhood, Transit Village, Industrial/Mixed-Use Center, Los Medanos Industrial Center, Railroad Avenue Retail Corridor, Atlantic Avenue Corridor, and East Leland Corridor.

[1] "eBART" is the abbreviation used to refer to the East Contra Costa BART system expansion. As currently proposed, this system expansion would include a new BART station in the City of Pittsburg and another new station in the City of Antioch.

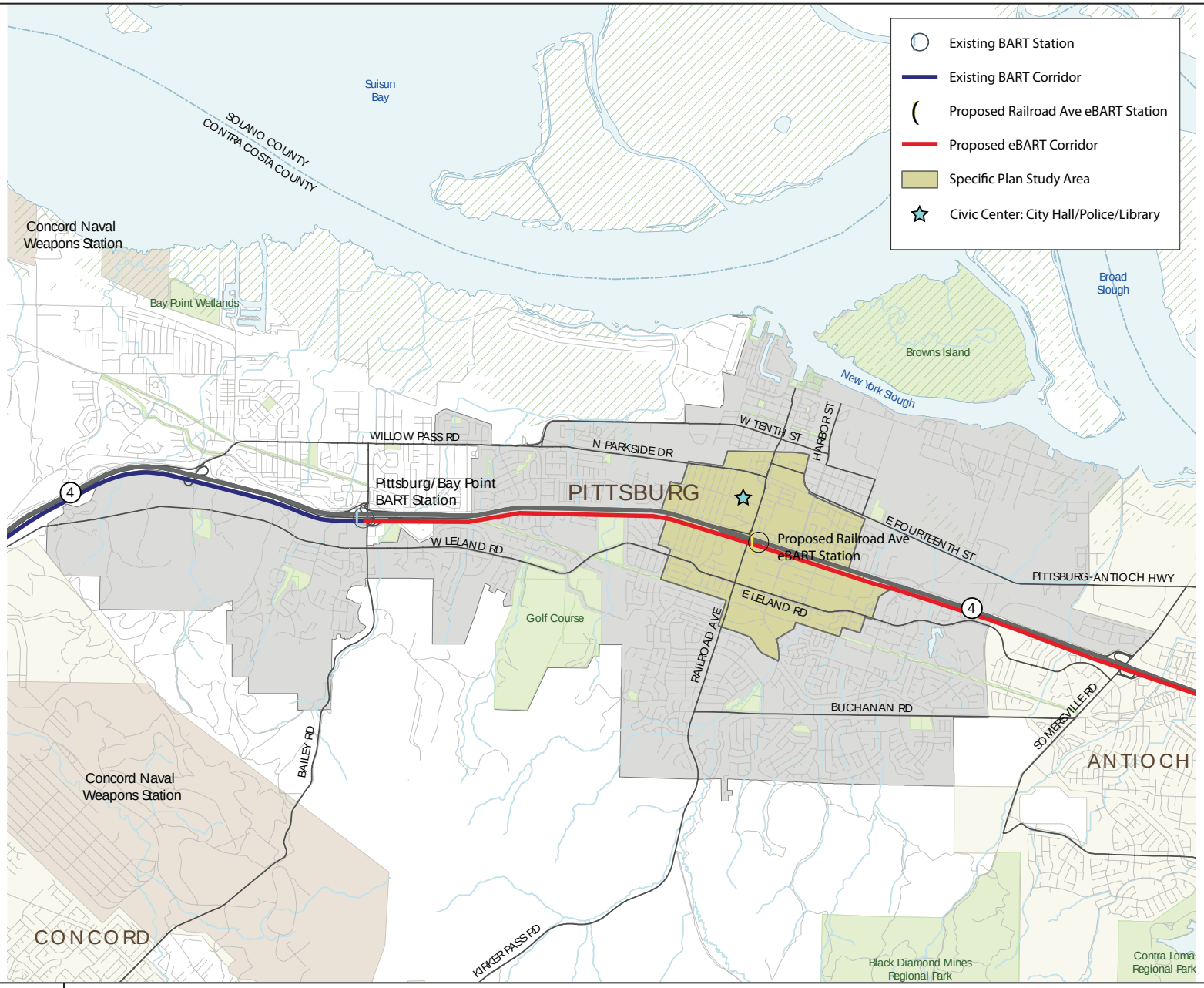

FIGURE 1-1
Project Location

***Source*:** MIG, 2008.

FIGURE 1-2
Specific Plan Area

***Source*:** MIG, 2008.

The Railroad Avenue Specific Plan project objectives are to allow for the rezoning of specific lands and related changes to planning controls in an area within the City of Pittsburg, in order to provide opportunities for transit oriented development around a planned transit station. The transit oriented development would result in clustered, high density, mixed use development to increase proximity of commercial, residential, public and community services. The development standards contained in the Specific Plan would set minimum thresholds of development and provide parking maximums to discourage automotive use in the area and to reduce vehicle miles traveled (VMT) while encouraging other modes of transportation within and to the project area. In order to facilitate multi-modal access to all uses in the area, the proposed plan would result in a variety of public paths, plazas and open spaces designed to link up with existing and proposed facilities in the City, and includes streetscape standards and architectural design designed to foster pedestrian and bicycle activity.

The overarching project objective is to increase the number of residents and workers into the neighborhoods within ½ mile of a proposed new Pittsburg eBART station. In a study conducted by the Metropolitan Transportation Commission (MTC), entitled *Characteristics of Rail and Ferry Station Area Residents in the San Francisco Bay Area: Evidence from the 2000 Bay Area Travel Survey, Volume 1 (2008)*, people living within half a mile of a rail or ferry station are four times as likely to use transit than people living further than half a mile from a station. In addition, the study found that individuals living and working within half a mile of a rail or ferry stop use transit for 42 percent of their work commute trips whereas individuals who neither live nor work within half a mile of a station use transit for only 4 percent of their work commute trips. These studies were used to develop the minimum residential and ridership thresholds set by MTC. These thresholds are contained in the *Resolution 3434: Transit Oriented Development Policy for Regional Transit Expansion Projects (2005)*, and require a minimum of 2,200 residential units within ½-mile of a planned commuter rail station.

In addition to MTC's Transit Oriented Development (TOD) policies, the City must show compliance with BART's System Expansion Policy (SEP) that was adopted in 1999 and requires that participating jurisdictions adopt a Ridership Development Plan (RDP) to demonstrate that a corridor wide ridership threshold can be achieved through measures such as transit-supportive land uses and investment in access programs and projects (East Contra Costa BART Extension Draft EIR, 1-14). These thresholds can be achieved through a combination of residential and commercial development as well as assumed riders that would access the station from surrounding areas by multiple modes. The proposed project, the Railroad Avenue Specific Plan serves as the RDP required by BART to support the extension of BART to Contra Costa County. By adopting the minimum development thresholds, maximum parking standards, and various improvements to bicycle, pedestrian and transit facilities that are proposed under the Specific Plan, the City of Pittsburg would meet and exceed the MTC requirements for the placement of 2,200 residential units within half a mile of the planned station. (See Table 1-1, Comparison of MTC Resolution #3434 Targets with Proposed Project Station Area Development.) Likewise, the City of Pittsburg would meet and exceed BART's 1999 SEP corridor-wide minimum requirement that there be 5,801 anticipated patron entries and exits to justify the proposed track extension and operation of diesel multiple units trains along the eBART corridor. (See Table 1-2, Comparison of BART System Expansion Policy Ridership Target with Proposed Project Ridership

Forecasts.) It is important to note that it is not essential for individual stations to meet the minimum thresholds provided that land use changes and access improvements for stations along the eBART corridor (defined as the Pittsburg/Bay Point BART Station, and the planned stations at Railroad Avenue in Pittsburg and Hillcrest in Antioch) allow for the thresholds to be met.

Table 1-1
Comparison of MTC Resolution #3434 Targets with Proposed Project Station Area Development

Station	Housing Units in 2030[a]	
MTC Target	2,200	
Pittsburg/Bay Point[b]	2,195	Per Station Average = 2,755
Railroad Avenue[c]	4,591	
Hillcrest Avenue[c]	1,479	

Source: *Pittsburg General Plan; Antioch General Plan,* CCTA, and Fehr & Peers Associates.

Notes:

a. Housing units within one-half mile of station sites; however, housing units do not include Ridership Development Plan.

b. Pittsburg/Bay Point BART Station Area Specific Plan Final EIR, December 2001, identifies 2,195 housing units at buildout.

c. These figures are derived from the CCTA traffic model. Data were based on the adopted General Plan and compiled for applicable Traffic Analysis Zones, which included those within one-half mile of a station.

Table 1-2
Comparison of BART System Expansion Policy Ridership Target with Proposed Project Ridership Forecasts (weekday entries and exits in 2030)

System Expansion Policy Target	**5,801**
Proposed Project Ridership[a]	
Railroad Avenue	1,900
Hillcrest Avenue	8,200
Total Corridor Ridership	**10,100**

Source: Arup for the Ridership Target, 2008; Wilbur Smith Associates for Proposed Project ridership, 2008.

The Railroad Avenue Specific Plan has been prepared in accordance with the Pittsburg Municipal Code (PMC) Chapter 18.62, PD-Planned Development District. This Chapter outlines the requirements for the preparation, adoption and implementation of Specific Plans. Adoption of a Specific Plan for the surrounding planned eBART station is called for in the *City of Pittsburg 2020 General Plan* (*General Plan)* and in PMC Chapter 18.53, Mixed Use District. In 2007, the Pittsburg City Council conducted a city-wide rezoning effort and adopted Ordinance No. 07-1284 setting forth a new zoning district, the M (Mixed Use) District. The chapter also forth regulations for the land immediately surrounding the

planned eBART station including a minimum density of 30 residential units per acre and a maximum of 65 residential units per acre for the land within one quarter mile of the planned eBART station. These regulations are consistent with, and supportive of, the goals set forth in the Railroad Avenue Specific Plan.

The proposed Specific Plan contains detailed land use and development information for the Specific Plan Area, beyond that strictly required to comply with the thresholds related to the approval and establishment of the new Railroad Avenue eBART station. Specifically, the Railroad Avenue Specific Plan defines the amount, type and location of urban development proposed within the project area. The Specific Plan also provides development standards and design guidelines for development and recommends specific actions to implement the Specific Plan and financing methods and sources to fund improvements.

The Specific Plan includes new land use classifications, development policies and guidelines, urban design guidelines, planned community resources, transportation and circulation improvements, utility and infrastructure improvements, implementation strategies, and phasing recommendations. Details on land use classifications are provided in Chapter 2.2, Proposed Project. The following land use designations would be established or expanded in the project area:

- **Low Density Residential (1 to 7 units/gross acre):** allows for single-family residential units built at a density of one to seven units per gross acre;
- **Medium Density Residential (7 to 14 units/gross acre):** allows for single and multi-family residential units built at a density of seven to 14 units per gross acre;
- **High Density Residential (14 to 25 units/gross acre):** allows for a mix of housing types built at a density of 14 to 25 units per gross acre;
- **Community Commercial:** allows for a variety of commercial uses and service-oriented businesses at scales ranging from large retail stores serving the community and region to smaller businesses oriented towards neighborhood activity. The maximum permitted FAR in this land use designation is 0.4. However, *commercial projects* along Railroad Avenue between State Route 4 and Leland Road are permitted a maximum FAR of 2.0. For *mixed use projects* located on Railroad Avenue between State Route 4 and Leland Road, a maximum FAR of 1.0 is permitted for the commercial portion of the development, and an additional 25 dwelling units per acre may be allowed for the residential portion of the development;
- **Business Commercial:** focuses on providing sites for administrative, financial, business, research and development and public offices, as well as custom manufacturing, limited assembly, light manufacturing, warehousing and distribution, and support commercial uses. The maximum permitted FAR in this land use designation is 1.0;
- **Service Commercial:** provides sites for commercial businesses that are not appropriate in other commercial areas because they generate high volumes of vehicle traffic or other potential adverse impacts on adjacent uses. The maximum permitted FAR in this land use designation is 0.5;

- **Public/Institutional:** allows schools, government offices, transit sites, public utilities, and other facilities with a unique public character;
- **Parks/Recreation:** provides for parks, recreation complexes, community fields, greenways, and trails;
- **Transit Oriented Development Residential (**Residential: 20 to 50 dwelling units per gross acre; Non-residential: Maximum 0.25 FAR): intended to provide opportunities for multi-family residential rental or for-sale development in a well-designed walkable environment within ½-mile of local and regional transportation facilities;
- **Transit Oriented Development High (**Residential: 30 to 65 dwelling units per gross acre; Non-residential: Maximum 1.0 FAR**):** intended to promote a vertical combination of ground-floor, pedestrian friendly retail uses and residential uses or offices on upper stories in the areas closest to proposed regional transit facilities; and
- **Transit Oriented Development Medium (**Residential: 15 to 30 dwelling units per gross acre; Non-residential: Maximum 1.0 FAR**):** intended to allow primarily multi-family residential development with ground-floor commercial uses are permitted below residential uses within ½-mile of regional transit facilities.

Overall, it is estimated that the proposed land uses in the Railroad Avenue Specific Plan Area would result in approximately 1,845 new residential units and 988,449 square feet of new commercial floor area within the approximately 97 acres of project area closest to the eBART station. This area currently contains a substantial amount of vacant and underutilized land. The remaining 978 acres of the Specific Plan area are primarily built out with existing and well established residential neighborhoods and commercial uses; therefore, the development regulations pertaining to the remainder of the Specific Plan Area would remain essentially unchanged from existing regulations. The assumptions for the Railroad Avenue Specific Plan development scenario are discussed in more detail in Section 2.2, Proposed Project, of this EIR, and are also discussed within the Railroad Avenue Specific Plan (Chapter 3, Section 3.4, Assumed Development Program).

1.2 MAJOR EIR CONCLUSIONS

Impacts and Mitigation Measures

Table 1-3, below, summarizes the environmental impacts and mitigation/improvement measures as contained in the body of the EIR. The description of some impacts and measures in the table have been abbreviated, consistent with the format of a summary section, and the reader is referred to the main EIR text for a complete discussion of environmental impacts and mitigation/improvement measures (refer to the numbering sequence for location).

Table 1-3
City of Pittsburg Railroad Avenue Specific Plan EIR Summary of Impacts and Mitigation Measures

Impacts	Impact Significance Without Mitigation	Mitigation/Improvement Measures	Impact Significance With Mitigation
Chapter 3.2 Transportation/Traffic			
TR-1 The intersection of Harbor Street/Garcia Avenue would exceed acceptable LOS levels during the AM peak hour. Under Year 2015 plus 25% Project the Leland Road/Freed Avenue would exceed acceptable LOS levels during the PM peak hour. However, operations would not deteriorate at either of these intersections as a result of the proposed project.	LTS	None required.	LTS
TR-2 The intersection of Harbor Street/Garcia Avenue would operate at LOS F, with significant delays along the eastbound and westbound approaches under Year 2015 plus 25% Project conditions during the PM peak hour.	PS	**TR-2.1. Signalization.** The Harbor Street/Garcia Avenue intersection shall be converted from a two-way stop-controlled (TWSC) intersection to a signalized intersection with a cycle length of 75 seconds for the PM peak hour, allowing the intersection to operate at LOS A, with 8.4 seconds of average delay.	LTS
TR-3 Under Year 2030 plus Project conditions, the Leland Road/Freed Avenue intersection would exceed acceptable LOS levels during the AM peak hour. Under Year 2030 plus Project, the Railroad Avenue/Leland Road, Leland Road/Freed Avenue and Harbor Street/California Avenue intersections would exceed acceptable LOS levels during the PM peak hour, but operations would not deteriorate at any of these intersections as a result of the proposed project.	LTS	None required.	LTS
TR-4 The intersection of Harbor Street/Garcia Avenue would operate at LOS F, with significant delays along the eastbound and westbound approaches under Year 2030 plus Project conditions during the AM peak hour.	PS	**TR-4.1. Signalization.** The Harbor Street/Garcia Avenue intersection signal cycle length shall be 70 seconds for the AM peak hour, so that the intersection operates at LOS A, with 7.7 seconds of average delay.	LTS

Legend:	(NI) No Impact	(LTS) Less than Significant	(PS) Potentially Significant	(SU) Significant and Unavoidable	(BI) Beneficial Impact

Table 1-3 (continued)
City of Pittsburg Railroad Avenue Specific Plan EIR Summary of Impacts and Mitigation Measures

Impacts	Impact Significance Without Mitigation	Mitigation/Improvement Measures	Impact Significance With Mitigation
TR-5 Under Year 2015 plus 25% Project and Year 2030 plus Project conditions, two of the 16 study intersections would not satisfy the Traffic Service Objectives in the East County Action Plan for the proposed project; however, the failure to meet these Objectives would not result from the proposed project, so is not a significant impact of the proposed project. Similarly, under Year 2030 conditions, SR 4 would not meet the Traffic Service Objectives, but this failure to meet the Objectives would not result from the proposed project, and is not an impact of the proposed project. The proposed project would have a less than significant impact on the Traffic Service Objectives in the year 2030.	LTS	None required.	LTS
TR-6 No significant impacts related to parking conditions were identified as a result of the proposed project. Therefore, no mitigation measures are recommended.	LTS	None required.	LTS
TR-7 None of these significant impacts related to transit conditions were identified or are anticipated as a result of the proposed project. Therefore, no mitigation or improvement measures are recommended.	LTS	None required.	LTS
TR-8 The proposed project would not create substantial overcrowding or hazardous conditions on public sidewalks, limit pedestrian access to adjoining areas, or impede or thwart implementation of a planned pedestrian pathway or conflict with adopted policies supporting alternative transportation. Therefore, the proposed project would not have significant impacts related to pedestrian conditions, and no mitigation or improvement measures beyond those included in the Specific Plan are recommended.	LTS	None required.	LTS

Legend:	(NI) No Impact	(LTS) Less than Significant	(PS) Potentially Significant	(SU) Significant and Unavoidable	(BI) Beneficial Impact

Table 1-3 (continued)
City of Pittsburg Railroad Avenue Specific Plan EIR Summary of Impacts and Mitigation Measures

Impacts	Impact Significance Without Mitigation	Mitigation/Improvement Measures	Impact Significance With Mitigation
TR-9 The proposed project would not create substantial hazardous conditions for bicyclists, limit bicycle access to adjoining areas, or impede or thwart implementation of a planned bicycle pathway or conflict with adopted policies supporting alternative transportation. Therefore, the proposed project would not have significant impacts related to bicycle conditions, and no mitigation or improvement measures beyond those included in the Specific Plan are recommended.	LTS	None required.	LTS
Chapter 3.3 Air Quality			
AQ-1 Construction activities under the proposed project could cause emissions of dust or contaminants from equipment exhaust that could contribute to existing air quality violations or expose sensitive receptors to pollutant concentrations. This would be a temporary but potentially significant impact.	PS	**AQ-1.1. Implement Dust Control Measures.** To reduce particulate matter emissions during construction, the City shall ensure that all development proposed under the Railroad Avenue Specific Plan complies with the dust control strategies developed by BAAQMD. These dust control strategies shall include: • Cover all trucks hauling construction and demolition debris from the site; • Water all exposed or disturbed soil surfaces at least twice daily; • Use watering to control dust generation during demolition of structures or break-up of pavement; • Pave, apply water three times daily, or apply (non-toxic) soil stabilizers on all unpaved parking areas and staging areas; • Sweep daily (with water sweepers) all paved parking areas and staging areas during the earthwork phases of construction; • Provide daily clean-up of mud and dirt carried onto paved streets from the site; • Enclose, cover, water twice daily, or apply non-toxic soil binders to exposed stockpiles (dirt, sand, etc.);	LTS

Legend:	(NI) No Impact	(LTS) Less than Significant	(PS) Potentially Significant	(SU) Significant and Unavoidable	(BI) Beneficial Impact

Table 1-3 (continued)
City of Pittsburg Railroad Avenue Specific Plan EIR Summary of Impacts and Mitigation Measures

Impacts	Impact Significance Without Mitigation	Mitigation/Improvement Measures	Impact Significance With Mitigation
		• Limit traffic speeds on unpaved roads to 15 mph; • Install sandbags or other erosion control measures to prevent silt runoff to public roadways; and • Replant vegetation in disturbed areas as quickly as possible. **AQ-1.2. Reduce Emissions from Heavy-duty Diesel-powered Equipment.** The City shall ensure that all development proposed under the Railroad Avenue Specific Plan implements measures to reduce the emissions of pollutants generated by heavy-duty diesel-powered equipment during demolition and construction: • Keep all construction equipment in proper tune in accordance with manufacturer's specifications. • Use late model heavy-duty diesel-powered equipment at the Project Site to the extent that it is readily available in the San Francisco Bay Area. • Use diesel-powered equipment that has been retrofitted with after-treatment products (e.g., engine catalysts) to the extent that it is readily available in the San Francisco Bay Area. • Use low-emission diesel fuel for all heavy-duty diesel-powered equipment operating and refueling at the Project Site to the extent that it is readily available and cost effective in the San Francisco Bay Area (this does not apply to diesel-powered trucks traveling to and from the site). • Utilize alternative fuel construction equipment (i.e., compressed natural gas, liquid petroleum gas, and unleaded gasoline) to the extent that the equipment is readily available and cost effective in the San Francisco Bay Area.	

Legend:	(NI) No Impact	(LTS) Less than Significant	(PS) Potentially Significant	(SU) Significant and Unavoidable	(BI) Beneficial Impact

Table 1-3 (continued)
City of Pittsburg Railroad Avenue Specific Plan EIR Summary of Impacts and Mitigation Measures

Impacts	Impact Significance Without Mitigation	Mitigation/Improvement Measures	Impact Significance With Mitigation
		• Limit truck and equipment idling time to five minutes or less. • Rely on the electricity infrastructure surrounding the construction sites rather than electrical generators powered by internal combustion engines to the extent feasible.	
AQ-2 The proposed project would create new area and mobile sources of air pollutants that would generate emissions of ROG, NO_X, and PM_{10}. These emissions would exceed BAAQMD's established significance thresholds of 80 pounds per day and would contribute substantially to an existing or projected air quality violation and be inconsistent with regional air quality plans to achieve attainment. As such, project impacts on criteria air pollutants would be significant and unavoidable.	PS	No feasible mitigation available.	SU
AQ-3 Traffic generated by the proposed project would add to traffic volumes at intersections in the project vicinity. This traffic would increase concentrations of carbon monoxide, but not to the extent that ambient air quality standards would be exceeded. As such, project impacts on localized carbon monoxide concentrations would be less than significant.	LTS	None required.	LTS
AQ-4 The proposed project would place new residential uses within 500 feet of State Route 4, and would potentially expose new sensitive receptors to substantial concentrations of toxic air contaminants.	PS	**AQ-4.1. Implement site and architectural design measures to reduce air quality impacts to residential development located within 500 feet of State Route 4.** As part of the Design Review process for new development, ensure that residential development within 500 feet of State Route 4 contains air quality mitigation measures including, but not limited to, an increase in the distance between residents and the freeway; modification to the location and height of intakes to the ventilation system; addition of HEPA air filtration systems; location of recreational use areas, such as patio areas and balconies, on interior courtyards and shielded by the structure; triple paned windows; central heating, ventilation, and air conditioning (HVAC) systems with high efficiency filters,	LTS

Legend:	(NI) No Impact	(LTS) Less than Significant	(PS) Potentially Significant	(SU) Significant and Unavoidable	(BI) Beneficial Impact

Table 1-3 (continued)
City of Pittsburg Railroad Avenue Specific Plan EIR Summary of Impacts and Mitigation Measures

Impacts	Impact Significance Without Mitigation	Mitigation/Improvement Measures	Impact Significance With Mitigation
		and the location of air intake systems for the HVAC systems as far away from the roadway as possible; and an ongoing HVAC maintenance plan. These measures shall be designed and implemented consistent with the Specific Plan's Architectural and Site Design Criterion No. 22.	
AQ-5 Cumulative construction emissions could result in emissions of dust and particulates, which could exceed regional air quality standards. However, development projects proposed under the cumulative scenario would be required to implement measures to control construction emissions.	PS	Mitigation Measure AQ-1.1 and AQ-1.2 would reduce individual project contribution to those impacts to a less than significant level.	LTS
AQ-6 Since operational emissions from the proposed project would be individually significant, operational emissions would also be cumulatively considerable.	S	**AQ-6.1** Develop and implement a plan to reduce operational air emissions. Prior to approval of building entitlements and permits, the project developers shall be required to demonstrate to the City that stationary source emissions reduction measures have been included to reduce operational emissions resulting from development in the project area to the maximum extent practicable. A plan for reducing stationary sources shall be approved by City staff. The plan shall include measures such as, but not limited to, incorporating energy-saving appliances for heating and air conditioning units and energy efficient lighting. These reduction measures may be included as a part of developers' compliance with mitigation measure CC-1.1, Adoption of Additional Specific Plan Policies Pertaining to Greenhouse Gas Emissions.	S
Chapter 3.4 Noise			
NO-1 Development under the Railroad Avenue Specific Plan would expose existing sensitive receptors adjacent to the proposed uses to temporary increases in noise levels associated with construction. This would result in a potentially significant impact.	PS	**NO-1.1. Implement Construction Best Management Practices to Reduce Construction Noise.** The construction contractor(s) shall implement the following measures during the construction under the Railroad Avenue Specific Plan:	LTS

Legend:	(NI) No Impact	(LTS) Less than Significant	(PS) Potentially Significant	(SU) Significant and Unavoidable	(BI) Beneficial Impact

Table 1-3 (continued)
City of Pittsburg Railroad Avenue Specific Plan EIR Summary of Impacts and Mitigation Measures

Impacts	Impact Significance Without Mitigation	Mitigation/Improvement Measures	Impact Significance With Mitigation
		• Restrict construction activities to the hours of 8:00 a.m. to 5:00 p.m. • Equipment and trucks used for project construction shall utilize the best available noise control techniques (e.g., improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures and acoustically attenuating shields or shrouds, wherever feasible). • Impact tools (e.g., jack hammers, pavement breakers, and rock drills) used for project construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. However, where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used; this muffler can lower noise levels from the exhaust by up to 10 dBA. External jackets on the tools themselves shall be used where feasible, and this could achieve a reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment, whenever feasible. • Construction contractor shall use "quiet" gasoline-powered compressors or other electric-powered compressors, and use electric rather than gasoline or diesel powered forklifts for small lifting. • Stationary noise sources, such as temporary generators, shall be located as far from adjacent receptors as possible, and they shall be muffled and enclosed within temporary sheds, incorporate insulation barriers, or other measures to the extent feasible. • Erect temporary plywood noise barriers around the construction site, to shield adjacent uses. • Prohibit trucks from idling along residential streets serving the construction site.	

Legend:	(NI) No Impact	(LTS) Less than Significant	(PS) Potentially Significant	(SU) Significant and Unavoidable	(BI) Beneficial Impact

Table 1-3 (continued)
City of Pittsburg Railroad Avenue Specific Plan EIR Summary of Impacts and Mitigation Measures

Impacts	Impact Significance Without Mitigation	Mitigation/Improvement Measures	Impact Significance With Mitigation
NO-2 Development under the Railroad Avenue Specific Plan would not generate excessive groundborne vibration. This would be considered a less-than-significant impact.	LTS	None required.	LTS
NO-3 The Railroad Avenue Specific Plan proposes residential land uses in areas where ambient noise levels currently exceed acceptable levels for new residential uses. This is a potentially significant impact of the project.	PS	**NO-3.1. Implement site and architectural design measures to reduce noise levels for new residential development with ambient noise levels greater than 65 dBA CNEL.** Per the General Plan, new development located near a roadway that produces noise levels greater than 65 dBA CNEL (measured at the façade of a proposed residential use) shall be required to have an acoustical analysis prepared by a qualified acoustical engineer to ensure that all feasible site planning and architectural design measures were incorporated to reduce interior noise levels to a maximum of 45 dB CNEL. Measures to achieve acceptable noise levels include adjusting the configuration of the proposed residential buildings and placing exterior living areas such as patios and balconies away from high traffic roadways. Recommendations from the acoustical study must be incorporated into building and site design and submitted to the City for approval prior to issuance of a building permit.	LTS
NO-4 The Railroad Avenue Specific Plan would not substantially increase ambient noise levels at existing sensitive receptors in the vicinity of the project area. This is considered a less-than-significant impact.	LTS	None required.	LTS
Chapter 3.5 Cultural Resources			
CR-1 Implementation of the proposed project would not cause a substantial adverse change in the significance of a historical resource as defined in CEQA Guidelines section 15064.5.	PS	**CR-1.1. Historical Resources Review.** Prior to issuance of a development permit for improvements or alterations on a building or structure in the Specific Plan Area that is 45 years or older, or that is adjacent to a building or structure 45 years old or older, the City shall require the project sponsor (a) to submit an application for review to the City Historic Resources Commission/Planning Commission, or (b) to retain a cultural resource professional who	LTS

Legend:	(NI) No Impact	(LTS) Less than Significant	(PS) Potentially Significant	(SU) Significant and Unavoidable	(BI) Beneficial Impact

Table 1-3 (continued)
City of Pittsburg Railroad Avenue Specific Plan EIR Summary of Impacts and Mitigation Measures

Impacts	Impact Significance Without Mitigation	Mitigation/Improvement Measures	Impact Significance With Mitigation
		meets the Secretary of the Interior's Professional Qualifications Standards for Architectural History. The City Historic Resources Commission or the certified cultural resources professional shall evaluate the building or structure that is 45 years or older and determine if it qualifies as an historical resource (as defined in Public Resources Code, Sections 21084.1 and 21083.2 and CEQA Guidelines, Section 15064.5) and if its historic merit would be adversely affected by the proposed development. Whether the historical resource consideration is conducted under the auspices of the City Historic Resources Commission/Planning Commission or an investigation is completed by a professional retained by the project applicant, the results shall be documented. The results of any historic investigation shall be documented in a technical report or memorandum that (a) identifies and evaluates any historical resources that could be adversely affected by the development and (b) includes recommendations and methods for eliminating or reducing impacts on historical resources. Where historical resources are proposed for demolition, the investigation shall consider whether there is a feasible non-demolition option. As determined necessary by the City, environmental documentation (e.g., CEQA documentation) prepared for future development within the project site shall reference or incorporate the findings and recommendations of the technical report or memorandum. The project applicant shall be responsible for implementing methods for eliminating or avoiding impacts on historical resources identified in the technical report or memorandum. The technical report or memorandum shall be submitted to the City for approval as part of the development application, and the Historic Resources Commission/Planning Commission shall base its decision about the validity of the building as a historical resource and any potential required mitigations based on that decision on the staff report, technical	

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Table 1-3 (continued)
City of Pittsburg Railroad Avenue Specific Plan EIR Summary of Impacts and Mitigation Measures

Impacts	Impact Significance Without Mitigation	Mitigation/Improvement Measures	Impact Significance With Mitigation
		memorandum or report or other acceptable form of documentation.	
CR-2 Implementation of the proposed project could cause a substantial adverse change in the significance of an archaeological resource or disturb human remains, including those interred outside of formal cemeteries; however, adherence to existing *General Plan* Goals, Policies, and Mitigations would reduce this to a less-than-significant impact.	LTS	None required.	LTS
CR-3 The proposed project, in combination with other projects in East Contra Costa County region, could cause a substantial adverse change in the significance of cultural resources.	PS	Mitigation Measure CR-1.1, above, would reduce this cumulative impact to a less-than-significant level.	LTS
Chapter 3.6 Public Services and Recreation			
PS-1 The Specific Plan would require an increased level of police services. However, the increased level of police services would not be large enough to trigger the need for construction of new facilities that could adversely affect the physical environment, or affect human health and safety. Impacts would be less than significant.	LTS	None required.	LTS
PS-2 The Specific Plan could increase the need for fire protection and emergency response during operations; however, the increased demand would not result in the expansion or construction of facilities that would result in a physical effect.	LTS	None required.	LTS
PS-3 The Specific Plan would increase the number of school children in the area of the proposed development; however, the new development under the proposed Specific Plan would be subject to SB 50 School Impact Fees, which would mitigate impacts to a less-than-significant level.	LTS	None required.	LTS

Legend:	(NI) No Impact	(LTS) Less than Significant	(PS) Potentially Significant	(SU) Significant and Unavoidable	(BI) Beneficial Impact

Table 1-3 (continued)
City of Pittsburg Railroad Avenue Specific Plan EIR Summary of Impacts and Mitigation Measures

Impacts	Impact Significance Without Mitigation	Mitigation/Improvement Measures	Impact Significance With Mitigation
PS-4 The proposed Specific Plan development would not result in the construction or expansion of libraries or other community services, which could in turn result in adverse environmental impacts.	LTS	None required.	LTS
PS-5 The proposed Specific Plan development would result in increase in population which would require the need for additional open space and parks. However, this impact would be less than significant.	LTS	None required.	NI
Chapter 3.7 Utilities			
UT-1 New development would increase the demand for water supply and distribution system; however, future water supply and distribution would be adequately met by water supply available to, and provided by, CCWD and the City of Pittsburg.	LTS	None required.	LTS
UT-2 The proposed new development could exceed current wastewater collection and treatment capacity; however, Delta Diablo Sanitation District facilities would adequately accommodate the projected growth upon implementation of a recently-approved treatment plant expansion project.	LTS	None required.	LTS
UT-3 The proposed new development associated with the Specific Plan would not require an increase in the available disposal capacity at the Potrero Hill and Keller Canyon Landfills.	LTS	None required.	LTS
UT-4 The proposed new development associated with the Specific Plan would not substantially increase the demand for, or lead to inefficient use of, local energy sources.	LTS	None required.	LTS

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Table 1-3 (continued)
City of Pittsburg Railroad Avenue Specific Plan EIR Summary of Impacts and Mitigation Measures

Impacts	Impact Significance Without Mitigation	Mitigation/Improvement Measures	Impact Significance With Mitigation
Chapter 3.8 Climate Change			
CC-1 The proposed project could result in a substantial cumulative increase in greenhouse gas emissions.	PS	**CC-1.1 Adoption of Additional Specific Plan Policies Pertaining to Greenhouse Gas Emissions.** The following policies shall be incorporated into the Railroad Avenue Specific Plan to address the greenhouse gas emissions associated with solid waste, utilities, and water use: • Provide incentives to private developers to incorporate green building practices. Such incentives may include accelerated project review, rebates or low-interest loans for green building improvements, or other programs designed by the City. • Retrofit municipal water and wastewater systems in the Railroad Avenue Specific Plan Area with energy efficient motors, pumps and other equipment.	LTS

Source: PBS&J, 2009.

Legend:	(NI) No Impact	(LTS) Less than Significant	(PS) Potentially Significant	(SU) Significant and Unavoidable	(BI) Beneficial Impact

1.3 MITIGATION MEASURES FROM THE INITIAL STUDY

Impacts and Mitigation Measures

Table 1-4 (City of Pittsburg Railroad Avenue Specific Plan Initial Study Summary of Impacts and Mitigation Measures), below, summarizes the environmental impacts requiring mitigation/improvement measures, as contained in the Initial Study for the proposed project. The Initial Study for the proposed project was published for circulation on October 1, 2008. The description of some impacts and measures in the table have been abbreviated, consistent with the format of a summary section, and the reader is referred to the main text of the Initial Study (attached as Appendix A of this document) for a complete discussion of environmental impacts and mitigation/improvement measures (refer to the numbering sequence for location).

Table 1-4
City of Pittsburg Railroad Avenue Specific Plan Initial Study Summary of Impacts and Mitigation Measures

Impacts	Impact Significance Without Mitigation	Mitigation/Improvement Measures	Impact Significance With Mitigation
D.1. While nesting activities were not observed during the surveys in the Specific Plan Area, existing trees could support nesting birds in the future. Construction activities associated with future projects could result in the disturbance to nesting birds. This would be considered a potentially significant impact.	PS	**BIO-1. Conduct a Nesting Bird Survey within the Specific Plan Area.** Project applicants shall be required to comply with the following activities prior to construction during the nesting season, March 1st to August 1st. Outside the specified time period, no mitigation would be required. (a) Between March 1st and August 1st, the applicant shall have a qualified biologist conduct nest surveys 30 days prior to any demolition/construction activities that are within 500 feet of potential nest trees. A pre-construction survey report shall be submitted to CDFG and the City of Pittsburg that includes, at a minimum: (1) a description of the methodology including dates of field visits, the names of survey personnel with resumes, and a list of references cited and persons contacted; and (2) a map showing the location(s) of any bird nests observed on the project site. This report shall be consistent with the requirements from the East Contra Costa County HCP. If no active nests of MBTA, CDFG, or USFWS protected species are identified then no further mitigation is required. (b) Should active bird nests be located in the survey area, the applicant, in consultation with the City of Pittsburg and CDFG, shall delay construction in the vicinity of active nest sites during the breeding season (March 1st through August 1st) while the nest is occupied with adults and/or young. A qualified biologist shall monitor any occupied nest to determine when the nest is no longer used. If the construction cannot be delayed, avoidance shall include the establishment of a non-disturbance buffer zone around the nest site. The size of the buffer zone will be determined in consultation with the CDFG, but will be a minimum of 100 feet. The buffer zone shall be delineated by highly visible temporary construction fencing.	LTS

Legend:	(NI) No Impact	(LTS) Less than Significant	(PS) Potentially Significant	(SU) Significant and Unavoidable	(BI) Beneficial Impact

Table 1-4 (continued)
City of Pittsburg Railroad Avenue Specific Plan Initial Study Summary of Impacts and Mitigation Measures

Impacts	Impact Significance Without Mitigation	Mitigation/Improvement Measures	Impact Significance With Mitigation
		(c) No intensive disturbance (e.g., heavy equipment operation associated with construction or use of cranes) or other project-related activities that could cause nest abandonment or forced fledging, shall be initiated within the established buffer zone of an active nest between March 1st and August 1st. (d) If demolition/construction activities are unavoidable within the buffer zone, the project applicant shall retain a qualified biologist to monitor the nest site to determine if construction activities are disturbing the adult or young birds. If abandonment occurs the biologist shall consult with CDFG or USFWS for the appropriate salvage measures. This could include taking any nestlings to a local wildlife rehabilitation center. (e) Trees that support active nests which are to be removed shall only be removed during the non-breeding, non-nesting season.	
E.3. It is possible that intact paleontological resources could be adversely affected by the earth-moving development of the Specific Plan Area. Impacts on paleontological resources are therefore considered potentially significant.	PS	**CR-1. Treatment of Unexpected Paleontological Resources.** Should paleontological resources be identified at project construction sites during any phase of construction, the construction contractor/supervisor shall cease operation at the site of the discovery and immediately notify the City of Pittsburg Planning Department. The project applicant shall retain a qualified paleontologist to provide an evaluation of the find and to prescribe mitigation measures to reduce impacts to a less-than-significant level. In considering any suggested mitigation proposed by the consulting paleontologist, the City of Pittsburg Planning Department shall determine whether avoidance is necessary and feasible in light of factors such as the nature of the find, project design, costs, specific plan policies and land use assumptions, and other considerations. If avoidance is unnecessary or infeasible, other appropriate measures (e.g., data recovery) shall be instituted. Work	LTS

Legend:	(NI) No Impact	(LTS) Less than Significant	(PS) Potentially Significant	(SU) Significant and Unavoidable	(BI) Beneficial Impact

Table 1-4 (continued)
City of Pittsburg Railroad Avenue Specific Plan Initial Study Summary of Impacts and Mitigation Measures

Impacts	Impact Significance Without Mitigation	Mitigation/Improvement Measures	Impact Significance With Mitigation
		may proceed on other parts of the project site while mitigation for paleontological resources is carried out.	
G.2. The Specific Plan includes redevelopment of land within the Transit Village and Industrial Mixed Use Center sub-areas from industrial to residential, mixed use and public park space would create a potentially significant hazard to the public or environment through the accidental release of hazardous materials associated with any potential underground storage tanks and potential contamination from previous industrial and military uses of the site.	PS	**HAZ-1. Underground storage tank and hazardous materials remediation:** The proposed Specific Plan shall include the following policy: Policy SP7-P-2.9 – Require phase I environmental site assessments (and phase II sampling where appropriate) for redevelopment of previous industrial sites within the sub-areas that have the potential to contain underground storage tanks or contamination from previous industrial uses. When remediation is required pursuant to the findings of the environmental site assessments, implement all required remediation and abatement work in accordance with the requirements of the Department of Toxic Substances Control (DTSC), Regional Water Quality Control Board (RWQCB) requirements or other applicable agency.	LTS

Legend:	(NI) No Impact	(LTS) Less than Significant	(PS) Potentially Significant	(SU) Significant and Unavoidable	(BI) Beneficial Impact

1.4 AREAS OF CONTROVERSY AND ISSUES TO BE RESOLVED

Areas of Controversy

A public notice was posted on October 1, 2008, stating the City's intent to prepare an EIR for the proposed project, and providing notice of a public scoping meeting that would be held to: (1) explain the EIR process to the public, (2) discuss areas being studied, and (3) take public comment on the process and potential areas of project concern. This public scoping meeting was conducted on the evening of October 14, 2008, in the City Council chambers at City Hall. Public comments and concerns have been collected as expressed in both written comment letters and in the public scoping meeting. Areas of concern or controversy were raised by several agencies, and several local citizens, and include the following:

- The City of Pittsburg (the City) should review population projections in the Railroad Avenue Specific Plan and ensure that they match population projections provided in the recently published eBART Draft EIR. (Citizen)
- The City should review impacts from increased residential development on school district and public services. (Citizen)
- The City should review a project alternative that would eliminate residential and commercial uses on the Civic Center block, as that is an inappropriate location for residential uses and better suited to civic land uses, community services and open space only. (Citizen)
- The City should examine the impacts of growth under the Specific Plan project on City Hall, the Police Department and other public uses that would be responsible for providing service to the new residences and commercial uses. (Citizen)
- The City should examine the environmental impacts of the Specific Plan project on Kirker Creek and the Delta de Anza trail, especially near Central Junior High School. The City should investigate whether the creek could be repaired in the project area, as a way of addressing any environmental impacts. (Citizen)
- The City should examine the Specific Plan project impacts on Monarch butterflies, white tailed kites and other biological resources. (Citizen)
- The City should examine the impact of increased traffic and vehicle emissions, resulting from the proposed project. (Citizen)
- The City should consider requiring shade-giving trees to increase the tree canopy in the project area. (Citizen)
- The City should consider providing connections to other modes of transportation, such as the ferry and Amtrak, as part of the Specific Plan project. (Citizen)
- The City should ensure that the Transportation analysis they secure for the EIR considers pedestrian and bicycle safety and comfort particularly around State Route 4 ramps and

overcrossing, considers pedestrian and bicycle mobility and safety throughout the Specific Plan project area with anticipated changes in the roadway levels of service, and uses the URBEMIS model for traffic modeling so as to compare transportation demand management (TDM) strategies and their effect on traffic generation predictions in the EIR. The City should also consider air quality impacts of land use in all alternatives studied under the EIR, and should ensure there are proper construction mitigations to protect existing residents from new construction emissions and air quality impacts. ("TransForm" organization)

- BART should construct its eBART facilities on standard BART gauge, and should construct the proposed new BART extension as regular BART rather than a diesel BART line. (Citizen)
- The City should consider impacts of the Specific Plan project on local Pittsburg Unified School District schools, as the project would require a new elementary school and a new junior high school to accommodate the demand of new resident families, and additional busing could be required to transport new students to their destination schools. (Pittsburg Unified School District Superintendent)
- The Traffic Impact Study prepared for the Specific Plan EIR should include a full discussion of the City's responsibility for mitigation of impacts on highways, and should define the City's fair share contribution, method of financing, and scheduling for same. Detailed discussion followed this general request. (Caltrans)
- The City should ensure that all roadway improvements are completed prior to issuance of project occupancy permits, and shall secure encroachment permits and possibly an archaeological record search for work in the right-of-way, as appropriate. Detailed discussion followed this general request. (Caltrans)

Significant and Unavoidable Impacts, Cumulative Impacts, and Growth-Inducing Impacts

Significant and unavoidable impacts, cumulative development impacts, and growth-related impacts may result from the implementation of the proposed project. These impacts are presented in detail in Chapter 4 (Significant and Unavoidable Impacts, Cumulative Impacts, and Growth Management and Growth-Inducing Impacts) of this document.

Potentially significant and unavoidable impacts are impacts that would occur as a result of implementation of the proposed project, despite implementation of feasible mitigation measures. There is one significant and unavoidable impact that could result from the proposed project, namely, new area and mobile sources of ROG, NO_x, and PM_{10}. These emissions would (1) exceed the Bay Area Air Quality Management District's (BAAQMD's) established significance threshold of 80 pounds per day, (2) contribute substantially to an existing or projected air quality violation, and (3) be inconsistent with regional air quality plans to achieve attainment. As there are no feasible measures to mitigate these effects, this impact would be significant and unavoidable. This impact is discussed further in Chapter 3.3, Air Quality of this document.

Cumulative impacts occur when two or more individual effects may not be independently significant but, when considered together, may compound or increase to generate a potential environmental impact. This document identifies one impact of the proposed project that would be potentially significant in a cumulative scenario, namely, daily air emissions that would exceed BAAQMD thresholds.

Growth-inducing Impacts would occur if the project were noncompliant with applicable growth management policies, or would create circumstances that would induce substantial development or urban expansion (and related demands on infrastructure, undeveloped land and other resources), that are not anticipated and analyzed under this EIR. Growth management in the City of Pittsburg is enforced through three primary mechanisms. As is discussed in detail in Chapter 4 of this document, it was determined that implementation of the proposed project would not have a growth-inducing effect that would be inconsistent with the City's *General Plan* and urban limit line, or other growth management mechanisms currently in place.

1.5 SUMMARY OF PROJECT ALTERNATIVES

An examination of project alternatives is important in deliberating the merits of the Railroad Avenue Specific Plan. This EIR presents three alternatives for the project, namely, a No Project alternative (required under CEQA), a 75 Percent Residential Development alternative, and a Relocated Residential Density alternative. These alternatives, other than the No Project alternative, focus on project development scenarios that attempt to avoid or substantially lessen any significant environmental effects of the Railroad Avenue Specific Plan. The No Project alternative would leave *General Plan* land use designations and zoning in the Specific Plan Area as they are now. These alternatives are presented in detail in Chapter 5, Alternatives to the Proposed Project, of this EIR.

The No Project alternative would avoid the significant and unavoidable environmental air quality impacts (project-related and cumulative) associated with implementation of the proposed project by eliminating the new mobile and area source air emissions, but would not support transit-oriented development or the City's other project objectives to the same degree as the other two alternatives. While none of the other alternatives brings the project-related or cumulative impacts to air quality to a less-than-significant level, emissions from the 75 Percent Residential Development alternative would be less than would occur under the Relocated Residential Density alternative, and other than the No Project alternative, the 75 Percent Residential Development alternative would be the Environmentally Superior Alternative.

Chapter 2
Project Description

2.1 INTRODUCTION

Purpose of Environmental Impact Report

This Environmental Impact Report (EIR) has been prepared for the City of Pittsburg Railroad Avenue Specific Plan. The Railroad Avenue Specific Plan would affect a 1,075-acre area, and would include the potential construction of up to 1,845 new residential units and approximately 988,449 square feet of commercial floor area on approximately 97 acres of that total 1,075-acre Specific Plan Area. This EIR has been prepared in conformance with the provisions of the California Environmental Quality Act (CEQA) Guidelines as amended.[1]

The purpose of the EIR is (1) to provide the City of Pittsburg, public agencies and the public in general with detailed information about the environmental effects of implementing the Railroad Avenue Specific Plan (herein referred to as "the proposed project"), (2) to examine and institute methods of mitigating any adverse environmental impacts should the Railroad Avenue Specific Plan be approved, and (3) to consider alternatives to the Railroad Avenue Specific Plan as proposed, if this document finds that approval of the Railroad Avenue Specific Plan could lead to significant and unmitigable impacts.

CEQA provides that public agencies should not approve projects until all feasible means available have been employed to substantially lessen the significant environmental effects of such projects. "Feasible" means capable of being accomplished in a successful manner within a reasonable period of time taking into account all economic, environmental, social and technological factors.[2]

This EIR specifically addresses the Railroad Avenue Specific Plan and its infrastructure development components as proposed, but does not evaluate the individual private property development projects that would be authorized under the new zoning and land uses prescribed under the Specific Plan. This EIR is, therefore, a "program-level" document. In the future, this program-level EIR may be supplemented by further project-level environmental review if it is determined that an individual development project could potentially have one or more site-specific impacts on the environment that will not be mitigated by the measures contained herein and by complying with policies set forth in the *Pittsburg General Plan* and the Railroad Avenue Specific Plan. The current program-level EIR will be considered by officials of the City of Pittsburg, acting as Lead Agency for the project under CEQA, prior to any decisions being made on the proposed Railroad Avenue Specific Plan. Certification of the Final EIR by the City of Pittsburg City Council, as complete and adequate in conformance with

[1] *CEQA, California Environmental Quality Act, Statutes and Guidelines*, Guidelines as amended July 27, 2007, published by the Governor's Office of Planning Research.

[2] Public Resources Code 21061.1.

CEQA, does not grant any approvals for the project or its development components. The merits of the Railroad Avenue Specific Plan and its development components will be considered after the EIR is certified by the City of Pittsburg City Council.

EIR Scoping

Public Scoping Meeting

The City of Pittsburg Planning Department conducted an EIR public scoping meeting for the Railroad Avenue Specific Plan on the evening of October 14, 2008 in the City Council Chambers located at 65 Civic Avenue, Pittsburg, California, 94565. The purpose of the public scoping meeting was to allow agency representatives, individuals, and the public at large to express the environmental issues felt necessary to be addressed in the EIR for the Railroad Avenue Specific Plan, and for the Planning Department to record those concerns.

To advertise for the public scoping meeting, the Planning Department announced the scoping meeting time and place in the EIR Notice of Preparation (see below), which was posted on the project webpage, and mailed to all attendees of all workshops and community meetings associated with the project as well as to others who had expressed an interest in the Plan's development.

Initial Study and Notice of Preparation – Railroad Avenue Specific Plan

On October 1, 2008, the City of Pittsburg Planning Department issued a Notice of Preparation (NOP) that an EIR would be prepared for the Railroad Avenue Specific Plan project. The NOP response period extended for 30 days from the time of receipt of the NOP. The NOP was submitted to 24 City, County and State agencies, businesses, civic groups, committees and associations having jurisdiction or interest over environmental resources and/or conditions within the project area (including, but not limited to, City of Antioch, City of Concord, California Regional Water Quality Control Board, Contra Costa County Planning Department, Caltrans). It was also delivered to the Governor's Office of Planning and Research (the State Clearinghouse for EIRs). The purpose of the NOP was to allow the various private and public entities to transmit their concerns and comments on the scope and content of the EIR, focusing on specific information related to each group's interest or agency's statutory responsibility early in the environmental review process.

Attached to the NOP was an Initial Study. The Initial Study contained a preliminary evaluation of anticipated environmental impacts that would result from implementation of the Railroad Avenue Specific Plan project. On the basis of the analysis in the Initial Study, it was determined that the Specific Plan project could potentially have adverse impacts in the areas of (a) Cultural Resources, (b) Transportation, (c) Air Quality, (d) Noise, (e) Public Services and Recreation, and (f) Utilities. All other areas of potential environmental impact were deemed to have no potential adverse impacts under the Specific Plan project, so were "scoped out" (eliminated from further analysis and consideration in the EIR).

Impacts and Mitigation Measures from the Initial Study

The Initial Study "scoped out" certain potential environmental impacts, and identified other environmental concerns requiring further study in this EIR. In addition, the Initial Study identified three environmental impacts that could occur under the proposed project, but that could be effectively mitigated without further study. The three potential impacts identified in the Initial Study include (a) a potentially adverse impact on nesting habitat for a number of protected avian species, such as white-tailed kite, tree swallows, western blue bird, and American robin; (b) potentially adverse impacts on unique paleontological resources in the project area; and (c) potentially adverse hazardous materials releases into the environment that could be associated with any potential underground storage tanks and potential contamination from previous industrial and military uses of the site.

Mitigation measures were defined in the Initial Study, and would eliminate these three potentially adverse impacts, or reduce them to a less-than-significant level. In order to ensure that these impacts remain at a less-than-significant level, the associated mitigation measures must be incorporated as policies of the Specific Plan and implemented with projects undertaken in association with the Specific Plan, if approved. These Initial Study mitigation measures would be automatically adopted in association with the approval of this EIR. These mitigation measures have also been included in Chapter 1, Executive Summary of this EIR and the Railroad Avenue Specific Plan Mitigation Monitoring and Report Program (MMRP), for ease of reference. The following is a detailed discussion of the impacts identified and the mitigation measures required to reduce these impacts to less-than-significant. This text is taken directly from the Initial Study, which is Appendix A of this EIR.

Biological Resources

The Specific Plan Area is generally developed and therefore supports little to no sensitive and/or native biological resources. The only sensitive resource within the Specific Plan Area is Kirker Creek. The East Contra Costa County HCP designated Kirker Creek as potential breeding habitat for the CRLF. The nearest CRLF occurrence in the CNDDB was recorded in July 2002 on Kirker Creek approximately 1.96 miles south of the Specific Plan Area. The west fork of Kirker Creek, from Harbor Street until it leaves the Specific Plan Area, is composed of mud bottom. The east fork of Kirker Creek, from Stoneman Avenue until it leaves the Specific Plan Area (near SR 4) has a concrete bottom. The mud bottom section of Kirker Creek could support breeding habitat for the CRLF. Therefore, construction adjacent or within the Kirker Creek channel could affect the CRLF. However, the Specific Plan would not alter the existing land use designation in the area surrounding Kirker Creek nor propose circulation or utility improvements along the creek. As such, the Specific Plan would have no potential to impact Kirker Creek or the potential CRLF breeding habitat.

The riparian vegetation along Kirker Creek would provide the most likely nesting habitat for a number of protected avian species, such as white-tailed kite, tree swallows, western blue bird, and American robin. Although unlikely, trees within the urban and industrial zone of the Specific Plan Area could also provide suitable habitat for nesting birds. The white-tailed kite is a California fully protected species; the tree swallow, western blue bird, and other avian species are protected under the Migratory

Bird Treaty Act (MBTA). While nesting activities were not observed during the surveys in the Specific Plan Area, existing trees could support nesting birds in the future. Construction activities associated with future projects could result in the disturbance to nesting birds. This would be considered a potentially significant impact.

MITIGATION MEASURE. Mitigation Measure BIO-1, below, would minimize the potential effects from the implementation of the Specific Plan on nesting birds and reduce impacts to a less-than-significant level. Future project applicants within the Specific Plan Area would comply with the following measures.

BIO-1 *Conduct a Nesting Bird Survey within the Specific Plan Area.* Project applicants shall be required to comply with the following activities prior to construction during the nesting season, March 1st to August 1st. Outside the specified time period, no mitigation would be required.

(a) Between March 1st and August 1st, the applicant shall have a qualified biologist conduct nest surveys 30 days prior to any demolition/construction activities that are within 500 feet of potential nest trees. A pre-construction survey report shall be submitted to CDFG and the City of Pittsburg that includes, at a minimum: (1) a description of the methodology including dates of field visits, the names of survey personnel with resumes, and a list of references cited and persons contacted; and (2) a map showing the location(s) of any bird nests observed on the project site. This report shall be consistent with the requirements from the East Contra Costa County HCP. If no active nests of MBTA, CDFG, or USFWS protected species are identified then no further mitigation is required.

(b) Should active bird nests be located in the survey area, the applicant, in consultation with the City of Pittsburg and CDFG, shall delay construction in the vicinity of active nest sites during the breeding season (March 1st through August 1st) while the nest is occupied with adults and/or young. A qualified biologist shall monitor any occupied nest to determine when the nest is no longer used. If the construction cannot be delayed, avoidance shall include the establishment of a non-disturbance buffer zone around the nest site. The size of the buffer zone will be determined in consultation with the CDFG, but will be a minimum of 100 feet. The buffer zone shall be delineated by highly visible temporary construction fencing.

(c) No intensive disturbance (e.g., heavy equipment operation associated with construction or use of cranes) or other project-related activities that could cause nest abandonment or forced fledging, shall be initiated within the established buffer zone of an active nest between March 1st and August 1st.

(d) If demolition/construction activities are unavoidable within the buffer zone, the project applicant shall retain a qualified biologist to monitor the nest site to determine if construction activities are disturbing the adult or young birds. If abandonment occurs the biologist shall consult with CDFG or USFWS for the appropriate salvage measures. This could include taking any nestlings to a local wildlife rehabilitation center.

(e) Trees that support active nests which are to be removed shall only be removed during the non-breeding, non-nesting season.

Cultural Resources

Paleontological resources include fossil remains, as well as fossil localities and rock or soil formations that have produced fossil material. Fossils are the remains or traces of prehistoric animals and plants. Fossils are important scientific and educational resources because of their use in: (1) documenting the presence and evolutionary history of particular groups of now extinct organisms, (2) reconstructing the environments in which these organisms lived, and (3) determining the relative ages of the strata in which they occur and of the geologic events that resulted in the deposition of the sediments that formed these strata and in their subsequent deformation. Although Pleistocene epoch mammal and fish fossils have been found in Pittsburg (along the Mokelumne Aqueduct), because of the ground disturbance that has occurred in the Specific Plan area to create the existing urban land uses and infrastructure, shallow subsurface paleontological resources are not anticipated to be recovered intact. Nonetheless, it is possible that intact paleontological resources could be adversely affected by the earth-moving development of the Specific Plan area. Impacts on paleontological resources are therefore considered potentially significant.

MITIGATION MEASURE. Mitigation Measure CR-1, below, would ensure that any previously undiscovered paleontological resources would be treated by a qualified professional, who would reduce impacts to a less-than-significant level via avoidance, data recovery, or other appropriate measures. The impact, therefore, is considered less than significant with mitigation incorporated.

CR-1 *Treatment of Unexpected Paleontological Resources*. Should paleontological resources be identified at project construction sites during any phase of construction, the construction contractor/supervisor shall cease operation at the site of the discovery and immediately notify the City of Pittsburg Planning Department. The project applicant shall retain a qualified paleontologist to provide an evaluation of the find and to prescribe mitigation measures to reduce impacts to a less-than-significant level. In considering any suggested mitigation proposed by the consulting paleontologist, the City of Pittsburg Planning Department shall determine whether avoidance is necessary and feasible in light of factors such as the nature of the find, project design, costs, specific plan policies and land use assumptions, and other considerations. If avoidance is unnecessary or infeasible, other appropriate measures (e.g., data recovery) shall be instituted. Work may proceed on other parts of the project site while mitigation for paleontological resources is carried out.

Hazards and Hazardous Materials

The Transit Village, Industrial/Mixed Use Center and Los Medanos Industrial Center areas contained motor repair shops and gas stations during the Camp Stoneman era.[3] The Specific Plan includes land use changes from industrial to transit oriented mixed use (including residential, public parks, and ground-floor retail and commercial uses) within the Transit Village and Industrial/Mixed Use Center. Land use designations within the Los Medanos Industrial Center will remain for industrial type uses and will not result in the conversion of previous industrial sites for use as residential, mixed use, or public parks. Buildings within the Los Medanos Industrial Center sub area have been redeveloped since the Camp Stoneman era, and remnant buildings have been replaced with modern industrial type buildings. However, some of the remnant facilities associated with Camp Stoneman may remain within the Transit Village and Industrial/Mixed Use Center sub-areas. The Specific Plan would include changes in land use regulations that would allow sites containing these buildings to be redeveloped with residential, mixed use and recreation and park uses. The redevelopment of land within the Transit Village and Industrial Mixed Use Center sub-areas to include residential, mixed use and public park space creates a potentially significant hazard to the public or environment through the accidental release of hazardous materials associated with any potential underground storage tanks and potential contamination from previous industrial and military uses of the site.

The demolition of any structures within the City that may have asbestos containing building materials (ACBM) must be conducted in accordance with all applicable laws regarding ACBM abatement, including, but not limited to, Bay Area Air Quality Management District (BAAQMD) regulation 11, rule 2,[4] requiring that a licensed asbestos abatement contractor (acting under the supervision of a certified asbestos consultant) perform the demolition, transportation and disposal of the ACBMs. Prior to the issuance of a demolition permit, the City of Pittsburg Building Division ensures that the contractor has obtained approval from the BAAQMD, affirming the BAAQMD's understanding that there are no ACBMs present on the property, or that ACBMs will be handled in accordance with all BAAQMD requirements.[5] Compliance with the required BAAQMD asbestos demolition regulations, as enforced through the City's demolition permit issuance process, will ensure that potential hazardous materials impacts related to the demolition of ACBMs containing buildings will be reduced to less than significant levels without additional mitigation.

> MITIGATION MEASURE. Mitigation Measure HAZ-1, below, would ensure that any potentially significant hazard to the public or environment involving the release of hazardous materials would be mitigated to a less than significant level. The impact, therefore, is considered less than significant with the mitigation incorporated.

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[3] Specific Plan and Camp Stoneman Layout Map (1944), Post Engineer Office, Camp Stoneman, California. 3/31/1944

[4] Bay Area Air Quality Management District, Regulation 11, rule 2, asbestos demoltion, website: www.baaqmd.gov/dst/regulations/rg1102.pdf

[5] Curt Smith, Chief Building Official (2008). Staff communication, July 17, 2008.

HAZ-1 *Underground storage tank and hazardous materials remediation*: The proposed Specific Plan shall include the following policy:

Policy SP7-P-2.9 Require phase I environmental site assessments (and phase II sampling where appropriate) for redevelopment of previous industrial sites within the sub-areas that have the potential to contain underground storage tanks or contamination from previous industrial uses. When remediation is required pursuant to the findings of the environmental site assessments, implement all required remediation and abatement work in accordance with the requirements of the Department of Toxic Substances Control (DTSC), Regional Water Quality Control Board (RWQCB) requirements or other applicable agency.

Response to the NOP

In response to the NOP and Initial Study, the City of Pittsburg received comment letters from the following individuals and agencies (see Appendix B of this EIR, Notice of EIR Preparation and Letters of Response):

- State of California, Department of Transportation (Caltrans)
- Delta Diablo Sanitation District
- Contra Costa County Fire Protection District
- Pittsburg Unified School District
- TransForm
- Mr. Robert Allen

Based on the findings of the Initial Study, public comments received at the public scoping meeting, and written correspondence received in response to the issuance of the NOP, major issues studied in the EIR include:

- Air Quality
- Cultural Resources
- Public Services & Recreation
- Climate Change
- Noise
- Traffic and Circulation
- Utilities

This EIR also analyzes potential project impacts on climate change. Climate change is not currently an environmental issue requiring analysis under CEQA (CEQA Guidelines Section 15063(f), in association with Appendix G, the "environmental checklist form"). Furthermore, climate change impacts were not reviewed, nor found to be potentially significant, in the Initial Study, as was the case for all other environmental issues analyzed in this EIR. However, the City of Pittsburg recognizes the increasing important of recognizing project impacts on global and regional climatic conditions. Recent legislation adopted in the State of California includes two important bills that attempt to address the

issue of climate change and the role of greenhouse gases in this process. Assembly Bill 32 (AB 32, 2006) and Senate Bill 375 (SB 375, 2008) do not set specific thresholds for greenhouse gas production, or other quantifiable goals to analyze or control climate change, but underline the importance of understanding environmental impacts related to climate change, as agencies and jurisdictions consider adopting long-range policy-oriented plans such as the Railroad Avenue Specific Plan. Section 3.8, Climate Change is therefore included in this EIR in recognition of this recent legislation and public interest in climate change.

Effect on the Environment

It should be noted that the CEQA Guidelines define the effects of a project as changes from the environmental setting (existing conditions) that are attributable to the project. Short-term construction impacts as well as the long-term operational impacts are analyzed as appropriate for the various topics.

The environmental impacts resulting from implementing the Railroad Avenue Specific Plan and its development components are considered in this EIR. Current environmental conditions under which the project would be implemented are considered in determining impact significance. If it is determined that a potential impact is too speculative for evaluation, this condition is so noted and the discussion of the impact is terminated. It should be noted that the adopted *Pittsburg 2020 General Plan (General Plan)* would allow development beyond the levels that currently exist in Pittsburg, and there could be environmental impacts that would result from this development. These impacts have already been studied, and are subject to mitigation under the *General Plan EIR*. These impacts are not addressed in this Railroad Avenue Specific Plan EIR. Impacts already identified and mitigated under the currently approved *General Plan* are not considered project-related impacts that would result from the proposed Specific Plan. This EIR is intended to identify and address only those impacts that would result from implementation of the Specific Plan, above and beyond existing development allowed under the *General Plan*.

In accordance with Sections 15143 and 15145 of the CEQA Guidelines, this EIR focuses on the significant effects on the environment resulting from implementing the project. Each major topic (e.g., Traffic and Circulation, Cultural Resources) contains criteria for evaluating whether an environmental impact is significant or less than significant. These criteria, known as thresholds of significance, are presented in each technical section of this EIR and are as approved by the City of Pittsburg for use in EIRs for which Pittsburg serves as lead agency. As explained in Section 15002(g) of the CEQA Guidelines, a significant effect on the environment is defined as a substantial adverse change in the physical conditions that exist in the area affected by the proposed project. For purposes of this EIR a less-than-significant environmental impact is one in which there is no long or short-term substantial adverse change in the physical conditions that exist in the area affected by the proposed project. For some projects, mitigation measures, programs, policies or features that would reduce a particular environmental impact, can be required to reduce the significance of the project's environmental impacts to a less-than-significant level.

If the project has one or more significant unavoidable impacts (significant impacts that cannot be feasibly mitigated to a less-than-significant level), the lead agency (in this case, the City of Pittsburg),

must prepare a statement of overriding considerations in which the lead agency sets forth its views in writing on the ultimate balancing of the merits of approving a project despite the environmental impacts that would result from project implementation. This process requires consideration of the decision maker (the lead agency), to balance the benefits of a proposed project against its unavoidable environmental risks in determining whether to approve a project. The statement of overriding conditions is prepared after the Final EIR has been completed and is preserved in the record of EIR certification (if the EIR is certified).

Standard for Adequacy

Section 15151 of the CEQA Guidelines specifies that an EIR should be prepared on a project with a sufficient degree of analysis to provide decision-makers with information that enables them to make a decision that intelligently takes account of environmental consequences. Where a particular project effect is too speculative for evaluation, discussion of the effect is to be concluded.

The standards for adequacy are described in CEQA:[6]

- An evaluation of the environmental effects of a proposed project need not be exhaustive, but the sufficiency of an EIR is to be reviewed in the light of what is reasonably feasible.
- Disagreement among experts does not make an EIR inadequate, but the EIR should summarize the main points of disagreement among the experts.
- The courts have looked not for perfection but for adequacy, completeness, and a good faith effort at full disclosure.

Economic and Social Effects

Section 15131 of the CEQA Guidelines specifies that economic or social effects of a project shall not be treated as significant effects on the environment. However, "an EIR may trace a chain of cause and effect from a proposed decision on a project through anticipated economic or social changes resulting from the project to physical changes caused in turn by the economic or social changes. The intermediate economic or social changes need not be analyzed in any detail greater than necessary to trace the chain of cause and effect. The focus of the analysis shall be on the physical changes."[7] Accordingly, this EIR focuses on physical changes that would be caused through implementing the Railroad Avenue Specific Plan and its development components.

Mitigation Monitoring and Reporting

CEQA requires public agencies to adopt mitigation monitoring and reporting programs to provide the lead agency with a means for tracking and implementing mitigation measures as documented in an EIR. The monitoring and reporting program need not be a component of the EIR. The program is part of the project approval process. A mitigation monitoring and reporting program will be included with the

[6] CEQA Guidelines Section 15151.

[7] CEQA Guidelines Section 15131.

City of Pittsburg findings for the Railroad Avenue Specific Plan and its development components. According to CEQA Section 15126.(a)(2), in the case of the adoption of a plan, policy, regulation, or other public project, mitigation measures can be incorporated into the plan, policy, regulation, or project design.

2.2 PROPOSED PROJECT

Project Location

The proposed project area is located in Pittsburg in eastern Contra Costa County (Figure 2-1). Pittsburg is approximately 18.35 square miles (11,700 acres). The City is generally an urbanized area, with residential, commercial, public, and light industrial uses in the eastern and central parts of the City, and heavy industrial uses in the northeastern portion of the City. The middle of the Specific Plan Area is generally located at the intersection of Railroad Avenue and SR 4 in central Pittsburg. Downtown Pittsburg, the Pittsburg Marina, and Suisun Bay are located just north of the Specific Plan Area.

Neighboring jurisdictions include the City of Antioch to the east, unincorporated Bay Point immediately west of Pittsburg, and the City of Concord, which sits west of Bay Point. The southern edge of Pittsburg is bounded by undeveloped land that extends south to the Clayton city limits. Pittsburg's northern city limit follows the shoreline along the Sacramento Delta and delta sloughs.

The project area sits near the center of Pittsburg, and includes the City's civic center. The project site surrounds the proposed location of the Railroad Avenue eBART station (Figure 2-2), which would sit in the median of SR 4 beneath the Railroad Avenue overcrossing and would be accessible from both sides of the overcrossing. The project area boundary is generally ½ mile from the eBART station. The boundary is extended further where necessary to enclose complete neighborhoods. The ultimate borders are defined primarily by railroads, subdivision boundaries, and Contra Costa County's Traffic Analysis Zones (TAZs). In total, the Specific Plan Area encompasses approximately 1,075 acres, which are divided into the 11 planning subareas shown on Figure 2-2: Old Town Gateway, Parkside Manor Neighborhood, Civic Center, High School Village, Los Medanos Neighborhood, Transit Village, Industrial/Mixed-Use Center, Los Medanos Industrial Center, Railroad Avenue Retail Corridor, Atlantic Avenue Corridor, and East Leland Corridor.

The project area is bounded on its northern side by E Fourteenth Street/N Parkside Drive, except that the Old Town Gateway subarea sits north of E Fourteenth/N Parkside, so the project area extends northward to the railroad tracks to encircle that neighborhood. The project's southern boundary is generally defined by the Contra Costa Canal and the Delta de Anza trail, a 25-mile-long, paved, multi-use regional trail that follows the East Bay Municipal Utility District's corridor. Other uses to the south of the Specific Plan Area include Buchanan Park, public schools, and extensive residential neighborhoods. Residential neighborhoods and schools also abut the west side of the Specific Plan

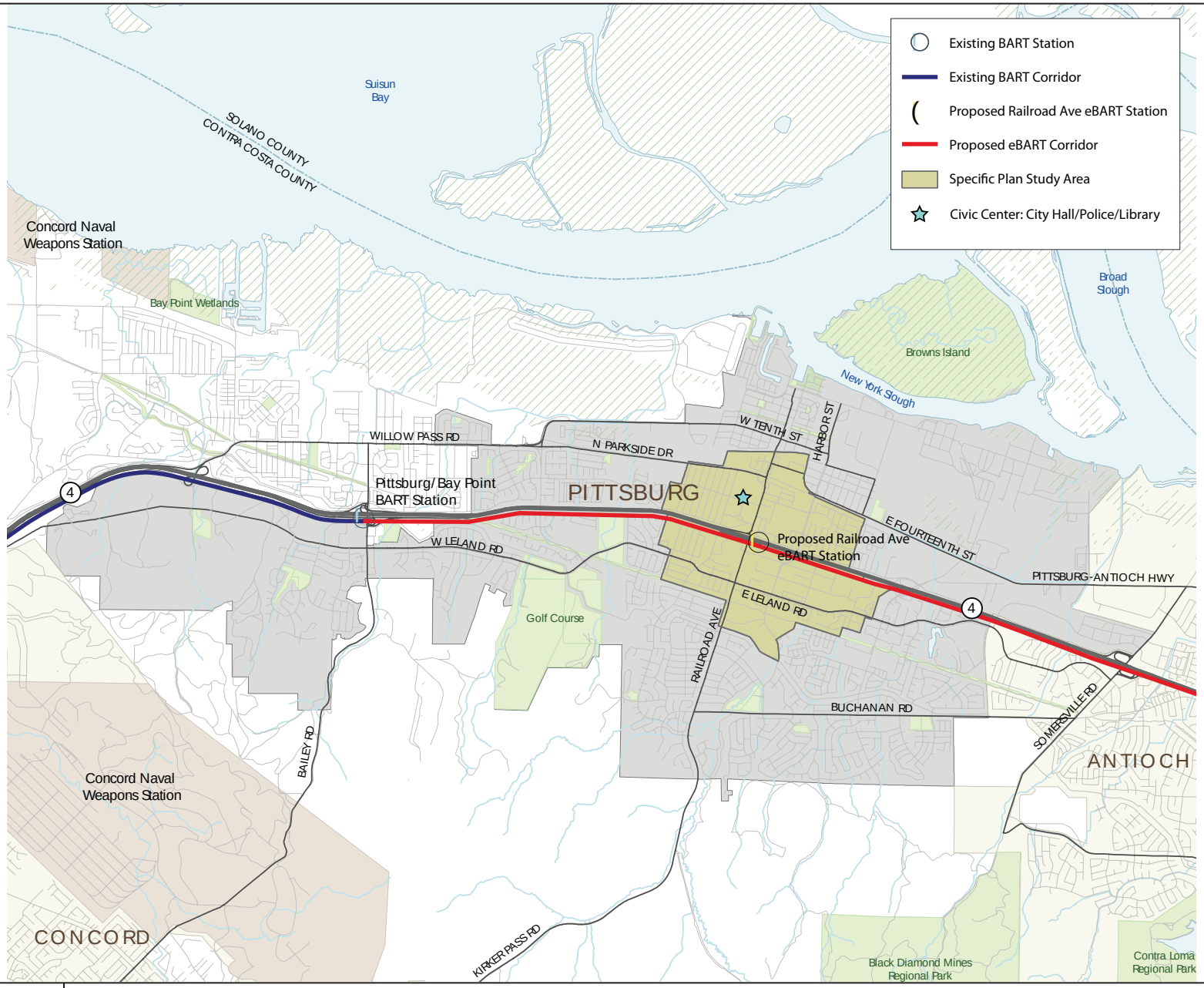

FIGURE 2-1
Project Location

***Source*:** MIG, 2008.

FIGURE 2-2
Specific Plan Area

***Source*:** MIG, 2008.

Area and portions of the east side. Access between the Specific Plan Area and the western and eastern portions of the City is primarily via SR 4 and Leland Road. Railroad Avenue and Harbor Streets are the only north-south roadways in the Specific Plan Area to span SR 4.

Project Setting

The City of Pittsburg is located in the eastern portion of Contra Costa County in the San Francisco Bay Area. Pittsburg is the westernmost city in eastern Contra Costa County which is composed of the incorporated cities of Antioch, Brentwood, and Oakley and the unincorporated communities of Bay Point, Bethel Island, Discovery Bay, and Byron. Eastern Contra Costa County is characterized by sprawling urban development surrounded by expansive open spaces, rural lands, and rolling hills, as well as proximity to the San Francisco Bay and Delta. Despite its long history as an agricultural area, East County has experienced a large increase in residential development in the past three decades. As housing prices and the cost of living increased in the western part of the Bay Area region, people began to move east to Pittsburg and other communities in Contra Costa County for the suburban lifestyle and affordable housing prices. Prior to the current economic crisis, businesses were also locating in and re-locating to the East County in order to take advantage of land availability, large portions of land zoned to allow industrial development, and the growing workforce population. It is anticipated that this will occur once again when the economy recovers.

According to the Association of Bay Area Governments, the inflow of new residents and businesses has made East Contra Costa County one of the fastest growing portions of the Bay Area. Between 2005 and 2030, the cities of Pittsburg and Antioch alone are projected to add 14,850 households and 38,200 jobs, a 28 percent and 23 percent increase, respectively.[8] This growth has been somewhat tempered by the housing mortgage crisis; however, the factors that contributed to the area's development boom over the past two decades are still present, including available land, lower housing and development costs, attractive weather, and desirable suburban lifestyle.

Increasingly, Pittsburg and other communities in East County are feeling the impacts of this growth in the form of traffic and congestion along major roadways and local streets. While many parts of the Bay Area have an array of transportation options, public transportation choices in the East County are limited. Currently, BART service ends at the Pittsburg/Bay Point BART Station at the western end of Pittsburg and bus service by Tri Delta Transit from the station to Pittsburg and surrounding communities is limited in frequency, which forces the majority of commuters to rely on their cars to get them to and from their destinations, including the BART Station.

The proposed eBART project would provide East County communities with an alternative to using their cars by connecting residents and businesses to the larger BART network from central and eastern Pittsburg. As shown in Figure 2-3, Phase I of the proposed eBART project would extend from the Pittsburg/Bay Point Station eastward via the median of SR4 for a distance of about 10 miles to its

[8] Association of Bay Area Governments, *Projections 2007*, December 2006.

terminus just east of Hillcrest Avenue in the City of Antioch. Two stations are proposed as part of the eBART project: at Railroad Avenue and at Hillcrest Avenue.

As noted in the Executive Summary, the Railroad Avenue Specific Plan has been prepared in response to BART's 1999 System Expansion Policy (SEP) and MTC's Resolution 3434: Transit Oriented Development Policy for Regional Transit Expansion Projects. The five main objectives of the Railroad Avenue Specific Plan are to: 1) contribute to the minimum corridor-wide residential and ridership counts required by MTC and BART, respectively; 2) establish a transit-oriented community that prioritizes pedestrians and supports multi-modal transportation and thus contributes to a reduction in VMT; 3) ensure an enjoyable and accessible environment for people of all ages, abilities and cultures; 4) promote development practices that are ecologically sound, socially equitable and economically feasible; and 5) create a high quality environment that is clean and safe (Draft Railroad Avenue Specific Plan). The BART SEP stipulation requires that jurisdictions seeking to connect to the BART system, via an extension of the system, prepare Ridership Development Plans (RDPs) to ensure that development or access improvements along the proposed corridor would attract enough riders to make the new extension financially viable. The RDP must also demonstrate that the local jurisdiction has satisfied the Metropolitan Transportation Commission (MTC) policy regarding extension of transit, which requires certain thresholds of development be achieved within ½ mile of each proposed station,[9] and that minimum ridership and residential counts are achieved on a corridor-wide basis.[10] As noted in the Executive Summary, the Railroad Avenue Specific Plan would serve as the City of Pittsburg's RDP. By adopting the minimum development thresholds, maximum parking standards, improvements in bicycle, pedestrian and transit facilities that are proposed under the Specific Plan, the City would meet and exceed BART and MTC's corridor-wide thresholds for ridership and minimum residential unit counts within ½-mile of the planned station, respectively. The proposed Railroad Avenue Specific Plan project would meet the requirements of BART's 1999 SEP, and would thereby establish the City of Pittsburg's Railroad Avenue Specific Plan area as an appropriate location for the placement of a new eBART station.

Project Characteristics

The Railroad Avenue Specific Plan includes land use designations, development policies and guidelines, urban design guidelines, planned community resources, transportation and circulation improvements, utility and infrastructure improvements, implementation strategies, and phasing recommendations. Once adopted, the Specific Plan would guide all new development in the Specific Plan Area. Existing developments would not be directly affected unless the occupants or owners choose to expand or change their structures, grounds, or uses in accordance with the Specific Plan, or the Pittsburg Municipal Code (PMC) Chapter 18.76, Nonconforming Uses and Structures.

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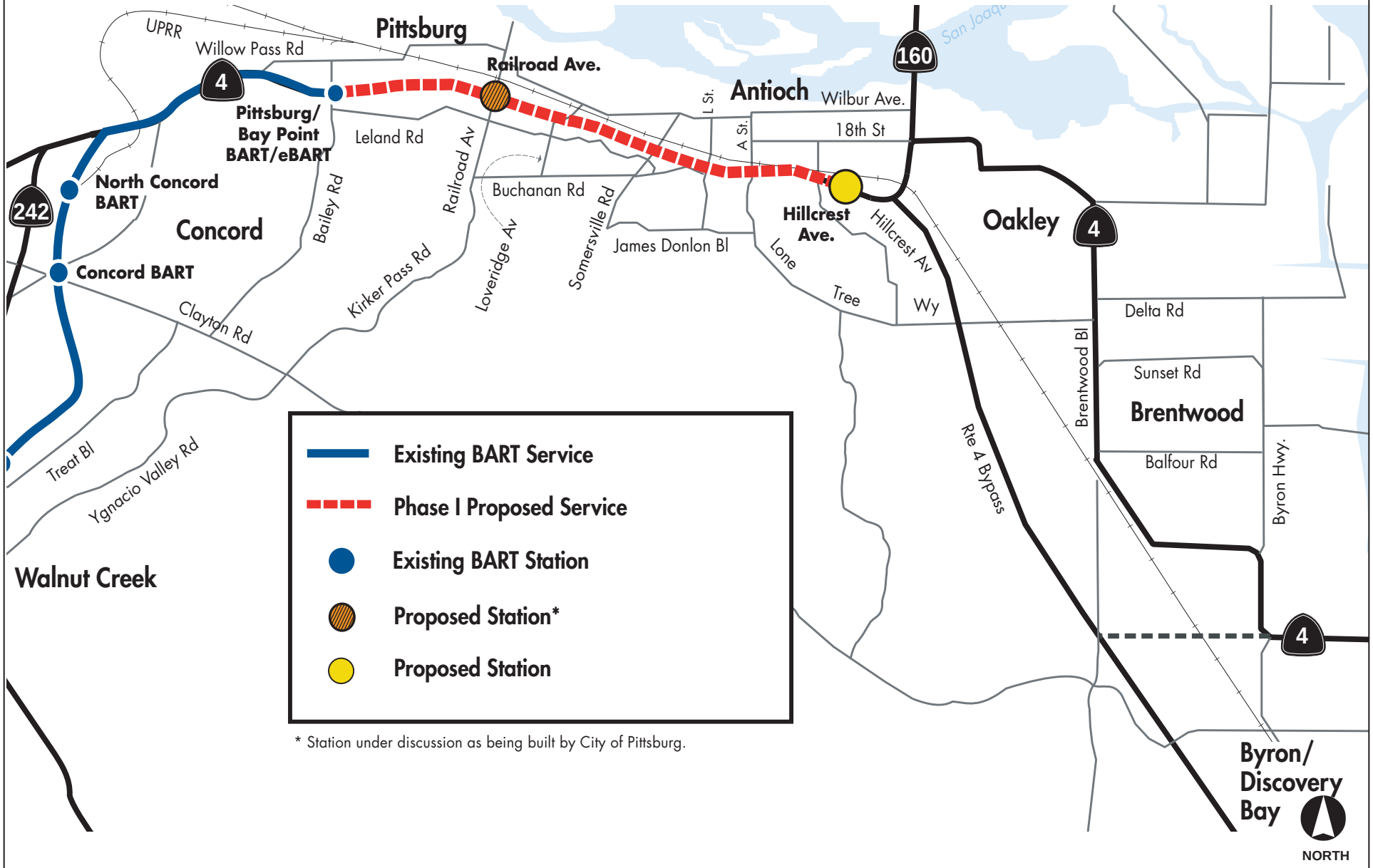
[9] Metropolitan Transportation Commission, MTC Resolution 3434 Transit-Oriented Development for Regional Transit Extension Projects.

[10] It is important to note that it is not essential for individual stations to meet the minimum thresholds provided that land use changes and access improvements for stations along the eBART corridor (defined as the Pittsburg/Bay Point BART Station, and the planned stations at Railroad Avenue in Pittsburg and Hillcrest in Antioch) allow for the thresholds to be met.



* Station under discussion as being built by City of Pittsburg.

FIGURE 2-3
Proposed eBART Alignment

***Source*:** Wilber Smith, 2008.

Railroad Avenue Specific Plan

The *General Plan* and Pittsburg Municipal Code (PMC) Chapter 18.53, Mixed Use District, call for the adoption of a Specific Plan around the planned eBART station in order to accomplish the proposed project goals and policies, and the requirements of the RDP (discussed above). The Railroad Avenue Specific Plan was therefore prepared in accordance with Pittsburg Municipal Code (PMC) Chapter 18.62, PD-Planned Development District. This chapter outlines the preparation, adoption and implementation processes, and the elements of the Railroad Avenue Specific Plan.

The Railroad Avenue Specific Plan planning process started in March 2005. In order to accurately reflect the needs and preferences of the Pittsburg community, the City of Pittsburg staff and consultant team collaborated with residents, business owners, and other stakeholders through a series of interviews and public forums. Between May 2006 and April 2007, the City of Pittsburg held focus group meetings, three community workshops, as well as educational outreach activities including a Transit-Oriented Development Seminar and bus tour. In addition, a joint Planning Commission/City Council meeting was held, as well as meetings with the City's Land Use Subcommittee. The purpose of these activities was to introduce best practices in transit oriented development, engage the community in discussions about the planned transit hub and surrounding area, develop land use alternatives, and refine a preferred plan.

In 2007, the Pittsburg City Council conducted a city-wide rezoning effort and adopted Ordinance No. 07-1284 setting forth a new zoning district, the M (Mixed Use) District. The chapter also forth regulations for the land immediately surrounding the planned eBART station including minimum density of 30 residential units per acre and a maximum of 65 residential units per acre for the land within 1/4 mile of the planned eBART station. These regulations are consistent with and supportive of the goals set forth in the Railroad Avenue Specific Plan; however the proposed Specific Plan contains more detailed land use and development information for the Specific Plan Area.

A Draft Railroad Avenue Specific Plan was prepared and released for public review on April 16, 2008, and a public meeting was held to answer questions and take comments on the draft document on May 8, 2008. The first four chapters of the Draft Plan were re-released for public comment on October 6, 2008 along with the project Initial Study and Notice of Preparation. In preparing the Specific Plan, a variety of engineering and technical studies were undertaken to document the existing conditions in the Specific Plan area as well as to develop some preliminary concepts for the layout of proposed land uses and activities for the Specific Plan area. The Railroad Avenue Specific Plan reflects the information contained in the Draft Railroad Avenue Specific Plan as well as the subsequent refinement of Plan concepts.

The Railroad Avenue Specific Plan contains the following eight elements: (1) *Introduction,* which describes the vision, purpose, context, organization, and preparation process for the Specific Plan document; (2) *Summary of Existing Conditions*, which describes existing land use, transportation, and infrastructure within the proposed project area; (3) *Land Use Goals and Policies*, which describe the various land use constraints and goals applicable to the Specific Plan area; (4) *Land Use*, *Design and*

Development, which establish more specific land use design and development standards for land uses allowed in the Specific Plan area, including site planning, building and open space relationships, architecture and land design, and public access; (5) *Community and Natural Resources,* which establishes policies to accommodate a range of social, educational and recreational activities for land uses allowed in the Specific Plan area; (6) *Transportation and Circulation*, which establishes the circulation system to accommodate vehicular, bicycle, transit, and pedestrian movement based on the transportation requirements generated by the land uses in the Specific Plan area; (7) *Utilities and Infrastructure*, which describes the basic improvements to be included for the provision of adequate water supply, sanitary sewers, storm drainage, solid waste, private utilities such as telecom and internet access, and addresses energy conservation; and (8) *Implementation*, which provides information on the actions needed to implement the Specific Plan project, provides information on capital, infrastructure, and community improvements, and provides information on phasing.

The Specific Plan establishes the amount, type and location of urban development proposed for development within the Specific Plan area. The Specific Plan also provides development standards and design guidelines for development and recommends specific actions to implement the Specific Plan and financing methods and sources to fund improvements.

The following actions may be required in order to implement the Specific Plan:

- General Plan amendment to change the land use designations in the Transit Village, Civic Center, and portions of the High School Village subareas to Mixed Use, and to revise other chapters to maintain internal consistency in the General Plan and consistency between the Specific Plan and General Plan.
- Zoning text amendments to maintain internal consistency and consistency between the Specific Plan, General Plan, and zoning ordinance.
- Rezoning the Transit Village, Civic Center, and portions of the High School Village subareas to Planned Development (PD) pursuant to PMC Chapter 18.62, Planned Development District.
- Amending PMC Chapter 17.32, Dedication and Reservations, in regards to parkland and other dedication requirements.
- Updating capital facilities plans including but not limited to utility master plans and capital improvement programs.

Project Objectives

The five main objectives of the Railroad Avenue Specific Plan are to: 1) contribute to the minimum corridor-wide residential and ridership counts required by MTC and BART, respectively; 2) establish a transit-oriented community that prioritizes pedestrians and supports multi-modal transportation and thus contributes to a reduction in VMT; 3) ensure an enjoyable and accessible environment for people of all ages, abilities and cultures; 4) promote development practices that are ecologically sound, socially equitable and economically feasible; and 5) create a high quality environment that is clean and safe (Draft Railroad Avenue Specific Plan).

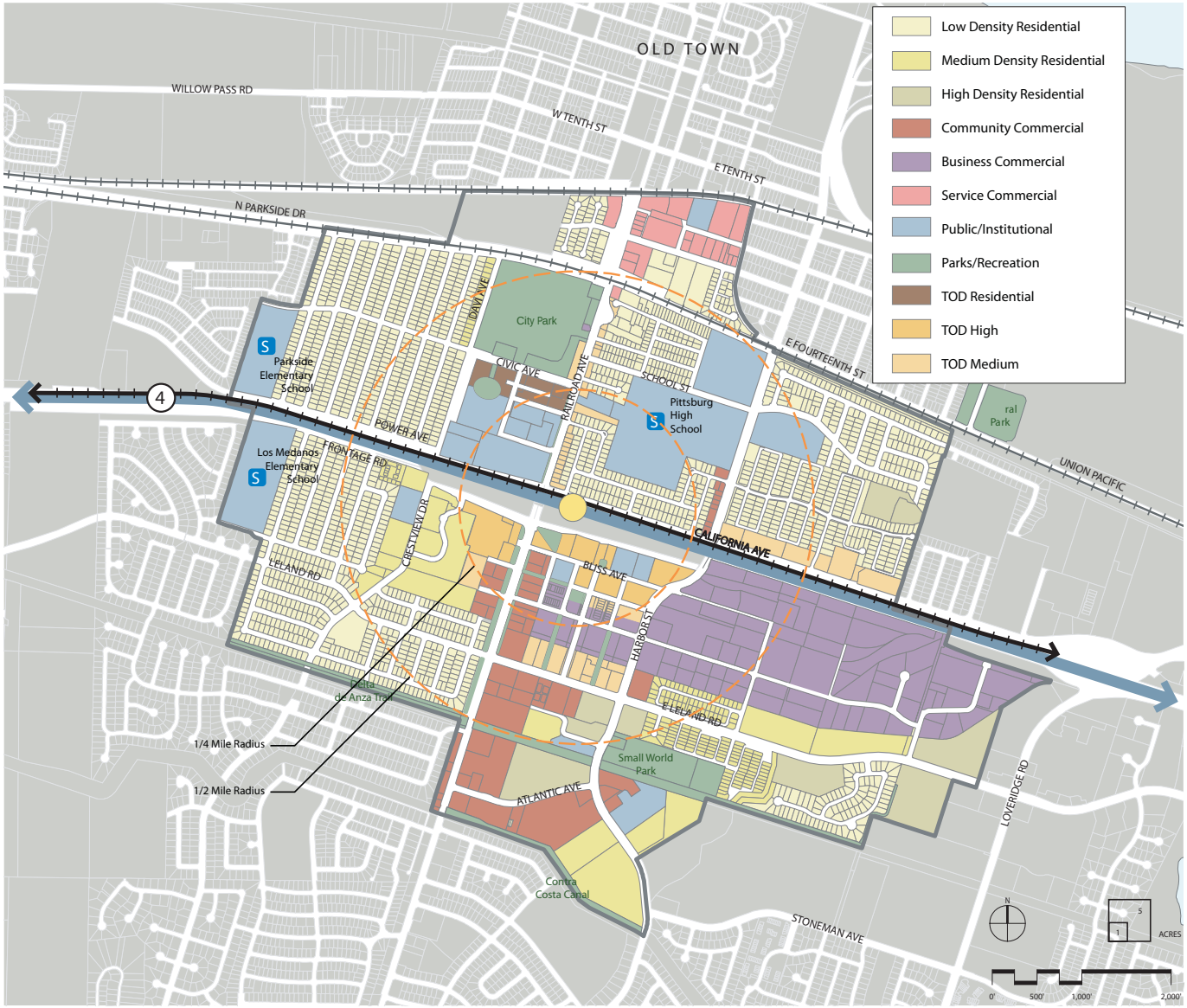
Land Use Classifications

Land use classifications within the Specific Plan Area include Low Density Residential, Medium Density Residential, High Density Residential, Community Commercial, Business Commercial, Service Commercial, Public/Institutional, and Parks/Recreation. Proposed new land use classifications in the Specific Plan include Transit Oriented Development – TOD Residential, TOD High, and TOD Medium, all of which would be contained within and are consistent with the *General Plan's* Mixed Use land use designation.

Each land use classification is defined below. In addition to the basic densities indicated for each land use classification, density bonuses could be awarded for all properties within one-quarter mile of the planned eBART station (allowing for greater densities than here indicated); increases in FAR would also be permitted in all commercial land use designations in order to accommodate a residential component. This would be consistent with the *General Plan* with regard to the placement of residential development in commercial land use classifications (*General Plan*, page 2-18). Additional increases in density and FAR are permitted within each land use designation, as described below and in Chapter 4 of the Railroad Avenue Specific Plan. Where mixed use development is permitted, the maximum floor area ratio relates only to the commercial portion of the development, and the maximum density relates only to the residential portion of the project.

Figure 2-4 illustrates the proposed land use plan.

- **Low Density Residential (1 to 7 units/gross acre):** The Low Density Residential classification allows for single-family residential units built at a density of one to seven units per gross acre. The classification is intended to promote and protect single-family neighborhoods. It is mainly intended for detached single-family dwellings, but attached single-family units may be permitted in select areas provided that each unit has ground-floor living area and private or common outdoor open space.
- **Medium Density Residential (7 to 14 units/gross acre):** The Medium Density Residential classification allows for single and multi-family residential units built at a density of seven to 14 units per gross acre. The classification accommodates more intensive forms of residential development, such as one or two story garden apartments, townhouses, and attached and detached single-family residences.
- **High Density Residential (14 to 25 units/gross acre):** The High Density Residential classification allows for a mix of housing types built at a density of 14 to 25 units per gross acre. The classification permits products ranging from single-family attached units to multi-family complexes. Subject to design review by the Planning Commission, additional discretionary density increases up to a maximum project density of 40 units per gross acre may be granted for projects that meet community objectives.



NORTH

PBS&J®

FIGURE 2-4
Proposed Land Use Plan

***Source*:** MIG, 2008.

- **Community Commercial:** The Community Commercial classification allows for a variety of commercial uses and service-oriented businesses at scales ranging from large retail stores serving the greater community to smaller businesses oriented towards neighborhood activity. Permitted uses include retail stores, eating and drinking establishments, commercial recreation and entertainment, service stations, auto sales and service, financial, educational and social services.

  The maximum permitted FAR in this land use designation is 0.4. However, *commercial projects* along Railroad Avenue between State Route 4 and Leland Road are permitted a maximum FAR of 2.0. For *mixed use projects* located on Railroad Avenue between State Route 4 and Leland Road, a maximum FAR of 1.0 is permitted for the commercial portion of the development, and an additional 25 dwelling units per acre may be allowed for the residential portion of the development.

- **Business Commercial:** The Business Commercial classification focuses on providing sites for administrative, financial, business, research and development and public offices, as well as custom manufacturing, limited assembly, light manufacturing, warehousing and distribution, and limited retail and office uses. Live-work lofts with ground floor commercial and custom manufacturing uses are appropriate in the light industrial areas within the Transit Village and Industrial/Mixed Use Center sub-areas. The maximum permitted FAR in this land use designation is 1.0; however, an additional 0.25 FAR may be permitted to accommodate residential uses.

- **Service Commercial:** The Service Commercial classification provides sites for commercial businesses that are not appropriate in other commercial areas because they generate high volumes of vehicle traffic or other potential adverse impacts on adjacent uses. Allowable uses in Service Commercial areas include contractors, automotive repair, equipment rental, and wholesaling and storage. The maximum permitted FAR in this land use designation is 0.5; however, an additional 0.25 FAR may be permitted to accommodate residential uses.

- **Public/Institutional:** The Public/Institutional classification allows schools, government offices, transit sites, public utilities, and other facilities with a unique public character. Other permitted uses on Public/Institutional sites located within one-half mile of the eBART station includes residential uses, offices, restaurants and office-supporting commercial uses in order to support the public/institutional uses located on the block during business hours, and to activate the area during evenings and weekends when public/institutional uses are typically closed. Residential and commercial uses are permitted provided that the City Planner, Planning Commission or City Council, as appropriate, finds that the land will not be needed in the future for a public/institutional use.

- **Parks/Recreation:** The Parks/Recreation classification provides for parks, recreation complexes, community fields, greenways, and trails.

- **TOD Residential (Residential: 20 to 50 dwelling units per gross acre; Non-residential: Maximum 0.25 FAR):** The TOD Residential land use classification is intended to provide opportunities for multi-family residential development in a well-designed walkable environment within one-half mile of local and regional transportation facilities. TOD Residential land uses are intended to provide sites for multi-family apartments, condos, row houses, apartments, townhouses, court homes, and cluster housing. Neighborhood commercial uses, as defined in the Zoning Ordinance, are also appropriate in this land use classification provided that the commercial use is integrated into the development and limited to properties fronting a major arterial street.
- **TOD High (Residential: 30 to 65 dwelling units per gross acre; Non-residential: Maximum 1.0 FAR):** The TOD High classification is intended to promote a vertical combination of ground-floor retail uses and residential uses on upper stories in the areas closest to proposed regional transit facilities. Special attention should be given to pedestrian circulation within the area. The designation is intended to encourage ground floor, pedestrian friendly, retail sales and service uses with upper floors of residential uses or offices. Ground floor commercial activity shall be required along Bliss Avenue between Railroad Avenue and Harbor Street.
- **TOD Medium (Residential: 15 to 30 dwelling units per gross acre; Non-residential: Maximum 1.0 FAR):** The TOD Medium classification is intended to allow primarily multi-family residential development. Secondarily, ground floor commercial uses are permitted below residential uses within one-half mile of regional transit facilities. In the High School Village sub-area, there is not a minimum residential development component, and commercial development is permitted at a maximum 1.0 FAR.

Development Program for Civic Center, Transit Village, and High School Village Subareas

As described above, the Specific Plan Area (project area) is divided into 11 subareas: Old Town Gateway, Parkside Manor Neighborhood, Civic Center, High School Village, Los Medanos Neighborhood, Transit Village, Industrial/Mixed-Use Center, Los Medanos Industrial Center, Railroad Avenue Retail Corridor, Atlantic Avenue Corridor, and East Leland Corridor. The land use mix within the majority of these sub-areas would generally not change with implementation of the Specific Plan. Rather, the land use concept set forth in the Specific Plan and shown in Figure 2-4 is designed to maximize development potential of land that is located closest to the planned eBART station while preserving the character of established residential neighborhoods located in the remainder of the project area. High-intensity mixed-use development would be allowed in former light industrial areas southeast of the proposed station in the proposed Transit Village subarea, and a mix of office, general commercial, public, and residential uses would be allowed in the Civic Center subarea surrounding City Hall. The specific land use changes in the Civic Center, Transit Village, and High School Village subareas are described in more detail below and quantified in Table 2-1, and the development assumptions for each sub-area is detailed below.

Table 2-1
Railroad Avenue Station Area - Assumed Development Program

Land Use Designation	Gross Area (acres)	Development		Parking (spaces)	
		Residential (units)	Commercial (sf)	Residential	Commercial
Civic Center					
TOD Residential	6.58	230	-	345	-
TOD Medium	0.88	17	22,550	26	67
Public/Institutional	19.81	-	304,400*	-	1,020
Parks/Recreation	2.22	-	-	-	-
Subtotal	**29.49**	**247**	**326,950**	**371**	**1,087**
Transit Village					
TOD High	16.59	830	52,500*	1,245	158
TOD Medium	12.36	247	36,354*	371	109
Business Commercial	8.53	-	223,046*	-	466
Community Commercial	10.37	259*	270,949*	389	814
Structured Public Parking	3.77	-	-	-	1,407
Parks/Recreation	2.75	-	-	-	-
Subtotal	**54.37**	**1,336**	**582,849**	**2,005**	**2,954**
High School Village					
TOD Medium	13.13	262*	78,650*	393	236
Total	**96.99**	**1,845**	**988,449**	**2,769**	**4,278**

Source: City of Pittsburg, *Railroad Avenue Specific Plan,* 2008.

Note:

* Currently permitted

Under the General Plan, the primary land use classifications in these three sub-areas is Business Commercial, Community Commercial and Public/Institutional. As shown in Table 2-2, below, the three sub-areas would be developed with primarily commercial and public/institutional uses. The net residential development would be approximately 1,845 residential units (using mid-range assumptions for development), while there would be a decrease in assumed commercial development from approximately 1.2 million square feet to approximately 988,000 square feet. While the General Plan allows mixed use development in all commercial land use designations and offers an additional 0.25 FAR above that permitted in the base land use designation as an incentive for mixed use development, there are no development minimums for mixed use development to ensure that the area around the planned eBART station would develop with a mix of high intensity commercial and high density residential uses. Rather, it is likely that the area would continue to develop with relatively low intensity commercial development with large-scale parking lots located in front of the developments.

Civic Center. In the Civic Center sub-area, the plan assumes an average development of 35 dwelling units per acre within the TOD Residential area (20-50 dwelling units per gross acre). Given 6.58 acres of potentially available land, development under this assumption would create the potential for 230 new housing units. Pursuant to the Specific Plan, a maximum number of 1.5 parking spaces per residential unit would be permitted on-site, creating 345 residential parking spaces under these development assumptions.

The Civic Center sub-area includes an additional 0.88 acres of privately-owned land at the southeastern corner of City Park. Within the TOD Medium areas, the plan assumes an average development density of 20 dwelling units per acre (where a range of 15 to 30 dwelling units is permitted) and retail development on the ground floor of buildings 50 feet from the front property line along Railroad Avenue. Thus development on this parcel could result in approximately 17 residential units, and 22,550 square feet of commercial space. Assuming no more than the allowable maximum of 1.5 parking spaces per residential unit, and one parking space for every 333 square feet of commercial space as outlined in the Specific Plan, a total of 93 parking spaces would serve residential and commercial uses on this site.

The Public/Institutional uses in the sub-area are designed to preserve City Hall and parking for employees and visitors. The anticipated land uses include expansion of the Pittsburg Library (from approximately 7,000 square feet to approximately 13,000 square feet), and construction of a new County courthouse which would be expanded from four courtrooms to seven courtrooms in the near future. Commercial uses in the sub-area include a recently approved 134,000 square foot, six-story office building that would house the Pittsburg Library and retail uses on the ground floor and office uses on the upper floors. Parking for the new and expanded uses on the Civic Center block would be accommodated through surface parking until the TOD Residential portion at the northern part of the block develops, at which time it would be necessary to construct a parking structure to provide adequate parking for all uses on the block. Additional uses in the sub-area would include the existing Federal Armory on an 135,000-square foot site, over which the City has no jurisdiction.

Transit Village. In the Transit Village sub-area, the plan assumes an average development density of 50 dwelling units per acre and retail development 50 feet deep on the ground floor of buildings on Bliss Avenue within the TOD High land use designation (where a range of 30 to 60 dwelling units is permitted). Given 16.59 acres of land designated with this use classification, redevelopment at this density would create the potential for 830 new residential units and 52,500 square feet of retail or office space. Pursuant to the Specific Plan, a maximum of 1.5 parking spaces per residential unit and one space per 333 square feet of retail or office space, 1,403 parking spaces would be developed on-site.

Within the TOD Medium areas, the plan assumes an average development density of 20 dwelling units per acre (where a range of 15 to 30 dwelling units is permitted) and retail development on the ground floor of buildings 50 feet from the front property line along Leland Road. This designation would create the opportunity to redevelop 247 residential units and 36,354 square feet of retail or office space. Pursuant to the Specific Plan, 1.5 parking spaces per residential unit and one space per 333 square feet of retail or office space, 480 parking spaces would be developed on-site.

The Business Commercial classification in this sub-area would continue to allow light industrial development. With an assumed intensity of a 0.6 FAR, the area could accommodate a total of 223,046 square feet of industrial development. At one parking space per 500 square feet of industrial development, 466 parking spaces would be developed on-site.

The Community Commercial designation promotes retail-focused development along Railroad Avenue, but it also allows for mixed-use development. Assuming an average intensity of a 0.6 FAR for commercial uses and 25 dwelling units per acre of residential development, the area could accommodate up to 270,949 square feet of commercial uses and 259 new residential units. With 1.5 parking spaces per residential unit and one parking space per 333 square feet of commercial space, a total of 1,202 parking spaces would be developed on-site.

The structured parking lots along Bliss Avenue would be required to contain ground floor commercial uses (there is not a minimum FAR) and an active pedestrian streetscape. In addition, there would be 350 parking spaces dedicated for BART parking within the structures.

High School Village. While the vast majority of the land located within the High School Village subarea is a combination of established single family residential and public uses (Pittsburg High School), there are two areas within the High School Village that could accommodate an intensification of residential and commercial development. Specifically, the area along California Avenue between Harbor Street and Edward Avenue and the area along the east side of Railroad Avenue between State Route 4 on the south and Fifteenth Street on the north. Both areas would be developed under the TOD Medium standards, which allow between 15-30 dwelling units per acre and 1.0 FAR. In accordance with previous assumptions for the TOD Medium District (20 dwelling units per acre and commercial development on the ground floor extending fifty feet back from the front property line), there could be 262 residential units and 78,650 square feet of commercial development within these areas. Pursuant to the Specific Plan, a maximum of 1.5 parking spaces per residential unit and one parking space per 333 square feet of commercial would be permitted on site for a total of 629 parking spaces.

Combined Development Potential. Within the Civic Center and Transit Village sub-areas, the Specific Plan would create a land use and policy framework that would allow up to 1,590 residential units and 880,098 square feet of commercial and civic space. To support these new uses, two three-story parking structures would be built in the Transit Village, providing 1,407 spaces. New plazas and open spaces are also planned, and nearly five acres of land would be designated to provide for the recreational needs of residents and visitors. When the 1,590 potential new units are added to the existing 1,600 units already in the Specific Plan Area, the total number of residential units within one-half mile of the proposed eBART station would equal 3,190, more than satisfying the MTC requirement of 2,200 housing units for the area.

Land Use, Design, and Development

The Specific Plan provides specific land use and, development standards; parking minimums and maximums; landscaping requirements; and, architectural form and design criteria for each land use classification within the project area, and specifically focuses on the land use classifications within the Civic Center, Transit Village and portions of the High School Village sub-areas that will be zoned PD (Planned Development) District. The definitions, procedures, applications, findings, standards for review and development standards and allowable uses set forth in PMC Title 18, Zoning, would govern in the Specific Plan Area unless otherwise stated within the Specific Plan. These development standards and other development controls are listed in Table 2-2, below, for each of the proposed land uses.

Table 2-2
Specific Plan Development Standards by Land Use

Land Use	Development Intensity	Height	Setback	Parking Standards[d, e]
TOD High	30 to 65 du/ac (residential) 0.25 to 1.0 FAR (non-residential	25' to 65'	Front: 0' (up to 15') Side: 0' Rear: 0'	1.5 spaces per unit 1 space/333 sf
TOD Medium	15 to 30 du/ac (residential)[a] up to 1.0 FAR (non-residential)	25' to 40'	Front: 0' (up to 15') Side: 0' Rear: 0'	1.5 spaces per unit 1 space/333 sf
TOD Residential	20 to 50 du/ac (residential) up to 0.25 (non-residential)[b]	25' to 45'	Front: 0' to 15' Side: 0' (up to 5') Rear: 0' (up to 10')	1.5 spaces per unit 1 space/333 sf
Business Commercial	up to 1.0 FAR[c]	up to 50'	Front: 0' (up to 10') Side/Rear: 10'	1 space/500 sf
Community Commercial	For commercial projects on Railroad Ave between SR 4 and Leland Road allow up to 2.0 FAR For mixed use projects on Railroad Ave between SR 4 and Leland Road allow 1.0 FAR and up to 25 du/ac For all other commercial and mixed use development along Railroad Avenue south of Leland Road allow up to 0.4 FAR[c]	up to 60'	Front: 0' (up to 15') Side/Rear: 0' (up to 10')	1.5 spaces per unit 1 space/333 sf
Governmental/Quasi-public	–	–	–	–

Source: City of Pittsburg, *Railroad Avenue Specific Plan*, 2008.

Notes:

a. There is no minimum residential density requirement in the High School Village sub-area.

b. Commercial development in the TOD-Residential land use classification allowed only along a major arterial.

c. Subject to the discretion of the Planning Commission, mixed use projects in commercial districts may receive a 0.25 additional FAR over the maximum permitted base district FAR in order to accommodate the residential component. Pursuant to PMC Section 18.52.010, the residential portion of a mixed use project is permitted above, or adjacent to ground floor office, restaurant, or retail use on the same site, and the residential floor area must comprise no less than 25% and no more than 75% of the total square footage of the building developed on-site.

d. Residential parking reductions for senior and affordable housing developments at the discretion of the Planning Commission/City Council.

e. The Specific Plan also contains minimum bicycle parking standards at a ratio of one bicycle parking space per 2,500 square feet of gross building area. In order to support publicly accessible, centrally located bicycle parking, the Specific Plan would allow adjacent bicycle parking facilities on the street to fulfill a portion of the requirement.

The planning goals and policies are intended to ensure that future decision-making remains relevant to larger aspirations for the area. The goals prioritize the pedestrian experience; preserve each subarea's character; define the area as a gateway to the community; and support a high quality environment that is clean and safe, as well as socially and environmentally responsible. The Specific Plan also includes architectural and site design criteria intended to maximize ridership and economic development potential by focusing on the experience commuters, workers, and residents will have in the area surrounding the proposed station with the goal of creating a positive and attractive setting. Building design would enhance the pedestrian experience with transparency of storefronts, maximum setbacks, minimum building heights, minimum commercial intensities and residential densities, well-articulated business facades, recessed entry vestibules, and outdoor seating areas. In addition, the Specific Plan contains a policy requiring that site and building design incorporate sustainable elements such as improved insulation, operable windows, energy efficient appliances and lighting, natural ventilation and permeable paving materials, among other sustainable building and site specific elements.

Community and Natural Resources

The Specific Plan contains goals and policies related to parks, opens spaces, and recreational and public facilities that serve the community in addition to natural resources located within the Specific Plan Area. The plan recommends specific goals and policies to expand open space and facilities in the area, to improve existing parks and facilities, and to provide an enjoyable transit experience for riders. The land use plan for the Specific Plan Area features pocket parks, transit plazas, city parks, playfields, school grounds, and community facilities. These open space and community resources would be linked via a network of dedicated pedestrian greenways, trails, and pedestrian-friendly corridors both within the Specific Plan Area and to the rest of the City through existing and planned bicycle routes, sidewalks, and trails. Six specific improvements to facilities and services are identified in the Specific Plan:

- Develop and expand library services and public meeting/classrooms in the City of Pittsburg by including space for a new library facility in the proposed Civic Tower development at the corner of Railroad Avenue and Center Drive;
- Relocate the Teen Center from Railroad/Power Avenues to a new facility at City Park or other appropriate location;
- Continue to provide resources for and operate the Senior Center in its current location;
- Coordinate with Pittsburg Unified School District to use fields and other school facilities at Parkside Elementary School, Los Medanos Elementary School, and Pittsburg High School as amenities available to the entire community during school off-hours;
- Coordinate with the Pittsburg Unified School District to utilize the District meeting spaces during off-hours to host job training and educational workshops; and
- Coordinate with the Contra Costa County Courts to utilize the courthouse during off-hours for educational and social events.

The design recommendations described in the Specific Plan are intended to help define an integrated system of open spaces that are attractive, engaging, and accessible to support a multi-modal environment. Key improvements include:

- A large plaza near the intersection of Railroad and Bliss Avenues;
- A secondary plaza on the north side of Bliss Avenue, midway between Railroad Avenue and Harbor Street with a connection to the multi-use path that will run parallel to Highway 4;
- A 1.5-acre neighborhood urban pocket park between Bliss and Garcia Avenues, with potential program elements such as a basketball court, benches and tables, interactive water features, and both hardscape and landscape;
- Two greenways that run north to south from Garcia Avenue to East Leland Road to provide pedestrian-friendly connections to commercial businesses along East Leland Road;
- An east-west greenway from Clark Avenue that provides pedestrian-friendly connections for Transit Village Residents to commercial services along Railroad Avenue;
- A 10 to 12-foot wide multi-use pathway along the north side of Highway 4 from Davi Avenue to Railroad Avenue;
- A 10 to 12-foot-wide multi-use pathway along the south side of Highway 4 between Railroad Avenue and Harbor Street; and
- A 12-foot-wide multi-use pathway within the existing greenbelt along the west side of Railroad Avenue between Highway 4 and the Delta De Anza Trail to connect the Delta De Anza trail to the Specific Plan Area

Natural resources located within the project area include Kirker Creek, which passes through the southeast corner of the project area and provides limited riparian woodland vegetation. In addition, vacant areas in the Specific Plan Area are identified as covered in ruderal land cover type according to the East Contra Costa County Habitat Conservation Plan (HCP), and those undeveloped areas are subject to HCP development fees. The Specific Plan contains policies to encourage all development along Kirker Creek and the Delta De Anza trail to protect, restore and retain natural characteristics of the environment to enhance local resources and provide additional community amenities as well as to ensure that all development is compliant and consistent with the HCP.

The Specific Plan land use plan locates a significant amount of high density housing within 500 feet of State Route 4, a heavily traveled freeway, in order to take advantage of proximity to the eBART station; however, it is widely held that noise and air quality impacts could affect the quality of life of residents of those facilities. Therefore, the Specific Plan contains an additional policy that all residential development within 500 feet of State Route 4 incorporate site and building specific measures such as triple-paned windows and internal ventilation systems to alleviate noise and air quality issues related to the proximity of proposed high density residential development to the highway.

Transportation and Circulation

The Specific Plan contains transportation and circulation-related goals, policies, and a series of recommended improvements to support a seamless multi-modal circulation network in the Specific Plan Area. The transportation and circulation system is designed to improve the existing roadway system and reducing VMT by incorporating traffic calming measures, improving transit connections by installing transit only roadways and increasing transit service in the area, and installing public pedestrian greenway networks and bicycle lanes throughout the Specific Plan Area and connecting to a larger network of bicycle facilities in the City. The proposed circulation system would link the eBART station and the Specific Plan Area to the entire City and the surrounding region by supporting a variety of modes. This integrated network would promote transit, pedestrian, and bicycle modes above private vehicle travel through policies supporting traffic calming strategies, reduced parking standards, improved sidewalks, and transit amenities such as a bus-only lane within the Transit Village. Specifically, the Specific Plan seeks to accomplish its circulation goals by minimizing walking distances to key transit-oriented retail, employment, and residential destinations; accommodating safe, direct, and efficient automobile, bus, bicycle, and pedestrian routes; designating truck routes to circumvent major pedestrian, bicycle, and local traffic corridors; strategically locating parking facilities; and improving streetscapes to create a pleasant and inviting pedestrian experience.

Specific roadway improvements in the Civic Center subarea include improvements in conjunction with the Civic Tower and Davi Avenue Roadway Improvement Projects. Those roadway improvements are currently under construction to allow for the future development of the Contra Costa County Courthouse and the Pittsburg Civic Tower. Upon adoption of the Specific Plan, internal roadways located north of Center Drive would be constructed to coincide with future residential development on the northern part of the Civic Center block. In addition, California Avenue, which runs along the southern portion of the High School Village sub-area, would be widened.

Specific roadway improvements in the Transit Village would include:

- Conversion of the existing private roadway along Bliss Avenue into a public roadway with two travel lanes, diagonal parking on both sides of the street, curbs, gutters, 15-foot wide sidewalks with landscaping, and crosswalks with bulb outs that are raised if feasible. This street is envisioned as a major pedestrian oriented street;
- Conversion of the existing private roadway along Clark Avenue into a public roadway (local street) with two travel lanes, curbs, gutters, sidewalks, and crosswalks;
- Extension of Garcia Avenue from its western terminus to Railroad Avenue including improved sidewalks and crosswalks. Garcia Avenue would be designed as a wider street to accommodate spill over vehicular traffic from Bliss Avenue;
- Construction of roadway improvements (road, sidewalk, curb, gutter, and crosswalks) for two new north-south local streets extending from Bliss Avenue to Garcia Avenue; and
- Construction of roadway improvements (road, sidewalk, curb, gutter, and bike lane) for one new north-south local street extending from Bliss Avenue to Leland Road.

Bicycle improvements in the Specific Plan Area would include:

- Installation of new Class I trails on the north and south sides of SR 4 as described above;
- Extension of a Class III bicycle lane north of SR 4 along Railroad Avenue;
- Installation of a new 12-foot wide multi-use path in the existing greenbelt along the west side of Railroad Avenue extending from State Route 4 south to the Delta de Anza trail;
- Creation of new multi-modal bike and pedestrian pathways from Garcia Avenue to Leland Road and from the terminus of Clark Avenue, west to Railroad Avenue; and
- Placement of a new bicycle lane along School Street from Railroad Avenue to Harbor Street.

Parking facilities for vehicles would be accommodated through a combination of on-site parking, on-street parking, and construction of two public parking structures on both sides of Bliss Avenue to accommodate 350 parking spaces for use by BART patrons as well as patrons of the commercial uses located in the Transit Village subarea. A large parking structure is also planned for the Civic Center subarea; however, the location is yet to be determined. Bicycle parking would be accommodated with the installation of bicycle racks in front of businesses, along designated bicycle routes in the Specific Plan Area. Enclosed bicycle parking would likely be located on the ground floor of public parking garages in the Transit Village and Civic Center subareas.

Improvements related to public transportation would include a new, north-south bus-only roadway between Garcia Avenue and Bliss Avenue to provide a dedicated area for bus pick-up and drop-off near the proposed eBART station. The 80- to 90-foot-wide right-of-way (depending on the bus parking configuration) would accommodate two-way bus lanes, extra wide sidewalks for passenger circulation, shelters, wayfinding signage, and schedule information. The bus throughway would be located adjacent to a proposed public parking garage which could contain bicycle parking and public bathrooms. Coordination with Tri Delta Transit would ensure minimum 10-15 minute bus headways during peak hours with longer headways during non-peak hours. In addition, a dedicated shuttle is planned to run between the Specific Plan Area and Old Town Pittsburg during peak commute times.

Utilities and Infrastructure

The Utilities and Infrastructure chapter of the Specific Plan provides an overview of the existing utilities and contains goals and policies related to environmental sustainability that cover site and building design, stormwater control and treatment, water conservation measures, and appropriately sized trash enclosures with areas for recycling and green waste storage, among others. Specific utility improvements and upgrades necessary to implement the Specific Plan include installation of and expansion of existing water, wastewater, and storm drain pipes in the Transit Village and Civic Center subareas as well as the installation of water booster pumps for structures larger than two stories in the subareas to compensate for low water pressure levels. With regards to stormwater management, adjacent development projects are encouraged to meet C.3 requirements jointly through construction of swales and other treatment and flow control measures along public green paths and other open spaces in the Transit Village and Civic Center subareas.

2.3 CONSISTENCY WITH PLANS AND POLICIES

The *General Plan* has been termed the constitution of community land use; it is the highest expression of desired community character. In California, all other land use policies and permits must ultimately conform to the goals and policies of the *General Plan*. The *General Plan* serves primarily as a policy document and is used as a point of reference by public officials when making decisions on such things as subdivisions, capital improvements, neighborhood rehabilitation, and public acquisition.

This portion of the EIR assesses the proposed project's conformance with the goals and policies of the City's *General Plan*. The Specific Plan is consistent with all elements of the General Plan, and specifically fulfills the General Plan's policies to create a specific plan for the potential eBART station area featuring a mix of commercial and residential uses with extensive pedestrian amenities and linkages to surrounding neighborhoods. It also fulfills policies to allow for expansion, intensification and densification of commercial and residential uses along the Railroad Avenue corridor closest to the future eBART station. Circulation improvements envisioned by the General Plan will also be implemented through the Specific Plan including the extension of Garcia Avenue to Railroad Avenue; development of transit-oriented development patterns such as smaller blocks to support pedestrian activity; and, improvements in public transit amenities by including streetscape amenities such as pedestrian-scaled lighting, benches and bus shelters. A comprehensive list of General Plan goals and policies supporting the development of the Specific Plan and the guidelines and programs contained therein is included as Appendix F of this EIR.

2.4 PROJECT SCHEDULING

No construction scheduling has been developed for the Railroad Avenue Specific Plan project at the time of preparing the Specific Plan EIR. Assuming the Specific Plan would be adopted by the City of Pittsburg, the local real estate and development market would likely determine the timing of the start of development, in accord with the higher densities and new land uses allowed under this project. With up to 1,845 residential units proposed, on multiple lots, and with many owners potentially involved in area development, the actual construction timetable could encompass a period of up to twenty years or more. The actual rate of buildout will depend on market conditions and the demand for housing and new commercial floor area in the Pittsburg/east Contra Costa County area.

Notwithstanding the preceding discussion, for the purposes of the Transportation Impact Analysis and Air Quality analysis, two horizon years for project build-out are presumed to occur. Specifically, this EIR presumes 25% build-out of the assumed development potential by 2015 when the eBART is planned to be operational, and 100% build-out in year 2030.

The Railroad Avenue Specific Plan is envisioned as a twenty year policy document. This EIR examines implementation and impacts of this project under two horizon years: one horizon year is 2015, when eBART is projected to be operational and about 25% of the maximum build-out of the Specific Plan Area could be achieved, and one horizon year in 2030, when it is assumed that the Specific Plan will

achieve build-out. Assuming 25% build-out in 2015 is somewhat aggressive given the current economic situation and the potential for developers to be slow in proposing new development projects in the area until eBART is fully operational.

The development assumptions contained herein assume a mid-range build-out which is consistent with the development assumptions contained in the *General Plan* and as evaluated by the *General Plan EIR*. The rationale behind setting forth mid-range development assumptions is to provide a realistic number of residential units and commercial square footage that could develop as a result of the development standards contained in the Specific Plan. Mid-range assumptions are considered realistic due to the fact that some developers develop at the maximum allowable density and others will develop at the minimum allowable density. In addition, there are other site constraints, such as landscaping, public pathway dedications, economic and market feasibility and other limitations that could dictate potential development of a site. The assumed development potential for the area is contained in Section 2.2, Proposed Project.

2.5 REQUIRED APPROVALS

General

The EIR must be certified by the Pittsburg City Council as complete and adequate under CEQA prior to Specific Plan adoption. If this EIR is certified by the Pittsburg City Council, the City Council will then consider the adoption of the Railroad Avenue Specific Plan and all related General Plan and zoning amendments.

If adopted by the City of Pittsburg as proposed, the Railroad Avenue Specific Plan would become a public document that establishes the amount, type and location of urban development to be permitted in the Railroad Avenue Specific Plan area. The Specific Plan would also become the guiding document that provides the development standards and design guidelines for development within the Railroad Avenue Specific Plan area and specific actions to implement the plan and financing methods and sources to fund public services within the Specific Plan area. The following describes the approvals that would be required for adoption of the Specific Plan project.

City of Pittsburg

The Railroad Avenue Specific Plan has been submitted to the City of Pittsburg and will go before the Planning Commission for recommendation at a public hearing. Upon completion of environmental review under CEQA, the Plan will come before the City Council for review and adoption at public hearings. If approved by the City Council, the Specific Plan will be implemented by resolution. A concurrent PD (Planned Development) District would be adopted by the City Council as an ordinance that would serve as the regulatory mechanism for enforcing the development standards set forth in the Specific Plan. If the Specific Plan is adopted, future project applicants in the Specific Plan area must submit site development plans for review by the City for consistency with the Specific Plan. If the future site development plans are determined to be consistent with provisions of the Railroad Avenue

Specific Plan and PD District, the environmental impacts associated with the development plan would likewise be considered to be consistent with and addressed by this EIR as applicable under CEQA's streamlining techniques.

The approvals/actions required include (1) certification of the Railroad Avenue Specific Plan Environmental Impact Report, (2) adoption of the Railroad Avenue Specific Plan, 3) General Plan amendment to identify the land in the Civic Center, Transit Village and portions of the High School Village as the Mixed Use land use classification, and 4) adoption of PD District for the Civic Center, Transit Village and portions of the High School Village sub-areas in a manner that is consistent with the revised General Plan map. The City of Pittsburg would use the EIR and Specific Plan in evaluating future planning and development applications in the Specific Plan Area, to ensure conformance with the plan's design review guidelines and conformance with the provisions of the Specific Plan and General Plan, where appropriate.

The mitigation measures set forth in this EIR and adopted with the Mitigation and Monitoring Plan shall be incorporated into the Specific Plan and policies that will be included as standards of development and conditions of approval for future projects.

Regional Water Quality Control Board (RWQCB)

The City of Pittsburg would also review project design plans to ensure project compliance with the standards of the Contra Costa Clean Water Program, under regulations adopted by the San Francisco Regional Water Quality Control Board (RWQCB). Regulations pertaining to storm water discharges associated with construction activity were issued by the U.S. Environmental Protection Agency in 1990. The National Pollutant Discharge Elimination System (NPDES) Program prevents the pollution of storm water through the control of erosion, sedimentation and toxic or hazardous materials at construction sites. This NPDES program is administered by the Contra Costa Clean Water Program, under regulations adopted by the San Francisco Regional Water Quality Control Board (RWQCB).

Pollution reduction design is required for the construction and operational phases of a project. A permit is required for construction projects that are greater than one acre. A Storm Water Pollution Prevention Plan (SWPPP) is required that identifies the potential sources of sediment and other potential pollutants, and ensures the reduction of sediment and other pollutants in the storm water discharged from a construction site. A monitoring program is required to aid the implementation of, and assure compliance with, the SWPPP.

Waste discharges during the operational phase of a project are regulated through the NPDES permit. All new development that will that will result in 10,000 or more square feet of impervious surface must submit a Preliminary Stormwater Control Plan (SCP) with any development application. The SCP must identify treatment and source control measures, in addition to run-off flow control so post-project runoff does not exceed estimated pre-project rates or durations. Treatment measures are implemented through best management practices (BMPs) that are intended to retain and treat stormwater before it is released into the stromdrain system. The SCP is integrated with the site, drainage and landscaping plans, and it must be deemed correct and complete prior to the application being deemed complete.

Chapter 3
Environmental Setting and Impacts

3.1 INTRODUCTION

Program Level Environmental Analysis

Under CEQA, program-level environmental review is used in environmental analyses for a series of actions or projects that can be characterized as one large project because they are logically related. In this case, provisions allowing for increased residential development, infrastructure improvements, and changes to land uses in different areas of the City of Pittsburg are logically related because these provision are all contained within the Railroad Avenue Specific Plan, and are part of the Specific Plan program.

This chapter presents the program-level environmental analysis for the Railroad Avenue Specific Plan. The Specific Plan would contain new land use classifications, development standards and guidelines, urban design and streetscape guidelines, community resources, transportation and circulation improvements, utility and infrastructure improvements, implementation strategies, and phasing recommendations. Adoption of the Specific Plan would allow for the development of up to 1,845 new residences in an area within approximately ½ mile of a proposed new eBART station. This eBART station would sit in the median of State Route 4 beneath the Railroad Avenue overcrossing. Adoption of this Specific Plan would meet the both MTC and BART's requirement that Pittsburg adopt a Ridership Density Plan (RDP) to demonstrate a minimum residential units count and ridership number for the planned station. Approval of this EIR, and subsequent adoption of the Specific Plan, would therefore meet one of the prerequisites to construction of the proposed Railroad Avenue eBART station.

Potential Impacts of the Railroad Avenue Specific Plan

This Environmental Impact Report (EIR) follows an Initial Study published on October 1, 2008 (attached as Appendix A). The Initial Study assessed the following environmental factors:

- Aesthetics
- Agricultural Resources
- Air Quality
- Biological Resources
- Cultural Resources
- Geology/Soils
- Hazards and Hazardous Materials
- Hydrology/Water Quality
- Land Use/Planning
- Mineral Resources
- Noise
- Population/Housing
- Public Services
- Recreation
- Transportation/Traffic
- Utilities/Service Systems
- Mandatory Findings of Significance

The Initial Study concluded that the proposed project would have a less-than-significant in most of these areas, except

- Transportation and Circulation (Transportation/Traffic)
- Air Quality
- Noise
- Cultural Resources
- Utilities (Utilities/Service Systems)
- Public Services
- Recreation
- Biological Resources
- Hazards and Hazardous Materials
- Mandatory Findings of Significance

Because potential impacts were identified in the aforementioned areas, the project was also deemed to have the potential for adverse impacts in the Mandatory Findings of Significance category. These environmental factors are addressed in this EIR in the following sections.

3.2 TRANSPORTATION/TRAFFIC

Introduction

This section summarizes the results of the Transportation Impact Analysis (TIA) prepared for the proposed project.[1] Wilbur Smith Associates' (WSA's) TIA evaluated the impacts that could result from new development allowed under the Railroad Avenue Specific Plan, above and beyond development currently permitted under the approved *Pittsburg 2020 General Plan* and evaluated in the *General Plan EIR*. The existing *General Plan* would allow development beyond the levels that currently exist in Pittsburg, and there could be transportation impacts that would result from this development. These impacts have already been studied under the *General Plan EIR*. The *General Plan EIR* determined that, subject to the mitigation measures indicated in the *General Plan EIR,* there would be no significant impacts to transportation, as a result of implementation of the *General Plan*.

Public Resources Code Section 21094 provides that, "where a prior environmental impact report has been prepared and certified for a . . . plan . . . the report on [a] later project need not examine those effects which the lead agency determines were examined at a significant level of detail in the prior [EIR] to enable those effect to be mitigated or avoided by site specific revisions." Because the *General Plan EIR* evaluated transportation impacts under the *General Plan* and found the transportation impacts to be less than significant with mitigation, WSA's TIA does not evaluate the impacts of potential development already approved under the *General Plan*. In accordance with CEQA and the Public Resources Code, the WSA TIA and this EIR evaluate only those transportation conditions that would result directly from the implementation of the Railroad Avenue Specific Plan, above and beyond the levels of development potential approved under the current *General Plan* and analyzed in the certified EIR.[2] Therefore, the TIA evaluated the increased development potential of the Railroad Avenue Specific Plan beyond that considered in the *General Plan* and in the *General Plan EIR*. The TIA was prepared in accordance with the *Technical Procedure Update – Final (July 19, 2006)* manual published by the Contra Costa Transportation Authority (CCTA). The TIA can be found in Appendix C.

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1 Wilbur Smith Associates, *Railroad Avenue Specific Plan Transportation Impact Analysis (TIA) Preliminary Draft Report*, December 2008.

2 Under Public Resources Code Section 21093(b) and CEQA Guidelines Section 15152, EIRs on later development projects, that are consistent with, or implement the plans of, earlier EIRs may "tier" from, or incorporate by reference, the discussion in any prior environmental impact report (such as a General Plan EIR). "Second tier" EIRs may focus on the issues and impacts relevant only to a specific project or plan (such as the Railroad Avenue Specific Plan) that is proposed to be implemented within the area and subject to the impacts already addressed by the "first tier" EIR.

Setting

This section includes a description of the existing transportation network (traffic, transit, pedestrian, bicycle, and parking facilities) and intersection operating conditions.

The information on land use changes specified in the Railroad Avenue Specific Plan and on roadway network improvements planned in the study area was provided by the City of Pittsburg. Some of these are roadway changes, such as widening, while others are changes to the intersection geometry. Project-related impacts are compared to future conditions that can reasonably be expected to occur in the project area, if the policies and developments for the Railroad Avenue Specific Plans are not implemented and built (i.e. No Project conditions, or future conditions without the project). For the purposes of this comparison, No Project conditions were examined for two future time periods, known as "horizon years". The horizon years selected for this analysis are (a) Year 2015, when 25 percent of the development potential in the Railroad Avenue Specific Plan (beyond what is included in the *General Plan* and evaluated in the *General Plan EIR*) would be expected to be built, and (b) Year 2030, when the proposed project would be expected to be built-out and the Specific Plan policies would have been implemented over an extended period of time. Throughout this document, these two build-out scenarios are referred to as the "Year 2015 plus 25% Project" for the partial build-out scenario, and "Year 2030 plus Project" or simply the "proposed project", for the complete build-out scenario.

In addition to the changes included in Table 3.2-1, below, the intersection at Railroad Avenue/Power Avenue is presumed to no longer exist in the Year 2015 and Year 2030 scenarios per prior approved developments that are currently under construction. In the Year 2030 scenario, Garcia Avenue is expected to be extended to intersect with Railroad Avenue, per the Specific Plan.

Transportation Network

The project area includes a number of major roadways that support regional trips within east Contra Costa County, and also provides access to the commercial and residential areas adjacent to the project area. Several types of roadways serve the study area according to the Pittsburg *General Plan*:

- *Arterials* – high-capacity local facilities that meet demand for longer, through trips in the community.
- *Collectors* – relatively moderate-speed, moderate-capacity streets that are designed for circulation within neighborhoods and connect arterials with local streets.
- *Local Streets* – generally low-speed facilities that provide direct access to abutting properties.

The regional roads within the study area are described below and shown in Figure 3.2-1.

Table 3.2-1
Planned Roadway Improvements within the Specific Plan Area

Project	Year of Completion[a]
Harbor St/Bliss Ave. - traffic signalization	Already Constructed
Harbor St./E. Leland Rd. - additional right-turn lanes, 4 approaches	Already Constructed
Railroad Ave./SR 4 eastbound ramps - additional eastbound shared through-right turn lane	Already Constructed
California Ave. – widening, phase 1 (north) from Loveridge Rd. to Harbor St.	2015
California Ave. – widening, phase II (south) from Loveridge Rd. to Harbor St.	2015
California Ave. – widening, phase III from Harbor St. to Railroad Ave.	2030
California Ave./SR 4 westbound off-ramp (Harbor Exit) – additional eastbound through lane and right-turn overlap phase	2015
Loveridge Rd./E. Leland Rd. – additional northbound right-turn lane and right-turn signal overlap phase	2015
Railroad Ave./SR 4 westbound ramps – westbound approach widened for exclusive right-turn lane	2030
California Ave./SR 4 westbound ramps (Loveridge Exit) – widen California Ave. (ramps to Loveridge Rd.) and widen off ramp	2015
Railroad Ave./Leland Rd. – additional eastbound and southbound right-turn lanes	2015
Loveridge Rd./SR 4 eastbound ramps – widen Loveridge Rd. for a northbound right-turn lane onto eastbound SR 4	2030
Civic Ave./Davi Ave. – additional northbound free right turn on Davi Ave. with eastbound receiving lane on Civic Ave.	2015
Railroad Ave. - Implement Class II and Class III bicycle facilities	2015
Central Ave. - Implement Class II and Class III bicycle facilities	2015

Source: City of Pittsburg, October 2008.

Notes:

a. Roadway improvement projects are to be completed prior to or by Year 2015 and Year 2030 for purposes of this EIR.

Regional Access. The following roadways are part of the existing regional roadway network in the vicinity of the proposed eBART station area, including the location of the nearest access points.

State Route 4 (SR 4) – SR 4 is the primary east-west transportation corridor in Contra Costa County, connecting Intersection 80 in the City of Hercules to the west with SR 160 and the cities of Oakley and Brentwood to the east. SR 4 is a divided freeway from Interstate 680 east through Concord, Pittsburg, and Antioch, and is currently a two-lane roadway through Oakley and Brentwood. SR 4 has been one of the more congested freeways in Contra Costa County. Heavy congestion is a particular concern on the segments between Lone Tree Way and Railroad Avenue in the morning and Bailey Road to Lone Tree Way in the afternoon. These segments are in the process of being widened. SR 4 has already been widened to eight lanes from SR 242 to Railroad Avenue, with four lanes in the each direction including

FIGURE 3.2-1
Regional Roadway Network

***Source*:** City of Pittsburg, 2008.

High Occupancy Vehicle (HOV) lanes. SR 4 is a four-lane freeway between Railroad Avenue and SR 160. Interchanges along SR 4 in the project area include Railroad Avenue and Loveridge Road.

Local Access. This following roadways are part of the existing local roadway system in the vicinity of the proposed project area.

Railroad Avenue. This north-south roadway runs between 3rd Street and Castlewood Drive. In the vicinity of the project area, Railroad Avenue has two travel lanes in each direction, with a landscaped, tree-lined median north and south of SR 4 and left turn pockets at major intersections. Railroad Avenue has a five-foot sidewalk on the west side and a 10-foot-wide sidewalk on its east side, and many segments have landscaping buffers. The *General Plan* identifies Railroad Avenue as a Major Arterial in the roadway system.

Harbor Street. This north-south roadway runs from East 3rd Street to Buchanan Road. In the vicinity of the project area, Harbor Street has two travel lanes in each direction with left turn pockets, and Class II bicycle lanes along both sides of the street from Contra Costa Canal to the south to East 3rd Street to the north. The street is marked by incongruently spaced narrow and wide tree-lined medians. Six-foot-wide sidewalks are located along most of its length. The *General Plan* identifies Harbor Street as a Minor Arterial in the roadway system.

Loveridge Road. Loveridge Road is a north-south roadway that runs between Waterfront Road and Buchanan Road. In the vicinity of the project area, Loveridge Road has two travel lanes and Class II bike lanes in each direction with narrow and wide tree-lined medians and left lane turning pockets at major intersections. The *General Plan* identifies Loveridge Road as a Major Arterial in the roadway system.

Leland Road. Leland Road is an east-west roadway that runs between Century Boulevard and San Marco Boulevard. Leland Road has two travel lanes in each direction and Class II bike lanes in each direction through most of the project area, (notwithstanding an existing gap between Railroad Avenue to the east and Burton Avenue to the west, that will be corrected in the future as part of a proposed new Class III bicycle facility). The roadway has a large tree-lined median and left lane turning pockets at major intersections. Ten-foot-wide sidewalks are located along most of its length.

Davi Avenue. This north-south roadway runs between Power Avenue and North Parkside Drive. In the vicinity of the project area, Davi Avenue has one travel lane in each direction. A six-foot-wide sidewalk is located along its eastern edge. The *General Plan* identifies Davi Avenue as a Collector in the roadway system.

Civic Avenue. Civic Avenue is an east-west roadway that runs between Railroad Avenue and Davi Avenue (becomes West 17th Street west of Davi Avenue). In the vicinity of the project area, Civic Avenue has two travel lanes in each direction with a large tree-lined median and a left lane turning pocket leading to the driveway entrance to City Hall. Six-foot-wide sidewalks are located along its length. The *General Plan* identifies Civic Avenue as a Collector in the roadway system.

Power Avenue. Power Avenue runs east-west between Railroad Avenue and the area west of the Pacific Gas and Electric (PG&E) right-of-way. In the vicinity of the project area, Power Avenue has one travel lane in each direction. There is a six-foot-wide sidewalk along its northern edge, and parallel parking along both sides of the street. The *General Plan* identifies Power Avenue as a Collector in the roadway system.

Freed Avenue. Freed Avenue is a north-south roadway that runs from Bliss Avenue to Leland Road. In the vicinity of the project area, Freed Avenue has one travel lane in each direction with no paved sidewalks along most of its length. The *General Plan* identifies Freed Avenue as a Local Street/Minor Road in the roadway system.

Bliss Avenue. This east-west roadway runs between Railroad Avenue and Martin Way. In the vicinity of the project area, Bliss Avenue has one travel lane in each direction with no paved sidewalks along most of its length. The *General Plan* identifies Bliss Avenue as a Local Street/Minor Road in the roadway system.

Garcia Avenue. This east-west roadway runs between Piedmont Way and ends west of Harbor Street. In the vicinity of the project area, Garcia Avenue has one travel lane in each direction with paved sidewalks on the north side of the street along a portion of its length. The *General Plan* identifies Garcia Avenue as a Local Street/Minor Road in the roadway system.

Intersection Operating Conditions

WSA relied on traffic counts collected manually at key intersections in 2007 for the *East Contra Costa BART Extension Draft EIR* (*eBART DEIR)*[3], as the basis for their development of the Year 2008 traffic volumes. To bring these 2007 traffic counts up to date, WSA used a "growth factor" obtained from the Contra Costa Transportation Authority (CCTA) Travel Demand Model.[4] Existing intersection operating conditions were evaluated for the morning peak hour (7:00 AM to 8:00 AM) and evening peak hour (4:00 PM to 6:00 PM) using Synchro traffic modeling software. Results were used to derive levels-of-service (LOS) for the intersections studied.[5]

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[3] The *East Contra Costa BART Extension Draft EIR*, published in September 2008, is available for review online at http://www.ebartproject.org/news.php?display=1&oid=1000000509 (website current at time of access on February 18, 2009), or by contacting Katie Balk, BART Planning Department, 300 Lakeside Drive, 16th floor, Oakland, CA 94611.

[4] Refer to *Appendix C,* Wilbur Smith Associates, *Railroad Avenue Specific Plan Transportation Impact Analysis (TIA) Preliminary Draft Report,* December 2008, for more detailed information about Contra Costa Transportation Authority (CCTA) Travel Demand Model and Synchro Modeling Software.

[5] Level of Service (LOS) is a qualitative description of the performance of an intersection based on the average delay per vehicle. Intersection levels of service range from LOS A, which indicates free flow or excellent conditions with short delay, to LOS F, which indicates congested or overloaded conditions with extremely long delays. The HCM 2000 methodology calculates LOS values based on the average delay in seconds at the intersection, which is converted to an LOS value. The *CCTA Technical Procedures* guidelines permit this approach to deriving LOS using HCM 2000 methodologies (and Synchro 7 traffic analysis software), and this approach has been used in this traffic study.

A total of 16 intersections were analyzed, of which 11 are signalized, four are Two-Way Stop-Controlled (TWSC) intersections, and one is an All-Way Stop-Controlled (AWSC) intersection. Under the existing AM peak hour conditions, 15 of the 16 study intersections operate at LOS E or better, which is considered acceptable. However, the Harbor Street and Garcia Avenue intersection operates at an unacceptable LOS F.

Under the existing PM peak hour conditions, 13 of the 16 study intersections currently operate at acceptable conditions, according to the City of Pittsburg's threshold, i.e., at LOS E or better. The following intersections operate at unacceptable conditions:

- Leland Road/Freed Avenue
- California Avenue/SR 4 Westbound Ramps
- Harbor Street/Garcia Avenue

Table 3.2-2 summarizes the intersection operations under existing conditions.

Traffic Service Objectives. The TIA also evaluated the ability of the current freeway and roadway network to meet the Traffic Service Objectives for the Routes of Regional Significance[6] set forth in the *East County Action Plan of 2000*[7]. Eleven of the 16 study intersections are on Routes of Regional Significance. Of these intersections, the Railroad Avenue/Leland Road and Leland Road/Freed Avenue intersections currently fail to satisfy the traffic service objectives. In addition, the freeway portion of SR 4 does not meet the vehicle occupancy rates[8] and delay index standards defined in the Traffic Service Objectives.[9] Finally, three intersections do not currently meet the minimum acceptable

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6 Routes of Regional Significance are multi-jurisdictional transportation arteries, as distinct from Non-regional Routes. Routes of Regional Significance were first identified in the Measure C Growth Management Plan for Contra Costa County, and are subject to control under the *Countywide Comprehensive Transportation Plan* of the Contra Costa Transportation Authority (CCTA). The three Routes of Regional Significance in the project area include SR 4, Railroad Avenue, and Leland Road.

7 The *East County Action Plan of 2000* is a plan of the Contra Costa Transportation Authority with the guiding vision of construction the transportation facilities needed to improve mobility, sustain economic vitality, and maintain a favorable quality of life in eastern Contra Costa County.

8 Vehicle occupancy rates are calculated by determining the number of people and the number of vehicles passing a certain point on a route, and dividing the number of people by the number of vehicles (and is roughly comparable to the average number of passengers per vehicle at a given point on a given roadway). The objective of many travel demand management (TDM) programs and air quality improvement programs is to increase VORs. The Contra Costa Transportation Authority's vehicle occupancy rate goal for SR 4 is 1.2 persons per vehicle.

9 A delay index standard measures travel congestion. It is expressed as the ratio of (a) the time required to travel between two points during the peak hour to (b) the time required to travel that same distance during uncongested off-peak times. According to the Contra Costa Transit Authority *Traffic Service Objective Monitoring Report 2004 Update to the Countywide Comprehensive Transportation Plan*, SR 4 East did not meet the Contra Costa Transportation Authority's delay index standard during the AM peak hour; and the Railroad Avenue northbound to Buchanan Street, and southbound to Leland Avenue, did not meet the delay index standard during the PM peak hour.

V/C ratio[10] defined by the CCTA. These intersections include the Leland Avenue/Freed Avenue intersection, California Avenue/SR 4 Westbound Ramps intersection, and the Harbor Street/Garcia Avenue intersection. The acceptable V/C ratio for an urban area, as defined by CCTA, is between 0.85 and 0.89 (maximum threshold). As illustrated in Table 3.2-2, below, the Leland Avenue/Freed Avenue intersection has a V/C ratio of 1.08 during the PM peak hour. The California Avenue/SR 4 Westbound Ramps intersection has a V/C ratio of 0.91 in the PM peak hour. The Harbor Street/Garcia Avenue intersection has a V/C ratio of 0.98 in the AM peak hour and 7.13 in the PM peak hour.

Transit Network Operating Conditions

The major public transit operators that provide service within or adjacent to the study area include BART, County Connection (operated by Eastern Contra Costa Transit Authority), and Tri Delta Transit. Limited service is also provided by other transit agencies that mainly serve areas further from the study area. Figure 3.2-2 illustrates the existing transit network in reference to the Railroad Avenue Specific Plan boundaries and Tri Delta routes.

BART Service. The Pittsburg/Bay Point BART service terminates at the southwest quadrant of the SR 4/Bailey Road interchange. During weekdays, scheduled trains complete over 80 outbound trips from the Pittsburg/Bay Point BART Station to other Bay Area destinations. In FY 2007, the station had an average of 4,986 weekday patron exits. The SFO-Pittsburg/Bay Point line, also referred to as the Concord Line, provides direct service to and from San Francisco and runs from 4:00 AM to 12:00 AM daily. Weekday service frequencies for outbound trains range from six minutes during the morning peak hour to 15 minutes off peak.

Tri Delta Transit Service. Tri Delta Transit serves East Contra Costa County including the cities of Pittsburg, Antioch, Oakley, and Brentwood, and the unincorporated areas of East County, along with Bay Point. Tri Delta Transit operates 16 local bus routes from Monday to Friday, including four express services, and three local bus routes during weekends and holidays. BART regional rail service can be accessed from the Tri Delta Transit local and express bus service. Paratransit ("Dial-A-Ride") service is also provided by Tri Delta Transit. The Dial-A-Ride service utilizes a computerized dispatch system to match van routing with passenger trip requests.

Tri Delta Transit has an annual fixed route ridership of over 2.5 million boardings. Route 380, which runs along Leland Road within the Specific Plan Area, is a weekday local route from Pittsburg/Bay Point BART Station through Hillcrest Park-and-Ride Lot into Antioch. Route 380 carried the largest volume of riders, and was one of the most productive routes in terms of passengers per revenue hour.

[10] The V/C ratio, or volume-to-capacity ratio, is literally the ratio of traffic volumes at a given intersection at any one time, or averaged over a period of time, compared to the total capacity which that intersection can accommodate.

Table 3.2-2
Study Intersection Operations – Existing Conditions

		Threshold			AM Peak			PM Peak		
#	Intersection	Control	Jurisdiction	LOS	V/C	Delay	LOS	V/C	Delay	LOS
1	Civic Avenue – W.17th Street/Davi Avenue	AWSC	City of Pittsburg	E		8.3	A		8.2	A
2	Power Avenue/Davi Avenue	TWSC	City of Pittsburg	E	0.11	12.1 (SB)	B	0.12	13.4 (SB)	B
3	Railroad Avenue/Civic Avenue	Signal	CCTA	D[b]	0.44	18.6	B	0.37	14.4	B
4	Railroad Avenue/Power Drive/Center Drive	Signal	City of Pittsburg	E	0.62	21.4 (EB)	C	0.51	17.1 (EB)	C
5	Railroad Avenue/SR 4 Westbound On-Ramp	Signal	Caltrans	C/D[a]	0.92	51	D	0.61	15.4	B
6	Railroad Avenue/SR 4 Eastbound Ramps	Signal	Caltrans	C/D[a]	0.73	18.6	B	0.80	16.8	B
7	Railroad Avenue/Bliss Avenue	Signal	CCTA CMP	E	0.57	17.7	B	0.84	24.5	C
8	Railroad Avenue/Leland Road	Signal	CCTA CMP	E	0.82	33.9	C	0.99	55.3	E
9	Leland Road/Harbor Street	Signal	CCTA	D[b]	0.74	31.4	C	0.83	41.2	D
10	Leland Road/Freed Avenue	TWSC	City of Pittsburg	E	0.31	44 (SB)	E	**1.08**	**>80 (NB)**	**F**
11	Leland Road/Loveridge Road	Signal	CCTA	D[b]	0.72	36.5	D	0.84	33.8	C
12	Loveridge Road/SR 4 Eastbound Ramps	Signal	Caltrans	C/D[a]	0.63	16.2	B	0.67	12.9	B
13	California Avenue/SR 4 Westbound Ramps	Signal	Caltrans	C/D[a]	0.70	31.2	C	**0.91**	**58.6**	**E**
14	Harbor Street/California Avenue	Signal	CCTA	D[b]	0.74	33.4	C	0.88	43.1	D
15	Harbor Street/Bliss Avenue	Signal	City of Pittsburg	E	0.63	5.7	A	0.56	16.7	B
16	Harbor Street/Garcia Avenue	TWSC	City of Pittsburg	E	**0.98**	**>80 (WB)**	**F**	**7.13**	**>80 (EB)**	**F**

Source: Wilbur Smith Associates, December 2008.

Notes:

AWSC – All-way Stop Control; TWSC – Two-way Stop Control.

Signal – Traffic Signal.

Delay presented in seconds per vehicle.

Delay and LOS presented for worst approach for two-way stop controlled intersections.

Boldface type indicates unacceptable values.

a. Represents a target LOS at the transition between LOS C and LOS D.

b. For an Urban Area, V/C ratio must be between 0.85 and 0.89.

FIGURE 3.2-2
Existing Transit Network

***Source*:** City of Pittsburg, 2008.

Route 300, a service between Brentwood and the Pittsburg/Bay Point BART Station, which also passes through the Antioch Park-and-Ride Lot, had the highest ridership among the weekday express service.[11]

County Connection Transit Service. The County Connection Transit Service, operated by the Contra Costa County Transit Authority (CCCTA), serves most Contra Costa cities, with limited service to East County areas. County Connection operates Route 930 through Pittsburg, which originates in Walnut Creek and travels to Ygnacio Valley Road/Kirker Pass Road to Buchanan Road. Its terminus is at the Hillcrest Park-and-Ride Lot in Antioch. Westbound service is offered weekday mornings, from 5:30 AM to 7:00 AM, approximately every 30 minutes. Eastbound evening service runs from 3:00 PM to 7:00 PM, at frequencies of 30 to 60 minutes. The County Connection Transit Service can be accessed through Tri Delta Transit Route 70, as well as routes that pass through the Hillcrest Park-and-Ride Lot.

Existing Pedestrian Conditions

There are existing sidewalks along most of the roadways within the study area. The sidewalks range from five to ten feet wide at various locations and are generally in good condition. Crosswalks are present at most of the study intersections; however, at a majority of the intersections on arterials, pedestrian crossings exist only along one approach each in the north-south and east-west directions to limit pedestrian crossing conflicts and exposure in high traffic areas. Existing gaps in the pedestrian network throughout the study area are summarized below:

- South side of Power Avenue, adjacent to SR 4 (Power Avenue is to be abandoned within the time frame of this Specific Plan, which will eliminate this conflict.);
- East side of Davi Avenue, adjacent to the City Hall grounds (under construction);
- West side of Loveridge Road, north of SR 4;
- East side of Loveridge Road, north of SR 4 overpass;
- Bliss Avenue, entire length except segment along BART park-and-ride lot;
- Portions of north side and all of south side of Garcia Avenue;
- Freed Avenue, entire length;
- South side of North Parkside Drive, adjacent to City Park;
- North and south sides of Clark Avenue; and
- Portion of north side of Leland Road (assessor's parcel number 088-183-004).

[11] Tri Delta Transit, *Tri Delta Transit Short Range Transit Plan (SRTP) FY 2007/2008 – FY 2017/2018,* January 30, 2008.

Bicycle Conditions

According to the *General Plan* and the *Contra Costa Countywide Bicycle and Pedestrian Plan*, there are existing bicycle lanes along some of the roadways as well as an off-street bike path (Class I facility) close to the two proposed eBART stations. Bicycle lanes are generally well-connected to one another, and most of the major roads in the vicinity of the proposed stations provide Class II or Class III bicycle facilities. Table 3.2-3 presents existing and planned bicycle facilities that traverse the study area.

Table 3.2-3
Bicycle Facilities Near or Serving the Study Area

Street	From:	To:	Class[a]
Harbor Street	Buchanan Road	East 10th Street	III/II[b]
Railroad Avenue	State Route 4	East 10th Street	III
E. Leland Road	Railroad Avenue	Antioch City Limit	II
Loveridge Road	Buchanan Road	Waterfront Road	II/III
State Route 4/Frontage	Crestview Drive	Railroad Avenue	I
Delta De Anza Trail	Throughout City	Throughout City	I
Central Avenue	Railroad Avenue	East 14th Street	II/III

Source: Wilbur Smith Associates, 2008.

Notes:

a. Bicycle facility classifications:
Class I – Off-street bike path
Class II – Marked on-street bike lane
Class III – Shared bike route; roadways recommended for use by bicycles and are designated by signs only

Parking Conditions

Parking. Most of the available on-street parking within the study area is located along residential streets and minor roads. The City of Pittsburg has established Preferential Residential Permit Parking Programs (PRPPs). These programs allow residential areas to be designated as restricted parking areas in order to prevent long-term non-resident and commuter parking. The City of Pittsburg and has established a PRPP area and within that area, the City does not currently charge for permits in that area. In general, off-street parking requirements are set by ordinance to provide a sufficient number of spaces and prevent spillover onto neighboring residential streets.

Park-and-Ride Lots. There is one main park-and-ride lot located within the study area. This lot is generally well served by local transit and is owned by BART. All of the parking lots are free and provide lighting. The Pittsburg Park-and-Ride Lot is located on Bliss Avenue, between Harbor Street and Railroad Avenue, has a parking supply of 185 parking spaces. Five of the Tri Delta Transit routes service this location, including the Delta Express (DX) lines.

BART Station Parking. The parking lot at the Pittsburg/Bay Point BART Station offers free parking and provides 2,036 patron spaces, including 117 designated carpool spaces, 35 ADA spaces, and over

50 mid-day spaces, which are spaces that are available only after 10:00 AM.[12] According to the BART website, the estimated fill time for this lot is 7:25 AM, and parking is limited to 24 hours.

Impact Assessment and Mitigation Measures

This section discusses the transportation operations under future conditions. Traffic (intersection), parking, and transportation circulation conditions are analyzed in this section. These conditions form the basis against which transportation impacts related to the proposed project are identified.

Methodology

Study Scenarios. Traffic operations were evaluated based on the methodologies in the *2000 Highway Capacity Manual* (HCM 2000).

The traffic impact analysis was conducted for the weekday AM and PM peak hours for the following scenarios:

- No Project Conditions
  - *Year 2015 No Project*
  - *Year 2030 No Project*
- Project Conditions
  - *Year 2015 plus 25% Project*
  - *Year 2030 plus Project*
- Relocated Residential Density alternative – Project Conditions (discussed in Chapter 5, Alternatives to the Proposed Project)
  - *Year 2015 plus 25% Project, under the Relocated Residential Density alternative*
  - *Year 2030 plus Project, under the Relocated Residential Density alternative*

Travel Demand Model. Traffic projections and ridership forecasts were developed for the transportation study using a Contra Costa Transportation Authority (CCTA) Travel Demand Model. A travel demand model is one of the most common methods of forecasting future travel demand in a given area. The model is based on inputs such as projections of population, employment, observed travel behavior, and anticipated changes to the transportation network.

The projections for Year 2015 and Year 2030 were developed using the CCTA travel demand model. Changes to the transportation network are identified later in the section under "Future (No Project) Conditions" and were integrated into the model assumptions. The model was also adjusted to account

[12] Accessible parking spaces are provided in compliance with the regulations specified in the Americans with Disabilities Act (ADA) of 1990.

for differences between the existing year model outputs and actual counts, and balanced for the observed and forecast turning movements.

The CCTA model uses Year 2007 as the base year and Year 2030 as the future or project "build out" year. The model can generate highway and transit outputs for the AM and PM peak hour, AM and PM peak period (four hours), and daily traffic volumes. The model outputs with respect to the traffic network include link volumes, intersection turning movements, volume to capacity (V/C) ratios, vehicle miles traveled (VMT), vehicle hours traveled (VHT), and vehicle hours of delay. The model provides sufficient detail to permit travel demand forecasts down to the level of minor collector roadways. It does not, however, include residential streets.

Volume Development – Future Year 2030 traffic volumes obtained from the Year 2030 model were used to analyze the future cumulative operation conditions at the study intersections.[13] However, Year 2030 traffic volumes were adjusted to account for the difference between the base-year model output and actual counts, and balanced for the observed and forecast turning movements. Future year traffic volumes were adjusted and balanced using the technique and procedures described in the *CCTA Technical Procedures Manual (July 2006)*.

Year 2015 traffic volumes were computed assuming a linear growth rate between the Base Year and Year 2030 model runs and applied to the existing traffic counts.

Trip Generation Estimate – For purposes of the study, WSA's analysis relied on an estimation of the number of vehicle trips associated with the land uses (the "trip generation" rate) within the specific subareas of the Railroad Avenue Specific Plan. Trip generation estimates were based on the CCTA model and household, population, employment land use data derived from Traffic Analysis Zones (TAZs) for the Transit Village and Civic Center subareas that will undergo the most dramatic land use changes and will encompass the majority of the development potential in the Specific Plan Area. Due to the transit-oriented nature of the proposed project (typified by enhanced multimodal access and mixed land use development that encourages internal trip capture), trip reductions were made as part of the trip generation estimation due to the fact that an objective of the Specific Plan is to implement policies and programs to reduce VMT. Transit-Oriented Development (TOD) trip reductions applied to the trip generation estimates were based on the following assumptions:

- Internal trips taken within the study area TAZs
- Transit within 0.5 mile radius of TAZs
- Walk access links connecting all TOD TAZs

Trip generation rates are provided in Table 3.2-4, below.

[13] This cumulative analysis thus includes an analysis of impacts under the proposed project build out and those resulting from implementation of other projects currently in the permit process, or known and anticipated to be built within the City of Pittsburg or on affected transportation arteries in the immediately vicinity.

Table 3.2-4
Trip Generation Estimate – Year 2030

		Year 2030 No Project				Year 2030 Plus Project				Year 2030 Project Relocated Residential Density Alternative			
		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
CCTA TAZ	Subarea	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
30048	TV-W	134	126	231	247	158	219	348	310	160	180	308	305
30065	TV-E	321	177	301	402	380	419	606	560	448	609	845	699
30069	TV-SW	139	116	211	235	145	154	254	252	145	154	253	252
30642	CC	255	196	346	425	305	292	482	533	253	195	345	424
	Total	**849**	**615**	**1,089**	**1,309**	**988**	**1,084**	**1,690**	**1,655**	**1,006**	**1,138**	**1,751**	**1,680**

Source: Wilbur Smith Associates, December 2008.

Notes:

Transit Village (west) – (TV-W)

Transit Village (east) – (TV-E)

Transit Village (southwest) – (TV-SW)

Civic Center – (CC)

Intersection Analysis. Level of Service (LOS) is a qualitative description of the performance of an intersection based on the average delay per vehicle. Intersection levels of service range from LOS A, which indicates free flow or excellent conditions with short delay, to LOS F, which indicates congested or overloaded conditions with extremely long delays. The HCM 2000 methodology calculates LOS values based on the average delay in seconds at the intersection, which is converted to an LOS value. The *CCTA Technical Procedures* guidelines permit this approach to deriving LOS using HCM 2000 methodologies (and Synchro 7 traffic analysis software), and this approach has been used in this traffic study.

Signalized Intersections – The average delay for study area signalized intersections was calculated using the Synchro analysis software based on HCM 2000 methodology and the delay at the intersections are correlated to LOS as shown in Table 3.2-5, below.

Unsignalized Intersections – These intersections were evaluated using the HCM 2000 methodology. In this case, the LOS is based on the "weighted average control delay" expressed in seconds per vehicle as illustrated in Table 3.2-6. Control delay includes the sum of all the individual movements that a vehicle might go through at an unsignalized intersection, including initial deceleration delay, queue move-up time, stopped delay, and final acceleration.

Table 3.2-5
Level of Service Criteria – Signalized Intersections

Level of Service	Description of Operations	Average Delay (seconds)
A	Operations with very low delay occurring with favorable progression and/or short cycle length.	≤ 10.0
B	Operations with low delay occurring with good progression and/or short cycle lengths.	10.1–20.0
C	Operations with average delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	20.1–35.0
D	Operations with longer delays due to a combination of unfavorable progression, long cycle lengths, or high V/C ratios. Many vehicles stop and individual cycle failures are noticeable.	35.1–55.0
E	Operations with high delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences. This is considered to be the limit of acceptable delay.	55.1–80.0
F	Operation with delays unacceptable to most drivers occurring due to over saturation, poor progression, or very long cycle lengths.	≥ 80.1

Source: Transportation Research Board, *Highway Capacity Manual*, 2000.

Table 3.2-6
Level of Service Criteria – Unsignalized Intersections

Level of Service	Description of Operations	Average Delay (seconds)
A	No Delay for stop-controlled approaches.	≤ 10.0
B	Operations with minor delays.	10.1–15.0
C	Operations with moderate delays.	15.1–25.0
D	Operations with some delays.	25.1–35.0
E	Operations with high delays, and long queues.	35.1–50.0
F	Operations with extreme congestion, with very high delays and long queues unacceptable to most drivers.	≥ 50.1

Source: Transportation Research Board, *Highway Capacity Manual*, 2000.

Two-Way Stop-Controlled Intersections – At Two-Way Stop-Controlled (TWSC) intersections, LOS is calculated for each controlled movement, as opposed to the intersection as a whole. For All-Way Stop-Controlled (AWSC) locations, LOS is computed for the intersection as a whole.

The following existing traffic network intersections were analyzed for this project and are illustrated in Figure 3.2-3:

1. Civic Avenue/17th Street/Davi Avenue
2. Power Avenue/Davi Avenue
3. Railroad Avenue/Civic Avenue/Civic Drive
4. Railroad Avenue/Power Avenue/Center Drive
5. Railroad Avenue/SR 4 westbound on-ramp
6. Railroad Avenue/SR 4 eastbound on-ramp/SR 4 westbound off-ramp
7. Railroad Avenue/Bliss Avenue
8. Railroad Avenue/Leland Road
9. Leland Road/Harbor Street
10. Leland Road/Freed Avenue
11. Leland Road/Loveridge Road
12. Loveridge Road/SR 4 eastbound ramps
13. California Avenue/SR 4 westbound ramps
14. Harbor Street/California Avenue
15. Harbor Street/Bliss Avenue
16. Harbor Street/Garcia Avenue

The following future traffic network intersection was also analyzed as part of this project:[14]

1. Railroad Avenue/Garcia Avenue

[14] Under future conditions, the intersection of Power Avenue and Davi Avenue is omitted due to the presence of the proposed eBART station. Therefore, a total of 16 intersections were analyzed under future conditions.

FIGURE 3.2-3
Study Intersections

***Source*:** City of Pittsburg, 2008.

Standards of Significance

The analysis of potential project impacts relies on standards of significance established by the jurisdictions within the study area. These thresholds, which are based on intersection LOS, are used to identify significant project-related impacts and a need for mitigation measures. This section describes the applicable policies and regulations that were included in the analysis. In the absence of established thresholds, alternate criteria were set that were consistent with the project and study purpose.

Caltrans. At the intersections located on State facilities, which are located at the freeway on- and off-ramps within the vicinity of the project area (nos. 5, 6, 14, 12 and 13 on Figure 3.2-3), the following guidelines serve as LOS thresholds for the intersection operation conditions:

- Caltrans recommends a target LOS at the transition between LOS C and LOS D;
- In case the recommended LOS is not achievable, Caltrans should be consulted in order to determine the target LOS; and
- If the intersection under existing conditions operates worse than the appropriate target LOS, then the existing LOS should be maintained.

Contra Costa Transportation Authority (CCTA). There are several separate sets of criteria for transportation standards of significance, as defined by the CCTA. First, the CCTA criteria require that applicable jurisdiction criteria be followed for unsignalized intersections, the Congestion Management Plan (CMP) network,[15] and state routes. In the absence of established local criteria to describe the operating conditions of intersections and ramp-freeway junctions, LOS D or better is typically considered to be acceptable for peak hours, while LOS E or worse is considered undesirable.

As noted above, the CCTA adheres to, and requires enforcement of, jurisdictional (i.e. the City of Pittsburg) standards of significance. However, the CCTA also sets it own distinct standards of significance.[16] The CCTA's standards of significance for the transportation network, including the CMP network and state routes, are discussed below.

In general, a project-related impact is considered significant if the proposed project would be likely to result in any of the following:

- Deterioration of an intersection from LOS D or better to LOS E or F under project conditions, or cause a substantial increase in volume-to-capacity (V/C) ratio at an intersection operating at LOS E or F;
- Deterioration of a freeway segment to LOS F, unless LOS F was measured when the CMP was established in 1991; or

[15] The Congestion Management Plan network is comprised of roadways within Contra Costa County that have significance for countywide transportation congestion and mobility.

[16] These City of Pittsburg standards of significance are those defined in the preceding discussion.

- Deterioration of an intersection or freeway segment to an LOS below the threshold of its jurisdiction.

These three general thresholds of significance help establish the extent of project impacts on intersections and freeway segments, and are supplemented by a second set of CCTA standards of significance which apply specifically to impacts to Routes of Regional Significance. The Routes of Regional Significance in the study area are State Route 4 (SR 4), Leland Road, and Railroad Avenue. For the purposes of this EIR, the CCTA considers an impact to a Route of Regional Significance to be significant if the project-related traffic would:

- Worsen intersection operating conditions by more than one degree of LOS; or
- Worsen intersection operating conditions to LOS E or F.

These standards of significance are detailed in Table 3.2-7, below.

Table 3.2-7
Summary of Traffic Service Objectives for Regional Routes of Significance

Regional Route	Traffic Service Objectives
State Route 4 (freeway)	1. Vehicle Occupancy of 1.2 persons per vehicle or higher during the morning peak hour
	2. Delay Index of less than 2.5
	3. Transit Ridership increase of 25% by year 2010 compared to year 2000
Leland Road Railroad Avenue	1. Mid-Level of Service D or better at intersections (volume to-capacity ratio of 0.85 or less)
	2. Delay Index less than 2.0

Source: Contra Costa Transportation Authority, *Technical Procedures Update,* 2006.

In addition to applying the two sets of significance criteria discussed above, the CCTA also is the designated County Congestion Management Agency (CMA) for Contra Costa County and must, therefore, apply distinct standards of significance to areas of the County that are within the Contra Costa Congestion Management Plan (CMP) network.[17] Parts of the project area, namely, SR 4 and Railroad Avenue south of SR 4, fall within the CMP network. The CCTA has established a minimum standard of LOS E for all parts of the CMP network except those that were already operating at worse levels of service in 1991. One freeway segment in the Railroad Avenue Specific Plan study area from Railroad Avenue to Loveridge Avenue operates at LOS F during the eastbound PM peak hour. Thus, under the existing PM peak hour conditions, the Railroad Avenue to Loveridge Road Segment operates worse than CCTA's CMP network standard of LOS E, in the eastbound direction.

As noted at the beginning of this discussion, notwithstanding the above discussion of CCTA standards of significance, the CCTA criteria ultimately require that applicable jurisdiction criteria be followed for

[17] Any agency appointed a County CMA – in this case, the CCTA for Contra Costa County – bears the responsibility for preparing and monitoring the preparation of a countywide Congestion Management Plan (CMP) as part of an aggressive overall strategy to reduce congestion and improve mobility in the County.

the Congestion Management Plan (CMP) network, unsignalized intersections, and state routes. Thus, the City of Pittsburg standard of significance – LOS F – would be the standard used in the analysis of the portions of SR 4 within the CMP network.[18]

City of Pittsburg. The following standards are used by the City of Pittsburg to identify traffic impacts; these guidelines are limited to the purpose of this analysis and study area boundaries:

- LOS D or better (< 85 percent capacity) on intersections along Major Arterials (**General Plan, Section 7.2 Roadway System and Traffic Standards**, pg. 7-7*)*; there would be a significant impact if a project performed worse than LOS D or exceeded 85 percent capacity on intersections along Major Arterials;
- LOS D or better at signalized intersections along non-freeway State Route 4 (**General Plan, Section 7.2 Roadway System and Traffic Standards**, pg. 7-7*)*; there would be a significant impact if a project performed worse than LOS D at signalized intersections along non-freeway State Route 4;
- LOS E or better at unsignalized intersections along non-freeway State Route 4 (**General Plan, Section 7.2 Roadway System and Traffic Standards**, pg. 7-7*)*; there would be a significant impact if a project performed worse than LOS D at signalized intersections along non-freeway State Route 4;
- Pre-existing unacceptable base case unsignalized intersection operation has an increase in the ratio of vehicles to capacity of 0.02 or greater or an increase in delay of 5 seconds or greater (**General Plan, Section 7.2 Roadway System and Traffic Standards**, pg. 7-7, as implemented by City Engineering Department); there would be a significant impact if the ratio of vehicles to capacity (V/C ratio) increased by 0.02 or more at an unsignalized intersection, or delay at an unsignalized intersection increased by 5 seconds or greater;
- Peak hour signal warrant criteria are met due to the addition of project traffic (**General Plan, Section 7.2 Roadway System and Traffic Standards**, pg. 7-7, as implemented by City Engineering Department); there would be a significant impact if peak hour signal warrant criteria are not met due to the addition of project traffic;
- Signal warrant criteria are met for a base case intersection condition and the project would contribute 25 or more trips to the intersection during a single peak traffic hour (**General Plan, Section 7.2 Roadway System and Traffic Standards**, pg. 7-7, as implemented by City Engineering Department); there would be a significant impact if signal warrant criteria are not met for a base case intersection condition and the project would contribute 25 or more trips to the intersection during a single peak traffic hour; and
- Achieve service level standards for Basic Route intersections that conform to the CCTA's Growth Management requirements for Routes of Regional Significance (**General Plan Goal 7-G-1**); there would be a significant impact if the project would not achieve service level

[18] Table 3.2-11, Page 3.2-11, *East Contra Costa BART Extension Draft EIR,* September 2008.

standards for Basic Route intersections that conform to the CCTA's Growth Management requirements for Routes of Regional Significance.

Parking. There are no established criteria for the assessment of parking impacts. For the purposes of this EIR, a significant parking impact would result if the proposed land uses in the Railroad Avenue Specific Plan substantially reduces parking supply more than it reduces the parking demand.

BART. According to the *eBART DEIR*[19], the actual maximum passenger capacity of a BART car is estimated as 150 persons per car. However, well before passenger loads approach this level, passengers would experience uncomfortable conditions and the time required at stations to unload and load passengers would cause delays affecting the overall operation of the system. BART staff determined that when the average passenger loads per car during the peak hour exceed 112 passengers per car, passenger comfort and system operations are compromised. The threshold of 112 passengers per car represents a load factor of 1.67 passengers per seat. For the purposes of this EIR, the project would result in a significant impact if it would cause the average passenger load per car during the peak hour to exceed 112 passengers.

Tri Delta Transit. In the Short Range Transit Plan issued in January 2008, Tri Delta Transit documents the adoption of transit objectives, performance indicators, and standards for the system. In terms of transit operations, the standards focus on service quality, reliability, productivity, and safety. For the purposes of this EIR, a significant transit impact would result if the project causes sustained service performance that violates the adopted standards as noted below:

- Schedule adherence – late service: Greater than 90 percent within 5 minutes of schedule
- Schedule adherence – early service: No bus ahead of schedule
- Productivity (passengers per hour) – minimum 15

Pedestrian and Bicycles. For purposes of this EIR, a significant pedestrian impact would result if the Railroad Avenue Specific Plan caused substantial overcrowding on public sidewalks, creation of hazardous conditions for pedestrians, or elimination of pedestrian access to adjoining areas. The Railroad Avenue Specific Plan would have a significant effect if it would create particularly hazardous conditions for bicyclists or eliminate bicycle access to adjoining areas. Finally, if the Railroad Avenue Specific Plan were to impede or thwart implementation of a planned pedestrian or bicycle pathway, or if the developments would conflict with adopted policies supporting alternative transportation (i.e., bus turnouts, bicycle racks), a significant pedestrian or bicycle impact would be identified.

[19] The *East Contra Costa BART Extension Draft EIR*, published in September 2008, is available for review online at http://www.ebartproject.org/news.php?display=1&oid=1000000509 (website current at time of access on February 18, 2009), or by contacting Katie Balk, BART Planning Department, 300 Lakeside Drive, 16th floor, Oakland, CA 94611.

Environmental Analysis

For each potential impact associated with the proposed project, a level of significance is determined and is reported in the impact statement. Conclusions of significance are defined as follows: significant impact (S), potentially significant impact (PS), less than significant (LTS), or no impact (NI). For each impact identified as being significant (S) or potentially significant (PS), the EIR provides mitigation measures to reduce, eliminate, or avoid the adverse effect. If the mitigation measures would reduce the impact to less-than-significant (LTS) level successfully, this is stated in the EIR. If the mitigation measures would not diminish significant or potentially significant impacts to a less-than-significant level, the impacts are classified as "significant unavoidable impacts (SU)." For this section, TR refers to Transportation.

Vehicle Circulation Impacts

Year 2015 plus 25% Project Impacts

TR-1 Under Year 2015 plus 25% Project conditions, the Leland Road/Freed Avenue and Harbor Street/Garcia Avenue intersections would exceed acceptable LOS levels during the AM peak hour. Under Year 2015 plus 25% Project the Leland Road/Freed Avenue would exceed acceptable LOS levels during the PM peak hour However, there would be no significant impact as a result of the proposed project. (LTS)

The intersection operations under Year 2015 plus 25% Project conditions are presented in Table 3.2-8 and are summarized below.

AM Peak Hour: Year 2015 plus 25% Project conditions would result in an unacceptable LOS at two of the study intersections during the AM peak hour:

- Under Year 2015 plus 25% Project conditions, the Leland Road/Freed Avenue intersection would continue to operate at LOS F, similar to Year 2015 No Project conditions. However, the proposed project would not worsen the LOS at this intersection. Per City of Pittsburg standards of significance, an impact would occur if Leland/Freed would operate worse than LOS E and if the V/C would increase by more than 0.02. This intersection is already operating at LOS F with a V/C of 1.58 under Year 2030 No Project conditions and would improve to LOS F with a V/C of 1.44 in the AM peak hour. Therefore, there would be no significant impact as a result of the proposed project. Per CCTA CMP standards of significance, an impact would occur if Leland Avenue/Railroad Avenue would operate at LOS E or F and if a significant increase in V/C would occur. This intersection would not operate worse than the LOS E threshold and this intersection would improve under Project Conditions in the AM peak hour. Therefore, there would be no impact from the proposed project. A significant impact would not occur as a result of the proposed project.

- Under Year 2015 plus 25% Project conditions, the Harbor Street/Garcia Avenue intersection would continue to operate at LOS F similar to Year 2015 No Project conditions. However, the proposed project would not worsen the LOS at this intersection. Therefore, a significant impact would not occur as a result of the proposed project.

PM Peak Hour: Year 2015 plus 25% Project conditions would result in unacceptable levels of service at the following study intersection during the PM peak hour:

- Under Year 2015 plus 25% Project conditions, the Leland Road/Freed Avenue intersection would continue to operate at LOS F, similar to Year 2015 No Project conditions. However, the proposed project would not worsen the LOS at this intersection. Therefore, a significant impact would not occur as a result of the proposed project.

TR-2 The intersection Harbor Street/Garcia Avenue would operate at LOS F, with significant delays along the eastbound and westbound approaches under Year 2015 plus 25% Project conditions during the PM peak hour. (PS)

Per the California Manual on Uniform Traffic Control Devices (MUTCD), a signal warrant analysis was conducted to determine the feasibility of signalization of the Harbor Street/Garcia Avenue intersection. The criteria for signal warrants were satisfied. Therefore, signalization is recommended to improve the Harbor Street/Garcia Avenue intersection operations from LOS F to LOS A, and would significantly reduce delay for Year 2015 plus 25% Project conditions.

MITIGATION MEASURE. The following mitigation measure would reduce impacts of the proposed project to a less-than-significant level. (LTS)

TR-2.1 Signalization of the Harbor Street/Garcia Avenue Intersection in year 2015. The Harbor Street/Garcia Avenue intersection shall be converted from a two-way stop-controlled (TWSC) intersection to a signalized intersection with a cycle length of 75 seconds for the PM peak hour, allowing the intersection to operate at LOS A, with 8.4 seconds of average delay.

Table 3.2-8
Study Intersection Operations – 2015 plus 25% Project Conditions

#	Intersection	Threshold			AM Peak			PM Peak		
		Control	Jurisdiction	LOS	V/C	Delay	LOS	V/C	Delay	LOS
1	Civic Avenue – W.17th Street/Davi Avenue	AWSC	City of Pittsburg	E		8.6	A		8.3	A
2	Railroad Avenue/Civic Avenue	Signal	CCTA	D[b]	0.46	11.9	B	0.58	16.2	B
3	Railroad Avenue/Center Drive	Signal	City of Pittsburg	E	0.48	6.2	A	0.73	10	B
4	Railroad Avenue/SR 4 Westbound On-Ramp	Signal	Caltrans	C/D[a]	0.69	13.1	B	0.53	10.4	B
5	Railroad Avenue/SR 4 Eastbound Ramps	Signal	Caltrans	C/D[a]	0.73	14.9	B	0.75	15.7	B
6	Railroad Avenue/Bliss Avenue	Signal	CCTA CMP	E	0.6	11.4	B	0.62	12.6	B
7	Railroad Avenue/Leland Road	Signal	CCTA CMP	E	0.84	34.6	C	0.95	41.7	D
8	Leland Road/Harbor Street	Signal	CCTA	D[b]	0.73	24.5	C	0.68	24.3	C
9	Leland Road/Freed Avenue	TWSC	City of Pittsburg	E	**0.46**[c]	**>50 (SB)**	**F**	0.67[c]	>50 (SB)	F
10	Leland Road/Loveridge Road	Signal	CCTA	D[b]	0.68	29.4	C	0.52	22.1	C
11	Loveridge Road/SR 4 Eastbound Ramps	Signal	Caltrans	C/D[a]	0.52	6.6	A	0.48	4.8	A
12	California Avenue/SR 4 Westbound Ramps	Signal	Caltrans	C/D[a]	0.34	15.2	B	0.61	19.5	B
13	Harbor Street/California Avenue	Signal	CCTA	D[b]	0.82	36.2	D	0.72	28.6	C
14	Harbor Street/Bliss Avenue	Signal	City of Pittsburg	E	0.94	8.9	A	0.5	12.2	B
15	Harbor Street/Garcia Avenue	TWSC	City of Pittsburg	E	**4.21**	**>50 (WB)**	**F**	**	**>50 (WB)**	**F**
16	Railroad Avenue/Garcia Avenue	Signal	CCTA CMP	E	0.41	8.5	A	0.95	37.6	D

Source: Wilbur Smith Associates, December 2008.

Notes:

AWSC – All-way Stop Control; TWSC – Two-way Stop Control

Signal – Traffic Signal

Delay presented in seconds per vehicle.

Delay and LOS presented for worst approach for two-way stop controlled intersections.

Boldface type indicates unacceptable values.

a. Represents a target LOS at the transition between LOS C and LOS D.

b. For an Urban Area V/C ratio must be between 0.85 and 0.89.

c. The V/C ratio increase at Leland Avenue/Freed Avenue is greater than 0.02 in the AM peak hour (impact) and less than 0.02 in the PM peak hour (no impact).

** Not *computed*

Year 2030 plus Project

TR-3 Under Year 2030 plus project conditions, the Leland Road/Freed Avenue intersection would exceed acceptable LOS levels during the AM peak hour. Under Year 2030 plus Project, the Railroad Avenue/Leland Road, Leland Road/Freed Avenue and Harbor Street/California Avenue intersections would exceed acceptable LOS levels during the PM peak hour, but operations would not deteriorate at any of these intersections as a result of the proposed project. (LTS)

The intersection operations under Year 2030 plus Project conditions are presented in Table 3.2-9 and are summarized below.

AM Peak Hour: Year 2030 plus Project conditions would result in unacceptable levels of service at one of the study area intersections during the AM peak hour; however, this would not constitute a significant project impact as conditions would not deteriorate as a result of the proposed project. Per City of Pittsburg standards of significance, an impact would occur if Leland/Freed would operate at an LOS worse than LOS E, and if the V/C increases by more than 0.02, as a result of the proposed project. This intersection currently operates at LOS F with a V/C of 1.58 under Year 2030 No Project conditions. The intersection would improve to LOS F with a V/C of 1.44 in the AM peak hour under proposed project conditions; therefore, there would be no significant impacts as a result of the proposed project.

- The Leland Road/Freed Avenue intersection would operate better under the Year 2030 plus Project conditions than under Year 2030 No Project conditions; therefore, a significant impact would not occur as a result of the proposed project.

PM Peak Hour: Year 2030 plus Project conditions would result in unacceptable levels of service at three of the study area intersections during the PM peak hour; however, this would not constitute a significant project impact as conditions would not deteriorate as a result of the proposed project. Per CCTA CMP standards of significance, an impact would occur if Leland Avenue/Railroad Avenue would operate at LOS E or F, and if there would be a significant increase in V/C. This intersection does not operate worse than the LOS E threshold and this intersection V/C ratio improves under Project Conditions in the AM peak hour; therefore, there would be no significant impacts as a result of the proposed project. The effects, at the three study area intersections affected during the PM peak hour, would include:

- The Railroad Avenue/Leland Road intersection would operate better under Year 2030 plus Project conditions than under Year 2030 No Project conditions; therefore, a significant impact would not occur as a result of the proposed project.
- The Leland Road/Freed Avenue, intersection would operate better under Year 2030 plus Project conditions than under Year 2030 No Project conditions; therefore, a significant impact would not occur as a result of the proposed project.

Table 3.2-9
Study Intersection Operations – 2030 plus Project Conditions

#	Intersection	Threshold			AM Peak			PM Peak		
		Control	Jurisdiction	LOS	V/C	Delay	LOS	V/C	Delay	LOS
1	Civic Avenue – W.17th Street/Davi Avenue	AWSC	City of Pittsburg	E		28.2	D		8.7	A
2	Railroad Avenue/Civic Avenue	Signal	CCTA	D[b]	0.59	16.5	B	0.48	16.4	B
3	Railroad Avenue/Center Drive	Signal	CCTA	E	0.53	8.9	A	0.94	18	B
4	Railroad Avenue/SR 4 Westbound On-Ramp	Signal	Caltrans	C/D[a]	0.90	19	B	0.64	13.3	B
5	Railroad Avenue/SR 4 Eastbound Ramps	Signal	Caltrans	C/D[a]	0.89	19.8	B	0.87	20.8	C
6	Railroad Avenue/Bliss Avenue	Signal	CCTA CMP	E	0.78	17.7	B	0.93	31.6	C
7	Railroad Avenue/Leland Road	Signal	CCTA CMP	E	1.02[c]	59.4	E	**1.15**[c]	**>80**	**F**
8	Leland Road/Harbor Street	Signal	CCTA	D[b]	0.81	28	C	0.78	41.8	D
9	Leland Road/Freed Avenue	TWSC	City of Pittsburg	E	**1.44**[c]	**>50 (SB)**	**F**	**2.67**[c]	**>50 (SB)**	**F**
10	Leland Road/Loveridge Road	Signal	CCTA	D[b]	0.76	32	C	0.62	23	C
11	Loveridge Road/SR 4 Eastbound Ramps	Signal	Caltrans	C/D[a]	0.56	7.1	A	0.44	7.4	A
12	California Avenue/SR 4 Westbound Ramps	Signal	Caltrans	C/D[a]	0.45	20.6	C	0.87	38.5	D
13	Harbor Street/California Avenue	Signal	CCTA	D[b]	1.01	50.7	D	**1.06**	**78.3**	**E**
14	Harbor Street/Bliss Avenue	Signal	City of Pittsburg	E	0.74	5.9	A	0.74	16.1	B
15	Harbor Street/Garcia Avenue	TWSC	City of Pittsburg	E	**9.44**	**>50 (WB)**	**F**	**	**>50 (WB)**	**F**
16	Railroad Avenue/Garcia Avenue	Signal	CCTA CMP	E	0.75	17.8	B	1.11	41.8	D

Source: Wilbur Smith Associates, December 2008.

Notes:

AWSC – All-way Stop Control; TWSC – Two-way Stop Control

Signal – Traffic Signal

Delay presented in seconds per vehicle.

Delay and LOS presented for worst approach for two-way stop controlled intersections.

Boldface type indicates unacceptable values.

a. Represents a target LOS at the transition between LOS C and LOS D.

b. For an Urban Area V/C ratio must be between 0.85 and 0.89.

c. This constitutes and improvement in the V/C ratio over current conditions, so represents no impact as a result of the proposed project.

** Not computed the Harbor Street/Garcia Avenue intersection would continue to operate at LOS F under Year 2030 plus Project conditions, with significant delays in the eastbound and westbound approaches in comparison to Year 2030 No Project conditions; therefore, a significant impact would occur as a result of the proposed project.

- The Harbor Street/California Avenue intersection would continue to operate at LOS E under Year 2030 plus Project conditions, and the LOS would not deteriorate in comparison to Year 2030 No Project conditions; therefore, a significant impact would not occur as a result of the proposed project.

TR-4 The intersection of Harbor Street/Garcia Avenue would operate at LOS F, with significant delays along the eastbound and westbound approaches under Year 2030 plus Project conditions during the AM peak hour. (PS)

The Harbor Street/Garcia Avenue intersection would continue to operate at LOS F under Year 2030 plus Project conditions, with significant delays in the eastbound and westbound approaches compared to Year 2030 No Project conditions; therefore, a significant impact would occur as a result of the proposed project.

Per the California MUTCD, a signal warrant analysis was conducted to determine the feasibility of signalization of the Harbor Street/Garcia Avenue intersection. The criteria for signal warrants were satisfied. Therefore, signalization is recommended to improve the intersection operations at Harbor Street/Garcia Avenue, during the AM and PM peak hour.

MITIGATION MEASURE. This mitigation measure would reduce impacts of the proposed project to a less-than-significant level. (LTS)

TR-4.1 Signalization of Harbor Street/Garcia Avenue Intersection in 2030. The Harbor Street/Garcia Avenue intersection signal cycle length shall be 70 seconds for the AM peak hour, so that the intersection operates at LOS A, with 7.7 seconds of average delay. This mitigation measure would reduce impacts of the proposed project to a less-than-significant level. (LTS)

Traffic Service Objective Impacts

TR-5 Under Year 2015 plus 25% Project and Year 2030 plus Project conditions, two of the 16 study intersections would not satisfy the Traffic Service Objectives in the East County Action Plan for the proposed project; however, the failure to meet these Objectives would not result from the proposed project, so is not a significant impact of the proposed project. Similarly, under Year 2030 conditions, SR 4 would not meet the Traffic Service Objectives, but this failure to meet the Objectives would not result from the proposed project, and is not an impact of the proposed project. The proposed project would have a less than significant impact on the Traffic Service Objectives in the year 2030. (LTS)

Traffic Service Objectives on SR 4 include a minimum vehicle occupancy requirement of 1.2 persons per vehicle, or higher, during the morning peak hour; a delay index of less than 2.5 (when comparing travel time during peak hours to non-peak travel times); and a transit ridership increase of 25% by year 2010, compared to year 2000. On Leland Road and Railroad

Avenue, these Traffic Service Objectives include a mid-Level of Service D or better at intersections (and volume-to-capacity ratio of 0.85 or less); and a delay index of less than 2.0.

Under both Year 2015 plus 25% Project and Year 2030 plus Project conditions, traffic operations at Railroad Avenue/Leland Road and Leland Road/Freed Avenue would not meet the Traffic Service Objectives in the *East County Action Plan*. However, the proposed project would improve traffic operations at Railroad Avenue/Leland Road and Leland Avenue/Freed Road by the year 2030 (compared to existing conditions). Therefore, the proposed project would have no significant impacts related to Traffic Service Objectives on either Leland Road or Railroad Avenue. Similarly, because the proposed project is designed to allow approval and construction of the Railroad Avenue eBART station, and placement of the eBART station would result in an LOS on SR 4 equal to, or better than, the no-eBART station project, the proposed project would have an indirect beneficial impact on SR 4, so would be supportive of the Traffic Service Objectives related to SR 4. No significant impacts related to Traffic Service Objectives were identified as a result of the proposed project. Therefore, no mitigation or improvement measures are recommended.

Parking Impacts

TR-6 No significant impacts related to parking conditions were identified as a result of the proposed project. Therefore, no mitigation measures are recommended. (LTS)

Parking demand has been estimated based on the proposed land uses and the projected station access mode splits developed for the *eBART DEIR* beyond the development potential in the *Pittsburg 2020 General Plan* and as evaluated in the *Pittsburg 2020 General Plan EIR*. The Railroad Avenue Specific Plan includes potential future development within the study area, ranging from additional BART facilities, and transit-oriented development (TOD) including new commercial, office, public, and recreational uses. An examination of parking demand, based on the City of Pittsburg Municipal Code, is also presented as a basis of comparison.

Existing Parking Requirement – Table 3.2-10 presents the parking requirements according to City of Pittsburg Municipal Code Section 18.78.040. General off-street parking requirements, based on number of required parking spaces per unit or square feet of development for residential, commercial, office, government, and retail land uses are outlined below.

Proposed Parking Requirements – There are two subareas within the boundaries of the Railroad Avenue Specific Plan (where land use changes in the Railroad Avenue Specific Plan would result in increased development beyond that analyzed in the *Pittsburg 2020 General Plan* and as evaluated in the *Pittsburg 2020 General Plan EIR*). The subareas would be served by high frequency transit and a high quality pedestrian and bicycling network facilities that would encourage and support multimodal access to and within the study area. Furthermore within each subarea, there is a mix of proposed land uses that would generate new multimodal person trips and result a new mix of parking demand. Due to the character of the proposed project, the growth of trips to the study area would be captured over the entire multimodal network

including transit (eBART, Tri Delta, and County Connection), bicycle facilities, pedestrian facilities, and the roadways network including parking lots.

Table 3.2-10
City of Pittsburg Municipal Code - Existing Parking Requirements

General Land Use Classification	Off-Street Parking Spaces (per unit or square feet)
Residential	2 spaces per unit, including 1 covered
Government	1 space per 250 square feet
Commercial	1 space per 250 square feet
Restaurant	1 space per 4 seats
Office	1 space per 250 square feet
Retail	1 space per 250 square feet
Industrial	1 space per 500 square feet

Source: City of Pittsburg Municipal Code Section 18.78.040 for Off-Street Parking Requirements.

In order to provide a realistic projection of future parking demand associated with these additional person trips, the Railroad Avenue Specific Plan has established TOD-based parking requirements that take into account the complementary parking demand profiles of the proposed mix of uses and the proximity of high frequency transit and high quality alternative mode (bike and pedestrian) facilities thus supporting reductions from typical parking requirements. The Railroad Avenue Specific Plan TOD parking requirements are listed in Table 3.2-11.

Table 3.2-11
Railroad Avenue Specific Plan TOD Parking Requirements per Land Use

Classifications	Maximum Parking Thresholds
TOD High (TOD-H)	1 space per 333 square feet of commercial 1.5 spaces per residential unit
TOD Medium (TOD-M)	1 space per 333 square feet of commercial 1.5 spaces per residential unit
TOD Residential (TOD-R)	1.5 spaces per residential unit
TOD Industrial Park (TOD-IP)	1 space per 500 square feet of development (west of Harbor Street) Municipal code requirements for all development east of Harbor Street
TOD Office Commercial (TOD-CO)	1 space per 333 square feet of commercial 1.5 spaces per residential unit
Public/Institutional (GQ)	Municipal code requirements for all Governmental/Quasi-Public uses

Source: Chapter 4, *Railroad Avenue Specific Plan,* 2008.

Based on the TOD parking requirements, the following parking supply estimates have been determined for both subareas within the study area. Overall, an estimated 7,000 additional parking spaces are proposed to accommodate future parking demand; approximately 1,450 spaces for the Civic Center subarea developments and over 3,500 spaces for the Transit Village subarea, with an additional approximately 1,400 off-street parking spaces. Table 3.2-12 and Table 3.2-13, below, present the parking supply estimates based on the number of residential dwellings and total square footage of each use proposed in the Civic Center and Transit Village subareas.

Table 3.2-12
Proposed Parking Supply – Civic Center Subarea

Uses	Residential Units	Commercial Size (sq.ft.)	Parking Spaces	
			Residential	Commercial
TOD-R	230		345	
TOD-M	17	22,550	26	67
Public/Institutional		304,400		1,020
Parks/Recreation	----	----	----	----
Total	**247**	**326,950**	**371**	**1,087**

Source: Chapter 4*, Railroad Avenue Specific Plan,* 2008.

Notes:

TOD-R: Transit-Oriented Development Residential

TOD-M: Transit-Oriented Development Medium Density

Table 3.2-13
Proposed Parking Supply – Transit Village Subarea

Uses	Residential Units	Commercial Size (sq.ft.)	Parking Spaces	
			Residential	Commercial
TOD-H	830	52,500	1,245	158
TOD-M	247	36,354	371	109
Business/Commercial		223,046		466
Community/Commercial	259	270,949	389	814
Structured Parking				1,407
Parks/Recreation	----	----	----	----
Total	**1,336**	**582,849**	**2,005**	**2,954**

Source: Chapter 4*, Railroad Avenue Specific Plan,* 2008.

Notes:

TOD-H: Transit-Oriented Development High Density

TOD-M: Transit-Oriented Development Medium Density

According to the Railroad Avenue Specific Plan, at least 350 additional parking spaces would be dedicated for future BART parking; these parking spaces would be distributed among two lots along Bliss Avenue, and one lot on the Civic Center sub-area block.[20] Therefore, the estimated total parking supply would be approximately 6,700 parking spaces, which includes the parking supply per subarea and the additional parking spaces at the transit station.

Within the Specific Plan Area, the maximum proposed parking requirements are provided per land use. For example, the general commercial parking requirement is one space per 250 square feet of development, whereas the proposed project calls for one space per 333 square feet of development, a 33 percent reduction in parking requirements. Overall, parking requirements have been reduced under the Railroad Avenue Specific Plan, ensuring a optimal utilization of land, regulating parking supply per land use, and promoting alternative modes of transportation (transit usage, walking, and bicycling) in order to control parking demand, which are important components of implementing TOD. This reduction in parking is supported by numerous goals and policies within the Specific Plan including but not limited to the following:

- **Specific Plan Policy 4-P-5** Allow reductions in on-site parking requirements at the discretion of the Planning Commission or City Council as part of project approval for affordable and senior housing developments located within the Transit Village, Civic Center and High School Village sub-areas.

- **Specific Plan Policy 6-P-11** Provide multiple public parking structures in strategic locations that may be shared by commercial and residential uses as well as eBART transit riders.

- **Specific Plan Policy 6-P-13** When traffic and parking demand volumes increase as the Specific Plan Area develops, implement Transportation Demand Management (TDM) strategies including unbundling parking from residential development, lowering minimum parking requirements, and instituting parking pricing strategies to discourage single occupancy vehicle travel to and from the Specific Plan Area.

These goals and policies, in addition to the Specific Plan goals and policies supporting multi-modal transportation, are representative of goals and policies generally implemented within TODs, and are intended to reduce the amount of vehicle traffic to the area.

Railroad Avenue Station Parking Demand. Since there is greater parking supply at Pittsburg/Bay Point and Hillcrest Ave eBART stations, transit patrons that choose to drive to BART in this corridor are more likely park at these destinations rather than park at the proposed Railroad Avenue eBART station. Therefore, the *eBART DEIR* states that demand for parking at the Pittsburg Bay Point BART and Hillcrest Avenue eBART stations would far exceed that of the demand at the Railroad Avenue eBART station. According to Table 3.2-14,

[20] Refer to Figure 6.9 Parking Structure Locations in the Railroad Avenue Specific Plan, Chapter 6.

which is from the *eBART DEIR* (Table 3.2-15), only 40 percent of the entire ridership is projected to access the Railroad Avenue Station via the park and ride lot, resulting in a much lower projected parking demand than the adjacent stations in 2030.[21]

Table 3.2-14
Access Mode Split by Station, 2015 and 2030

	Percentage of Riders Accessing the Station		2015		2030	
	Railroad Avenue	Hillcrest Avenue	Railroad Avenue	Hillcrest Avenue	Railroad Avenue	Hillcrest Avenue
Total Ridership[a]	—	—	750	3,150	1,900	8,200
Round Trips[b]	—	—	375	1,575	950	4,100
Car – Park & Ride	40%	62%	150	977	380	2,542
Car – Drop-off	20%	18%	75	284	190	738
Bus/Transit	10%	16%	38	252	95	656
Bicycle	2%	1%	8	16	19	41
Walk	28%	3%	105	47	266	123

Source: Wilbur Smith Associates, 2008.
Notes:
a. Total ridership defined as one-way person trips.
b. A round trip equals two one-way trips, representing a total trip which begins and ends at a given station.

Pittsburg Bay Point BART presently fills to capacity (2036 spaces) at 7:25 AM, and approximately 500 vehicles park in surrounding streets. The unconstrained model developed for the *eBART DEIR* projected demand for 3,500 parking spaces based on a 2030 ridership of 14,600 with no eBART Project indicating a latent demand of approximately 1,000 spaces. When the future eBART stations and associated parking facilities open, the demand at Pittsburg Bay Point would decline as some demand would shift mostly to Hillcrest Station and some to Railroad Avenue Station. While the 2,036 spaces would be sufficient, the unserved latent demand at Pittsburg Bay Point is expected to cause the parking facility to remain highly utilized.[22] The *eBART DEIR* projects the Hillcrest Avenue Station in Antioch would also be in high demand at 92 percent of its capacity (2600 spaces) in 2030.[23] The Railroad Avenue Specific Plan has planned at least 350 spaces for the station and its demand would slightly exceed its projected supply (up to 366 spaces) by 2030 based on the unconstrained travel forecasts conducted for the *eBART DEIR*. It should be noted that the application of standard parking management techniques such as on-street time limits and pricing and satellite parking with complementary shuttles would help further reduce parking demand and direct riders to alternative modes of transportation in the station area.

[21] Page 3.2-15, *East Contra Costa BART Extension Draft Environmental Impact Report, 2008* for a detailed access mode split for Future Year 2015 and Year 2030.

[22] Latent parking demand was one factor used to estimate total ridership at Pittsburg Bay Point Station in the *eBART DEIR*.

[23] Refer to Table 3.2-27 in the *East Contra Costa BART Extension Draft EIR, September 2008*.

As stated previously, there is a significant amount of existing off-street parking facilities as well as on-street parking near the proposed station area and within the boundaries of the Railroad Avenue Specific Plan. The Railroad Avenue Specific Plan proposes approximately 6,700 additional spaces to accommodate growth as well as 350 parking spaces for future transit demand. Furthermore, parking requirements have been reduced to account for transit-oriented development near the proposed station area. These modified parking minimum requirements permit developers and the other stakeholders to provide adequate parking while utilizing the maximum benefit of use in the study area. Due to the large parking supply differentials at the Pittsburg Bay Point BART and Hillcrest Avenue eBART stations the demand for parking at these stations would far exceed that of the demand at the Railroad Avenue eBART station. Additionally, only 40 percent of the entire ridership from the Railroad Avenue Station is projected to access the Station via the park and ride lot, resulting in a much lower projected parking demand than the adjacent stations in 2030. Despite the fact that there would be limited parking supply available at that station, the parking impacts at the Railroad Avenue eBART station would be less-than-significant due to the policies and programs contained within the Specific Plan to discourage vehicular trips to and from the site. These policies and programs include Transportation Demand Management strategies, pedestrian and bicycle friendly design features and traffic calming techniques. In addition, the provision of limited parking is designed to be an incentive for non-local drivers to park their vehicles at adjacent BART Stations that contain a greater parking supply.

As noted above, the Specific Plan contains policies to implement Transportation Demand Management strategies to reduce vehicle trips to the Specific Plan Area and reduce the demand for parking once the Specific Plan begins to develop, in addition to encouraging shard use of parking facilities. In addition, there are numerous goals, policies and programs, also enumerated above to provide increased and improved pedestrian, bicycle and transit access throughout the Specific Plan to reduce reliance on vehicles which will decrease the demand for parking in the Specific Plan Area.

Transit Impacts

As noted above, a significant transit impact would result if the project causes sustained service performance that violates the adopted standards as noted below:

- Schedule adherence – late service: Greater than 90 percent within 5 minutes of schedule
- Schedule adherence – early service: No bus ahead of schedule
- Productivity (passengers per hour) – minimum 15

TR-7 None of these significant impacts related to transit conditions were identified or are anticipated as a result of the proposed project. Therefore, no mitigation or improvement measures are recommended. (LTS)

There are several public transit buses operating throughout the study area; however there is only one route that would serve the station directly. Currently, the Tri Delta Route 380 bus service along Railroad Avenue has a stop near the proposed station and would allow direct access to the station for eBART patrons. As stated previously, Route 380 is the most productive line in the system, with connection to the existing Pittsburg/Bay Point BART station. According to the *East Contra Costa BART Extension Draft Environmental Impact Report (2008)*, an estimated 10 percent of eBART patrons would utilize transit service in order to access the station.[24]

The Railroad Avenue Specific Plan encourages modifications to the existing Tri Delta route and proposes implementing a dedicated shuttle service route to connect the Transit Village with Old Town Pittsburg. In parallel with the plans to extend Garcia Avenue to Railroad Avenue, an additional transit route would operate along Garcia Avenue, allowing patrons of the eBART station direct access to proposed park-and-ride lots and access to the station.[25] Specific Plan policies to strengthen the transit connections to and from the planned eBART station include:

- **Specific Plan Goal 5-G-3** Provide direct access and convenient bus service to the Transit Village and eBART station.

- **Specific Plan Policy 5-P-5** Create a dedicated bus-only street and lanes with access in both directions in the Transit Village sub-area.

- **Specific Plan Policy 5-P-7** Install street furniture that improves the transit rider's experience, including bus shelters with seating, interactive bus shelters with GPS tracking to show bus times, and other informational signage.

- **Specific Plan Goal 6-G-2** Reduce vehicle miles traveled by strengthening multi-modal connections in and around the Specific Plan Area.

- **Specific Plan Policy 6-P-16** Include efficient links between Tri-Delta buses, shuttles, public parking areas and the potential eBART station. Work with transit providers to ensure matching service spans between buses, shuttles and BART trains.

- **Specific Plan Policy 6-P-17** Achieve a minimum of 10 to 15 minute headways between BART and bus connections during peak hours.

- **Specific Plan Policy 6-P-18** Use shuttles to strengthen transit connections between the Specific Plan Area, the Pittsburg/Bay Point BART station and Old Town Pittsburg.

- **Specific Plan Policy 6-P-19** Develop a bus-only access street in the Transit Village.

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[24] Refer to Table 3.2-13 in the *East Contra Costa BART Extension Draft Environmental Impact Report (2008)*.

[25] Refer to Figure 6.10 in the Railroad Avenue Specific Plan for an illustration of the proposed transit route and shuttle service.

Overall, local transit services would not experience decreased service quality or productivity as a result of the proposed station or the implementation of the Railroad Avenue Specific Plan. Feeder routes to the new station would experience an increase in ridership; however, Tri Delta is proposing to reconfigure existing routes to accommodate increased demand (as noted in the *Railroad Avenue Specific Plan*, Chapter 6, Section 6.3.4). As such, Tri Delta plans to use the buses removed from SR 4 express service to improve bus service to the proposed station at Railroad Avenue. These improvements should result in improved service reliability and schedule adherence as well as greater connectivity between the surrounding neighborhoods and the proposed station area.

Pedestrian Impacts

TR-8 As noted above, a significant pedestrian impact would result if the Railroad Avenue Specific Plan caused substantial overcrowding on public sidewalks, creation of hazardous conditions for pedestrians, or elimination of pedestrian access to adjoining areas. Finally, if the Railroad Avenue Specific Plan were to impede or thwart implementation of a planned pedestrian pathway, or if the developments would conflict with adopted policies supporting alternative transportation (i.e., bus turnouts, bicycle racks), a significant pedestrian impact would be identified. The proposed project would not create substantial overcrowding or hazardous conditions on public sidewalks, limit pedestrian access to adjoining areas, or impede or thwart implementation of a planned pedestrian pathway or conflict with adopted policies supporting alternative transportation. Therefore, the proposed project would not have significant impacts related to pedestrian conditions, and no mitigation or improvement measures beyond those included in the Specific Plan are recommended. (LTS)

There are several sidewalks along major roadways throughout the study area. In proximity to the proposed station, there are sidewalks along both sides of Railroad Avenue, ranging from 5 to 10 feet in width, respectively. Pedestrian counts conducted by the City of Pittsburg observed a high amount of pedestrians traveling along and crossing Railroad Avenue, specifically at Civic Avenue and the SR 4 on- and off-ramps during the AM and PM peak hours.[26] A moderate-to-low amount of pedestrian activity was observed Bliss and California avenues as well as along Harbor Street. Field observations have indicated that a high level of pedestrian activity along Railroad Avenue, north of Bliss Avenue is primarily associated with the nearby Pittsburg High School.[27] According to the *eBART DEIR*, the proposed transit station would generate additional walk trips throughout the area. As mentioned above, the *eBART DEIR* estimated 28 percent of patrons would access the proposed station by walking from home or work, which is largest percentage of alternative mode access to the station. Total single occupancy vehicle (SOV) access is estimated at 60 percent of all access to the station.[28]

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[26] Pedestrian counts were collected by the City of Pittsburg in September 2008.

[27] Pedestrian activity data were collected by the City of Pittsburg in September 2008.

[28] Refer to Table 3.2-13 in the *East Contra Costa BART Extension Draft Environmental Impact Report (2008)*.

The Railroad Avenue Specific Plan proposes several sidewalk and streetscape improvements throughout the entire network. General improvements include:

- Widening sidewalks in mixed-use and commercial areas to at least 10 feet wide;
- The installation of planter strips between sidewalks and roadways to serve as buffers for pedestrians and increased safety;
- The provision of clearly marked crosswalks at all controlled intersections and major intersections; and
- Bulb-outs at intersections to increase visibility of pedestrians and to reduce walking distance.

Finally, the design of the station area recognizes that the sidewalk along the west side of Railroad Avenue overcrossing of SR 4 is five feet in width while the sidewalk along the west side of Railroad Avenue is approximately nine and one-half feet in width. While station access design will allow for stair and elevator access to the platform from both the eastern and western sides of the overpass, the eastern entrance will be designed as the main entrance and patrons will be directed to use the eastern entrance as the main entrance to the station platform.[29]

Specific Plan goals and policies intended to support multi-modal transportation, and pedestrian activity in particular, are listed below at the conclusion of the Multi-Modal Level of Service Analysis section.

Bicycle Impacts

TR-9 *As noted above, a significant bicycle impact would result if the Railroad Avenue Specific Plan create hazardous conditions for bicyclists, or eliminate bicycle access to adjoining areas. Finally, if the Railroad Avenue Specific Plan were to impede or thwart implementation of a planned bicycle pathway, or if the developments would conflict with adopted policies supporting alternative transportation (i.e., bus turnouts, bicycle racks), a significant bicycle impact would be identified. The proposed project would not create substantial hazardous conditions for bicyclists, limit bicycle access to adjoining areas, or impede or thwart implementation of a planned bicycle pathway or conflict with adopted policies supporting alternative transportation. Therefore, the proposed project would not have significant impacts related to bicycle conditions, and no mitigation or improvement measures beyond those included in the Specific Plan are recommended. (LTS)*

As noted previously, Crestview Drive includes a Class II bicycle facility that connects to a Class I multi-use trail that extends east along Frontage Road to Railroad Avenue. Currently, there are no designated bicycle facilities along Railroad Avenue south of SR 4. Other existing bicycle facilities are located along Harbor Street, from Buchanan Road to East 3rd Street; East

[29] Refer to *the Draft Specific Plan, section 1.4.3, eBART station and Access for details regarding pedestrian access of planned Station.*

Leland Road, from Railroad Avenue to East City Limits. Other proposed bicycle facilities include Power Avenue, from Davi Avenue to west of Case Drive; and Central Avenue, from Railroad Avenue to Columbia Street.[30]

In proximity to the proposed station, field observations indicated a low-to-moderate level of bicycle activity.[31] Bicycle counts conducted by the City of Pittsburg recorded few bicyclists traveling during AM and PM peak hours of observation along Railroad Avenue and along Harbor Street at each intersection with California and Bliss Avenues.[32] In regards to accessibility, the proposed bicycle route along Railroad Avenue would provide cyclists with direct access to the proposed station.

According to the Railroad Avenue Specific Plan, there are several proposed bicycle lanes within the study area and near the proposed station. For example, Year 2015 roadway improvements include an extension and implementation of Class II bicycle lanes and Class III bicycle routes along Railroad and Central Avenues. The bicycle facilities proposed within the Specific Plan Area will connect with existing and planned bicycle facilities. This will increase connectivity and bicycling mode share to the station area by extending the bicycle network throughout many neighborhoods in Pittsburg, and by allowing the bicycle network to extend outward into the surrounding region (by way of the Delta de Anza trail, for example).

Specific Plan goals and policies intended to support multi-modal transportation, including bicycle activity, are listed below at the conclusion of the Multi-Modal Level of Service Analysis section.

Multi-Modal Level of Service (MMLOS) Analysis

In addition to analyzing the auto level of service, which is required under CEQA, a multi-modal level of service was also performed using the National Cooperative Highway Research Program (NCHRP) #128 Multimodal Level of Service (MMLOS) for Urban Streets. Although not required under CEQA, the MMLOS analysis was performed on key corridors within the Specific Plan Area in order to quantify and comprehensively evaluate the future development and physical roadway network. Quantifying a multi-modal LOS at the segment level will allow existing and future roadway facilities to better accommodate a balanced transportation network that prioritizes person, transit and bicycle capacity as opposed to solely vehicle capacity. In addition, it is consistent with the goals and the policies of the Specific Plan to create a transit oriented development.

[30] Source: Railroad Avenue eBART station Area Specific Plan –Existing Conditions Report (November 2006).

[31] Observations by City of Pittsburg, September 2008.

[32] Observations by City of Pittsburg, September 2008.

The analysis, which examines transit, bicycle and pedestrian level of service, was performed on five multi-modal corridors as listed below:

- Facility 1: Railroad Avenue from Civic Avenue to Leland Road
- Facility 2: Leland Road from Railroad Avenue to Loveridge Road
- Facility 3: California Avenue from Loveridge Road to Railroad Avenue
- Facility 4: Harbor Avenue from Leland Road to California Avenue
- Facility 5: Bliss Avenue from Railroad Avenue to Harbor Street

Transit LOS is a function of accessibility by pedestrians, amenities at the bus stop, waiting time for the bus, and the mean speed of the bus. Bicycle LOS is a function of the perceived separation between motor vehicle traffic and the bicyclist, parked vehicle interference and the quality of roadway pavement. Pedestrian LOS is based on a combination of pedestrian density, and other factors including sidewalks, walkways, and additional physical barriers that separate pedestrians from vehicle traffic.

Based on the MMLOS analysis, it appears that the policies and programs contained in the Specific Plan, and planned for the arterial and collector roadways located within the Specific Plan Area, will provide minor benefits to pedestrians, bicyclists and transit riders along the corridors analyzed. To review the original analysis, please see the Traffic Impact Analysis in Appendix C of this EIR. The relatively minor improvements along those corridors make the sub-area specific improvements, including but not limited to, the proposed transit-only right-of-way, the pedestrian and bicycle-only pathways and trails, wider sidewalks and pedestrian amenities, in addition to an inviting and activated streetscape through a mix of uses and good urban design principles essential to improving the pedestrian, bicycle and transit experience through the Specific Plan Area.

Specific Plan goals and policies intended to support multi-modal transportation, and pedestrian and bicycle activity in particular, include:

- **Specific Plan Policy 3-P-7** Create an integrated network of open spaces and trails that connect different neighborhoods and sub-areas to each other and to transit facilities.

- **Specific Plan Goal 4-G-1** Provide a safe and inviting pedestrian environment to draw people to and from the eBART station.

- **Specific Plan Policy 4-P-1** Require high quality, pedestrian-friendly design and a high level of transparency along street fronts and pathways to activate the street environment, promote social interaction and support crime prevention.

- **Specific Plan Policy 4-P-2** Incorporate public pathways and greenways throughout private development located within the Civic Center and Transit Village sub-areas to facilitate pedestrian and bicycle movement throughout the Specific Plan Area.

- **Specific Plan Policy 4-P-6** Provide a combination of long term, secure and short term bicycle parking facilities and encourage decorative, yet functional, bicycle parking facilities.

- **Specific Plan Policy 5-P-2** Require new development in the Transit Village and Civic Center sub-areas to dedicate land or to build the proposed public pathways and trails into new development to create a strong network of parks, plazas and pathways that are consistent with those shown on the Land Use Plan.

- **Specific Plan Policy 5-P-8** Provide uniform pedestrian-scale lighting along all streets in the Transit Village and Civic Center sub-areas.

- **Specific Plan Goal 6-G-1** Make the Specific Plan Area a walkable center at the crossroads of the Pittsburg community.

- **Specific Plan Goal 6-G-3** Improve all transit connections from the Specific Plan Area outward to the City, the Pittsburg/Bay Point BART station and the region.

- **Specific Plan Policy 6-P-1** Encourage walking, bicycling and other non-motorized modes of transportation by providing clearly defined, generous, safe and enjoyable routes for pedestrians and cyclists.

- **Specific Plan Policy 6-P-3** Provide wide sidewalks (a minimum of six-feet wide in residential areas and ten feet in commercial areas) to enhance the pedestrian experience.

- **Specific Plan Policy 6-P-5** Minimize walking distances between key destinations by mixing uses and providing streetscape amenities.

- **Specific Plan Policy 6-P-6** Create dedicated mid-block greenway connections throughout the Transit Village and into the Civic Center sub-areas.

- **Specific Plan Policy 6-P-7** Design the public realm and rights-of-way for universal design and Americans with Disabilities Act (ADA) compliance to meet or exceed guidelines set by the Division of the State Architect.

- **Specific Plan Policy 6-P-8** Include accessible design improvements, such as appropriately placed curb cuts, audible pedestrian-crossing signals, minimum pathway grades, generous walkway width and areas for rest.

- **Specific Plan Policy 6-P-9** Incorporate traffic calming techniques such as wide sidewalks, narrow streets, bulb outs, on-street parking, and other strategies throughout the Transit Village, Civic Center and High School Village sub-areas.

3.3 AIR QUALITY

Introduction

This section of the EIR evaluates the potential impacts on air quality resulting from the Railroad Avenue Specific Plan. This assessment includes the potential for the project to conflict with an Air Quality plan, violate an air quality standard, or contribute substantially to an existing or projected air quality violation, to result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment, or to expose sensitive receptors to substantial pollutant concentrations. Air quality effects related to the proposed project are evaluated against State and federal ambient air quality standards, as well as the standards established by the Bay Area Air Quality Management District (BAAQMD).

At the October 14, 2008, public comment meeting, a citizen requested an analysis of potential impacts to climate change that would result from the proposed project, specifically as a result of increased vehicle greenhouse gas producing emissions associated with the new development in the project area. While greenhouse gas analysis is not currently required under CEQA statutes, this discussion has been provided in Section 3.8, Climate Change, of this EIR. NOP comments were also received in regard to the potential for air quality impacts to existing residential uses during construction.

Potential impacts from odors were found to be less than significant in the Initial Study prepared for the proposed project (see Appendix A).

Setting

Air Quality Background

The City of Pittsburg is within the San Francisco Bay Area Air Basin, so named because the surrounding mountains tend to confine the movement of air and the pollutants contained therein. This area includes all of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, the western half of Solano and the southern half of Sonoma counties. The regional climate within the Bay Area is considered semi-arid and is characterized by warm summers, mild winters, infrequent seasonal rainfall, moderate daytime onshore breezes, and moderate humidity. A wide range of emissions sources—such as dense population centers, heavy vehicular traffic, and industry—and meteorology primarily influence the air quality within the Bay Area.

Air pollutant emissions within the Bay Area are generated by stationary and mobile sources. Stationary sources can be divided into two major subcategories: point and area sources. Point source emissions occur at identified locations and are usually associated with manufacturing and industry. Examples of air emission point sources are boilers and combustion equipment that produce electricity or generate heat. Area-wide sources consist of many smaller point sources that are widely distributed. Examples of area-wide sources include residential and commercial water heaters, painting operations, lawn mowers, agricultural fields, landfills, and consumer products such as barbeque lighter fluid and hair

spray. Mobile sources refer to emissions from motor vehicles, including tailpipe and evaporative emissions, and are classified as either on-road or off-road. Off-road sources include aircraft, ships, trains, and self-propelled construction equipment. Air pollutants can also be generated by natural sources such as fine dust particles that are pulled off the ground and suspended in the air during high winds.

Both the federal and State governments have established ambient air quality standards for outdoor concentrations of various pollutants in order to protect public health. The national and State ambient air quality standards have been set at levels where concentrations could be generally harmful to human health and welfare, and to protect the most sensitive persons from illness or discomfort with a margin of safety.

The air pollutants for which national and State standards have been promulgated and that are most relevant to air quality planning and regulation in the Bay Area include ozone, carbon monoxide (CO), respirable particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead. In addition, toxic air contaminants (TACs) are of concern in the Bay Area. Each of these is briefly described below.

- *Ozone* is a gas that is formed when reactive organic gases (ROG) and nitrogen oxides (NOx)—both byproducts of internal combustion engine exhaust—undergo slow photochemical reactions in the presence of sunlight. Ozone concentrations are generally highest during the summer months when direct sunlight, light wind, and warm temperature conditions are conducive to its formation.
- *Carbon Monoxide* (CO) is a colorless, odorless gas produced by the incomplete combustion of fuels. CO concentrations tend to be the highest in the winter morning when surface-based inversions trap the pollutant at ground levels. Because CO is emitted directly from internal combustion engines—unlike ozone—and motor vehicles operating at slow speeds are the primary source of CO in the Bay Area, the highest ambient CO concentrations are generally found near congested transportation corridors and intersections.
- *Respirable Particulate Matter* (PM_{10}) and *Fine Particulate Matter* ($PM_{2.5}$) consist of extremely small, suspended particles or droplets 10 microns and 2.5 microns or smaller in diameter. Most particulate matter in urban areas is produced by fuel combustion, motor vehicle travel, and construction activities.
- *Nitrogen Dioxide* (NO_2) is a reactive, oxidizing gas capable of damaging cells lining the respiratory tract and is an essential ingredient in the formation of ozone. It is emitted as a by-product of fuel combustion.
- *Sulfur Dioxide* (SO_2) is a colorless, extremely irritating gas or liquid. It enters the atmosphere as a pollutant mainly as a result of burning high sulfur-content fuel oils and coal, and from chemical processes occurring at chemical plants and refineries.
- *Lead* occurs in the atmosphere as particulate matter. The combustion of leaded gasoline is the primary source of airborne lead in the Bay Area. The use of leaded gasoline is no longer permitted for on-road motor vehicles so most lead combustion emissions are associated with

off-road vehicles, such as racecars. Other sources of lead include the manufacturing and recycling of batteries, paint, ink, ceramics, ammunition, and secondary lead smelters.

- *Toxic Air Contaminants* (TACs) is a general term for a diverse group of air pollutants that can adversely affect human health, but have not had ambient air quality standards established for them. They are not fundamentally different from the pollutants discussed above, but lack ambient air quality standards for a variety of reasons (e.g., insufficient data on toxicity, association with particular workplace exposures rather than general environmental exposure, etc.). The health effects of TACs can result from either acute or chronic exposure; many types of cancer are associated with chronic TAC exposures.

Regional Air Quality

The emissions inventory for the entire Bay Area and Contra Costa County is summarized in Table 3.3-1. In the Bay Area, motor vehicles generate the majority of ROG, NO_x, and CO; stationary sources generate the most SO_x; and area-wide sources generate the most airborne particulates.

Table 3.3-1
2006 Estimated Average Daily Emissions
in Contra Costa County and the San Francisco Bay Area

Emissions Source	Emissions in Tons per Day					
	ROG	NO_x[1]	CO	SO_x	PM_{10}	$PM_{2.5}$
San Francisco Bay Area Air Basin	369	492	1,929	55	213	82
Contra Costa County	65	86	297	30	33	14

Source: CARB, *Almanac Emission Projection Data*, *http://www.arb.ca.gov/app/emsinv/emssumcat.php*, accessed January 12, 2009.

Measurements of ambient concentrations of the criteria pollutants are used by the U.S. Environmental Protection Agency (EPA) and California Air Resources Board (CARB) to assess and classify the air quality of each regional air basin, county, or, in some cases, a specific urbanized area. The classification is determined by comparing actual monitoring data with national and State standards. If a pollutant concentration in an area is lower than the standard, the area is classified as being in "attainment" for that pollutant. If the pollutant concentration exceeds the standard, the area is classified as a "nonattainment" area. If there are not enough data available to determine whether the standard is exceeded in an area, the area is designated "unclassified."

EPA and CARB use different standards for determining whether the Bay Area is an attainment area; however those standards are currently under review and subject to change. Under national standards, the Bay Area was designated as marginal nonattainment area for ozone in 2004. However, EPA recently lowered the national ozone standard and will issue final designations based upon the new standard by March 2010.

[1] NO_x is the generic term for a group of highly reactive gases, all of which contain nitrogen and oxygen in varying amounts. Nitric oxide (NO) and nitrogen dioxide (NO_2) are primary components of NO_x.

In 2006, the EPA lowered the national $PM_{2.5}$ standard, and on December 22, 2008, designated the Bay Area as nonattainment for $PM_{2.5}$. The EPA's designation of non-attainment for the Bay Area for $PM_{2.5}$ will be effective in April 2009, which is 90 days after publication of the EPA findings in the Federal Register.

The Bay Area is in attainment or designated as unclassified for all other pollutants under national standards. Under State standards, the Bay Area is designated as a nonattainment area for ozone, PM_{10}, and $PM_{2.5}$, and an attainment area for all other pollutants.

Local Air Quality

BAAQMD monitors ambient air pollutant concentrations through a series of monitoring stations throughout the Bay Area. The air quality in the Bay Area, including in the City of Pittsburg, has generally improved over the past 20 years, as motor vehicles have become cleaner, agricultural and residential burning has been curtailed, and consumer products containing ROG have been reformulated or replaced.

Table 3.3-2 identifies the federal and State ambient air quality standards for the relevant air pollutants, along with the ambient pollutant concentrations that were measured at the Pittsburg and Concord monitoring stations between 2005 and 2007. Data for 2008 are currently not available as monitoring stations are still in the process of compiling data. At the stations, pollutant level data is collected continuously and then averaged to the appropriate exposure time intervals specified in each pollutant's federal and state standards. For example, the carbon monoxide standard relates to an acceptable average ambient level over an 8-hour exposure time; the Table 3.3-2 values for carbon monoxide show the peak daily eight-hour running average at each station for each year.

During 2005 through 2007, the State 1-hour ozone standard was exceeded four times, the federal 8-hour ozone standard was exceeded once, and the State 8-hour ozone standard was exceeded 14 times. During the period of 2005 through 2007, there were no violations of the federal 24-hour standard for PM_{10} and seven violations of the State annual standard. Carbon monoxide, a product of incomplete combustion, was formerly a problem for the Bay Area; however, with improved motor vehicles and fuels, air quality in Pittsburg easily meets State and federal CO standards.

Existing Land Uses

Land uses such as schools, hospitals, and convalescent homes indicate the presence of sensitive receptors to poor air quality because the very young, the old, and the infirm are more susceptible to respiratory infections and other air quality-related health problems than the general public. Residential uses are also considered sensitive uses and to indicate sensitive receptors because people in residential areas are exposed to pollutants for extended periods of time. Recreational areas are considered moderately sensitive to poor air quality because vigorous exercise associated with recreation places a high demand on the human respiratory function. Residential uses within the project area are located primarily within in single family neighborhoods that were constructed between the 1930s and 1960s. The closest existing residential uses north of State Route 4 are along Power Avenue and along California Avenue and south of State Route 4 along Frontage Road.

Table 3.3-2
Summary of Ambient Air Quality in the Project Vicinity

Air Pollutants[a]	Year 2005	2006	2007
Ozone			
Maximum 1-hour concentration measured	0.094 ppm[b]	0.105 ppm	0.100 ppm
Days exceeding State 0.09 ppm 1-hour standard	0	3	1
Maximum 8-hour concentration measured	0.078 ppm	0.093 ppm	0.074 ppm
Days exceeding national 0.075 ppm 8-hour standard[c]	0	1	0
Days exceeding State 0.070 ppm 8-hour standard[c]	2	10	2
Respirable Particulate Matter (PM_{10})			
Maximum 24-hour concentration measured	57 $\mu g/m^3$ [d]	59 $\mu g/m^3$	59 $\mu g/m^3$
Days exceeding national 150 $\mu g/m^3$ 24-hour standard	0	0	0
Days exceeding State 50 $\mu g/m^3$ 24-hour standard	1	2	4
Fine Particulate Matter ($PM_{2.5}$)			
Maximum 24-hour concentration measured	48.9 $\mu g/m^3$	62.1 $\mu g/m^3$	46.2 $\mu g/m^3$
No. of days exceeding national 35 $\mu g/m^3$ 24-hour standard[e]	0	5	7
Annual Arithmetic Mean (AAM)	9.0 $\mu g/m^3$	9.3 $\mu g/m^3$	8.4 $\mu g/m^3$
Does measured AAM exceed national 15.0 $\mu g/m^3$ AAM standard?	No	No	No
Does measured AAM exceed State 12.0 $\mu g/m^3$ AAM standard?	No	No	No
Carbon Monoxide (CO)			
Maximum 8-hour concentration measured	1.7 ppm	1.9 ppm	1.5 ppm
Number of days exceeding national & State 9.0 ppm 8-hour standard	0	0	0
Nitrogen Dioxide (NO_2)			
Maximum 1-hour concentration measured	0.058 ppm	0.052 ppm	0.051 ppm
Days exceeding State 0.25 ppm 1-hour standard	0	0	0

Source: Bay Area Air Quality Management District, *Bay Area Air Pollution Summary*, 2005, 2006, and 2007.

Notes:

a. Data for $PM_{2.5}$ was obtained from the Concord monitoring station, while data for all other criteria pollutants were taken from the Pittsburg monitoring station.

b. ppm = parts by volume per million of air.

c. The California 8-hour ozone standard was implemented on May 17, 2005. EPA lowered the national 8-hour ozone standard from 0.80 to 0.75 ppm effective May 27, 2008. EPA will issue final designations based upon the new 0.75 ppm ozone standard by March 2010.

d. $\mu g/m^3$ = micrograms per cubic meter.

e. On December 17, 2006, the U.S. EPA implemented a more stringent national 24-hour $PM_{2.5}$ standard—revising it from 65 $\mu g/m^3$ to 35 $\mu g/m^3$.

Applicable Plans, Policies and Regulations

Air quality within the Bay Area is addressed through the efforts of various federal, State, regional, and local government agencies. These agencies work jointly, as well as individually, to improve air quality through legislation, regulations, planning, policy-making, education, and a variety of programs. The agencies responsible for improving the air quality within the Bay Area are discussed below.

Federal

The U.S. Environmental Protection Agency (EPA) is responsible for setting and enforcing the National Ambient Air Quality Standards for atmospheric pollutants. It regulates emission sources that are under the exclusive authority of the federal government, such as aircraft, ships, and certain locomotives.

As part of its enforcement responsibilities, the EPA requires each State with federal nonattainment areas to prepare and submit a State Implementation Plan (SIP) that demonstrates the means to attain the national standards. The SIP must integrate federal, State, and local plan components and regulations to identify specific measures to reduce pollution, using a combination of performance standards and market-based programs within the timeframe identified in the SIP.

State

The California Air Resources Board (CARB), a part of the California EPA, is responsible for the coordination and administration of both federal and State air pollution control programs within California. In this capacity, CARB conducts research, sets California Ambient Air Quality Standards, compiles emission inventories, develops suggested control measures, provides oversight of local programs, and prepares the SIP. CARB establishes emissions standards for motor vehicles sold in California, consumer products (e.g., hairspray, aerosol paints, and barbecue lighter fluid), and various types of commercial equipment. It also sets fuel specifications to further reduce vehicular emissions.

The California Energy Commission (CEC) established in 1978 the Energy Efficient Standards for Residential and Nonresidential Buildings, or Title 24, in response to a legislative mandate to reduce California's energy consumption. The State's Title 24 energy-efficiency standards require the design of new buildings to be energy conserving. The standards are updated periodically to allow consideration and possible incorporation of new energy-efficiency technologies and methods.

Regional

BAAQMD is the primary agency responsible for comprehensive air pollution control in the San Francisco Bay Area Air Basin, including Contra Costa County. To that end, BAAQMD, a regional agency, works directly with the Association of Bay Area Governments (ABAG), the Metropolitan Transportation Commission (MTC), and local governments and cooperates actively with all federal and State government agencies. BAAQMD develops rules and regulations, establishes permitting requirements for stationary sources, inspects emissions sources, and enforces such measures through educational programs or fines, when necessary.

BAAQMD is directly responsible for reducing emissions from stationary (area and point) sources and for assuring that State controls on mobile sources are effectively implemented. It has responded to this requirement by preparing a sequence of Ozone Attainment Plans and Clean Air Plans that comply with the federal Clean Air Act and the California Clean Air Act to accommodate growth, reduce the pollutant levels in the Bay Area, meet federal and State ambient air quality standards, and minimize the fiscal impact that pollution control measures have on the local economy. The Ozone Attainment Plans are prepared for the federal ozone standard, and the Clean Air Plans are prepared for the State ozone standards. The most recent Ozone Attainment Plan was adopted by the BAAQMD Board of Directors on October 2001 and demonstrates attainment of the federal ozone standard in the Bay Area by 2006. The current regional Clean Air Plan was adopted by the Board of Directors on December 20, 2000. It identifies the control measures that would be implemented through 2006 to reduce major sources of pollutants. These planning efforts have substantially decreased the population's exposure to unhealthful levels of pollutants, despite substantial population growth within the Bay Area. The Clean Air Plan predicts that regional ozone concentrations will decrease by 1.2 percent per year or 9.0 percent over the twelve years after it was adopted. In January 2006, BAAQMD adopted the 2005 Ozone Strategy to identify further steps needed to continue reducing the public's exposure to unhealthy levels of ozone.

In 2003, the California Legislature enacted Senate Bill 656 (SB 656) to reduce public exposure to PM_{10} and $PM_{2.5}$. SB 656 required CARB, in consultation with local air districts, to develop and adopt, by January 1, 2005, a list of the most readily available, feasible, and cost-effective control measures that could be used by CARB and the air districts to reduce PM_{10} and $PM_{2.5}$. In November 2005, BAAQMD adopted a Particulate Matter Implementation Strategy focusing on those measures most applicable and cost effective for the Bay Area.

Although BAAQMD is responsible for regional air quality planning efforts, it does not have the authority to directly regulate the air quality issues associated with plans and new development projects within the Bay Area. Instead, BAAQMD has used its expertise and prepared the *BAAQMD CEQA Guidelines* to indirectly address these issues in accordance with the projections and programs of the Ozone Attainment Plan and Clean Air Plan. The purpose of the *BAAQMD CEQA Guidelines* is to assist lead agencies, as well as consultants, project proponents, and other interested parties, in evaluating potential air quality impacts of projects and plans proposed in the Bay Area. Specifically, the *BAAQMD CEQA Guidelines* explain the procedures that BAAQMD recommends be followed during environmental review processes required by CEQA. The *BAAQMD CEQA Guidelines* provide direction on how to evaluate potential air quality impacts, how to determine whether these impacts are significant, and how to mitigate these impacts. BAAQMD intends that by providing this guidance, the air quality impacts of plans and development proposals will be analyzed accurately and consistently throughout the Bay Area, and adverse impacts will be minimized.

Local

Local jurisdictions, such as the City of Pittsburg, have the authority and responsibility to reduce air pollution through their police power and decision-making authority. Specifically, the City is responsible for assessing the potential for and mitigating air quality problems that result from its land use decisions.

Impact Assessment and Mitigation Measures

According to Appendix G of the CEQA Guidelines, a project would have a significant adverse air quality impact if the project would:

- Conflict with or obstruct implementation of an applicable air quality plan;
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation;
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or State ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors); or
- Expose sensitive receptors to substantial pollutant concentrations.

Standards of Significance

The thresholds discussed below are currently recommended by BAAQMD in the *BAAQMD CEQA Guidelines* to determine the significance of air quality impacts and are the thresholds used for this EIR.

Construction Emissions. Construction–related activities are generally short-term, and the BAAQMD does not recommend any thresholds of significance for their associated emissions. Instead, the BAAQMD bases the determination of significance on a consideration of the control measures to be implemented. If all appropriate emissions control measures recommended by the *BAAQMD CEQA Guidelines* are implemented for a project, then construction emissions are not considered significant. Currently these control measures only apply to emissions of fugitive dust. Emission controls are not required for the emissions generated by construction vehicle engines.

One of the reasons that construction-level air quality emissions are not compared with a quantified threshold is that the construction industry is an existing source of emissions within the Bay Area, and the entire state. In general, construction equipment operates at a site for a short time, and when finished, moves on to a new construction site. The same situation occurs for the construction employees who make a living going from one site to another doing similar construction work. For those reasons, construction exhaust emissions are included in the regional emission inventory that is the basis for regional air quality plans. Furthermore, construction equipment comprises a good portion of

the past, existing, and future (through 2006) emission inventory within the Bay Area.[2] Also, the *Bay Area 2000 Clean Air Plan*[3] states that PM_{10} emissions from "other sources" include construction operations for the past, present, and future (2006) emissions inventory.

Operational Emissions of ROG, NOx, and PM_{10}, $PM_{2.5}$ and CO. BAAQMD currently recommends that projects with operational emissions that exceed any of the following thresholds be considered significant. These thresholds apply to the operational emissions associated with individual projects only; they do not apply to construction-related emissions. The operational emissions that are generated by individual projects and exceed these thresholds are also considered to be cumulatively considerable by BAAQMD.

- 80.0 pounds per day (ppd) of ROG
- 80.0 ppd of NOx
- 80.0 ppd of PM_{10}

Operational emissions of CO are considered significant if they cause or contribute to violations of the federal or State ambient air quality standards for CO (i.e., 35 ppm and 20 ppm, respectively, for one-hour averages; 9 ppm for eight-hour averages).

There are currently no thresholds for $PM_{2.5}$ recommended by the BAAQMD.

Operational Emissions – Toxic Air Contaminants (Diesel Particulate Matter). CARB's *Air Quality and Land Use Handbook: A Community Health Perspective* identifies high traffic freeways and roads as a source of TACs that could present a potentially significant health risk and recommend that local land use agencies provided for specific "buffer zones" between these sources and nearby sensitive receptors. CARB studies show that air pollution levels can be significantly higher within 500 feet of high traffic freeways or roads (greater than 100,000 vehicles per day for an urban roadway or 50,000 vehicles per day for a rural roadway) and then diminish rapidly outside of that 500 foot buffer. Specifically, CARB has determined that at 500 feet from a freeway, particulate pollution drops by 70 percent, and cancer risk drops proportionately. Despite this general finding, actual concentration of diesel particulate matter will vary at a particular location depending on traffic volume, vehicle mix, prevailing winds and other variables. Therefore, CARB recommends a 500-foot screening distance for new sensitive land uses proposed near a high traffic freeway or road to determine if a detailed analysis is required. The basis for CARB's advisory recommendation of 500 feet is traffic-related studies of the additional cancer and non-cancer health risks attributable to proximity to roadways. For the purposes of this EIR, there would be a potentially significant impact if sensitive receptors were located within 500 feet of the travel lanes of State Route 4.

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[2] The *Revised San Francisco Bay Area Ozone Attainment Plan for the 1-Hour National Ozone Standard* (2001), Table 4, p. 12.

[3] *Bay Area 2000 Clean Air Plan,* Table 1, p. 3.

Environmental Analysis

For each potential impact associated with the proposed project, a level of significance is determined and is reported in the impact statement. Conclusions of significance are defined as follows: significant impact (S), potentially significant impact (PS), less than significant (LTS), or no impact (NI). For each impact identified as being significant (S) or potentially significant (PS), the EIR provides mitigation measures to reduce, eliminate, or avoid the adverse effect. If the mitigation measures would reduce the impact to less-than-significant (LTS) level successfully, this is stated in the EIR. If the mitigation measures would not diminish significant or potentially significant impacts to a less-than-significant level, the impacts are classified as "significant unavoidable impacts (SU)." For this section, AQ refers to air quality.

AQ-1 Construction activities under the proposed project could cause emissions of dust or contaminants from equipment exhaust that could contribute to existing air quality violations or expose sensitive receptors to pollutant concentrations. This would be a temporary but potentially significant impact. (PS)

Demolition and construction activities under the Railroad Avenue Specific Plan would require the use of heavy trucks, excavating and grading equipment, concrete breakers, concrete mixers, and other mobile and stationary construction equipment. Emissions during demolition and construction would be caused by material handling, traffic on unpaved or unimproved surfaces, demolition of structures, use of paving materials and architectural coatings, exhaust from construction worker vehicle trips, and exhaust from diesel-powered construction equipment.

Heavy construction activity on dry soil exposed during construction phases could cause emissions of dust (usually monitored as PM_{10}), which could be annoying and/or unhealthy to persons near the construction area. ROG, NO_x, CO, and particulate matter emissions also would result from the combustion of diesel fuel by heavy equipment and construction worker vehicles. Throughout the construction phases, construction and demolition-related emissions would vary day-to-day depending on the phase of the proposed project. When considered in the context of long-term proposed project operations, demolition and construction-related emissions would be short-term and temporary, but these activities could still cause significant effects on local air quality.

BAAQMD has included the emissions of ozone precursors and CO from all Bay Area construction sources in its emission inventory. Including emissions in the inventory means that these emissions are accounted for in the applicable BAAQMD attainment and maintenance plans, and that BAAQMD does not consider such emissions from any individual construction source or from the totality of all Bay Area construction sources as impeding the attainment or maintenance of air quality standards. Consequently, construction emissions of CO and ozone precursors from any individual construction source or from the totality of all Bay Area construction sources are not considered to be significant.

BAAQMD does not recommend that PM_{10} emissions from construction activity be quantified and compared with a significance threshold as an indicator of the severity of local impacts. Instead, BAAQMD recommends implementation of measures for reducing PM_{10} from construction activities. These measures are listed in Table 3.3-2 of the BAAQMD Guidelines.[4] According to the Guidelines, implementing these measures would ensure that construction activities associated with a proposed project would not have a significant PM_{10} impact.

The only other criteria pollutant anticipated due to project activities, SO_2, is emitted in very small quantities by construction equipment. The Bay Area's ambient SO_2 levels fall far short of established air quality standards; thus, the proposed project would not have a significant SO_2 impact.[5]

Demolition activities that could have the potential to disturb asbestos-containing materials would be required to comply with BAAQMD Regulation 11, Rule 2, which sets work practices, emission control procedures/standards, and disposal requirements for the control of the asbestos. Compliance with Regulation 11, Rule 2 would ensure that any project asbestos-related impact associated with the demolition are less-than-significant. These regulatory programs minimize the potential effects related to asbestos handling as well as emissions from equipment exhaust to a level of less than significant.

MITIGATION MEASURES. BAAQMD has identified a set of feasible PM_{10} control measures for all construction activities in the air basin to minimize dust emissions. Implementation of the BAAQMD-recommended measures for the proposed project (outlined in Mitigation Measures AQ-1.1 and AQ-1.2 below) would reduce the impacts from construction dust and equipment exhaust to a less-than-significant level. (LTS)

AQ-1.1 *Implement Dust Control Measures*. To reduce particulate matter emissions during construction, the City shall ensure that all development proposed under the Railroad Avenue Specific Plan complies with the dust control strategies developed by BAAQMD. These dust control strategies shall include:

a. Cover all trucks hauling construction and demolition debris from the site;

b. Water all exposed or disturbed soil surfaces at least twice daily;

c. Use watering to control dust generation during demolition of structures or break-up of pavement;

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[4] Bay Area Air Quality Management District (BAAQMD), BAAQMD CEQA Guidelines, Assessing the Air Quality Impacts of Projects and Plans, April 1996, revised December 1999, page 15.

[5] They Bay Area has not experienced ambient SO_2 levels exceeding established air quality standards in many years, and ambient SO_2 levels are not generally considered a current hazard in the Bay Area. According to BAAQMD data, ambient SO_2 levels have not exceeded any maximum daily threshold within the Bay Area or in Pittsburg itself since at least 1999. For information on current and historical SO_2 levels in the City of Pittsburg, access the BAAQMD website at http://gate1.baaqmd.gov/aqmet/aq.aspx. Select "Sulfur Dioxide" in the Measurement drop-down box. (Website consulted for this study on February 18, 2009.)

d. Pave, apply water three times daily, or apply (non-toxic) soil stabilizers on all unpaved parking areas and staging areas;

e. Sweep daily (with water sweepers) all paved parking areas and staging areas during the earthwork phases of construction;

f. Provide daily clean-up of mud and dirt carried onto paved streets from the site;

g. Enclose, cover, water twice daily, or apply non-toxic soil binders to exposed stockpiles (dirt, sand, etc.);

h. Limit traffic speeds on unpaved roads to 15 mph;

i. Install sandbags or other erosion control measures to prevent silt runoff to public roadways; and

j. Replant vegetation in disturbed areas as quickly as possible.

AQ-1.2 *Reduce Emissions from Heavy-duty Diesel-powered Equipment*. The City shall ensure that all development proposed under the Railroad Avenue Specific Plan implements measures to reduce the emissions of pollutants generated by heavy-duty diesel-powered equipment during demolition and construction.

a. Keep all construction equipment in proper tune in accordance with manufacturer's specifications;

b. Use late model heavy-duty diesel-powered equipment at the Project Site to the extent that it is readily available in the San Francisco Bay Area;

c. Use diesel-powered equipment that has been retrofitted with after-treatment products (e.g., engine catalysts) to the extent that it is readily available in the San Francisco Bay Area;

d. Use low-emission diesel fuel for all heavy-duty diesel-powered equipment operating and refueling at the Project Site to the extent that it is readily available and cost effective in the San Francisco Bay Area (this does not apply to diesel-powered trucks traveling to and from the site);

e. Utilize alternative fuel construction equipment (i.e., compressed natural gas, liquid petroleum gas, and unleaded gasoline) to the extent that the equipment is readily available and cost effective in the San Francisco Bay Area;

f. Limit truck and equipment idling time to five minutes or less;

g. Rely on the electricity infrastructure surrounding the construction sites rather than electrical generators powered by internal combustion engines to the extent feasible.

AQ-2 The proposed project would create new area and mobile sources of air pollutants that would generate emissions of ROG, NO_x, and PM_{10}. (S)

Emissions of PM_{10} from mobile sources would exceed the significance thresholds established by BAAQMD, as would ROG when mobile and stationary sources are taken together. Thus, the Railroad Avenue Specific Plan would contribute to further nonattainment of ozone and PM_{10} standards. The emission contributions from mobile and stationary sources are described in greater detail below.

Mobile Source Emissions. New residential and commercial uses developed under the Railroad Avenue Specific Plan would result in an increase in traffic from current conditions. According to the traffic report prepared for this analysis, the proposed project would generate an increase of about 9,470 net new daily trips over existing conditions. The CARB-approved URBEMIS 2007 model was used to calculate the emissions associated with the net increase in trips from buildout of the Railroad Avenue Specific Plan in Year 2030. Modeling results are providing in Table 3.3-3. Based on modeling results, the new trips would exceed BAAQMD thresholds for PM_{10}. As shown in the table, the majority of the emissions for this pollutant would be generated by vehicular activity.

While the total trips would increase due to the project, the overall project goals of high density, mixed use, infill development in combination with reduced parking standards, implementation of Transportation Demand Management Strategies, and construction of streetscape and facilities improvements to support pedestrian and bicycle activity as detailed in Section 2.2, Proposed Project could result in a decrease in vehicle miles travelled (VMT) both within and from the project area.

In addition to all of the overarching goals to create a multi-modal environment, Specific Plan policies that would likely result in a reduction in VMT include the following:

- **Specific Plan Policy 6-P-6** Create dedicated mid-block greenway connections throughout the Transit Village and into the Civic Center sub-areas.

- **Specific Plan Policy 6-P-8** Include accessible design improvements, such as appropriately placed curb cuts, audible pedestrian-crossing signals, minimum pathway grades, generous walkway width and areas for rest.

- **Specific Plan Policy 6-P-9** Incorporate traffic calming techniques such as wide sidewalks, narrow streets, bulb outs, on-street parking, and other strategies throughout the Transit Village, Civic Center and High School Village sub-areas.

- **Specific Plan Policy 6-P-17** When traffic and parking demand volumes increase as the Specific Plan Area develops, implement Transportation Demand Management (TDM) strategies including unbundling parking from residential development, lowering minimum

parking requirements, and instituting parking pricing strategies to discourage single occupancy vehicle travel to and from the Specific Plan Area.

- **Specific Plan Policy 6-P-18** Create an "easy-to-use" public transit system that is well-delineated with identifying and orienting signage, high quality shelters, benches, lighting and real-time LED signs showing bus arrival times.

- **Specific Plan Policy 6-P-19** Include efficient links between Tri-Delta buses, shuttles, public parking areas and the potential eBART Station. Work with transit providers to ensure matching service spans between buses, shuttles and BART trains.

- **Specific Plan Policy 6-P-24** Achieve a minimum of 10 to 15 minute headways between BART and bus connections during peak hours.

- **Specific Plan Policy 6-P-21** Use shuttles to strengthen transit connections between the Specific Plan Area, the Pittsburg/Bay Point BART station and Old Town Pittsburg.

Area and Stationary Source Emissions. New residential and commercial uses developed under the Railroad Avenue Specific Plan would also result in emissions from the use of electricity and natural gas for site heating, cooling, ventilation, and lighting. Emissions would be produced either directly at the site or indirectly through increased use of utility services. One of the overriding planning principles of the Specific Plan is to promote development practices that are ecologically sound. To this end, the Specific Plan contains goals and policies related to sustainable development within the Specific Plan Area including the following:

- **Specific Plan Goal 4-G-3** Promote high quality development that is socially and environmentally sustainable.

- **Specific Plan Policy 4-P-4** Develop incentives to support environmentally sustainable practices in site and building design such as improved insulation, operable windows, energy efficient lighting and appliances, socal access, natural ventilation, and permeable paving materials.

- **Specific Plan Goal 7-G-2** Encourage new development within the Specific Plan to incorporate energy efficient and sustainable building practices.

- **Specific Plan Policy 7-P-2** Promote building design that improves energy efficiency by incorporating natural cooling and passive solar heating where possible. This may include extended eaves, window overhangs, awnings and tree placement for natural cooling and building and window orientation to take advantage of passive solar heating.

- **Specific Plan Policy 7-P-3** Where possible, integrate solar generating structures with varied functions into the urban fabric including, but not limited to, bus shelters, parking lots, street lights and other public infrastructure.

- **Specific Plan Policy 7-P-7** New projects shall incorporate water conservation measures including but not limited to low flow showers and toilets, low flow and gray water irrigation systems and the use of drought tolerant landscaping.

Taking into account the assumed development program in the Specific Plan area, the area and stationary sources would not exceed BAAQMD thresholds.

Despite the goals and policies of the Specific Plan to reduce VMT through smart growth and to encourage sustainable growth and development within the Specific Plan project area, the combined mobile and stationary source emissions would exceed BAAQMD thresholds for both PM_{10} and ROG. There is no feasible mitigation at the program level that could reduce the significance of this impact. Therefore, impacts would be significant and unavoidable.

Table 3.3-3
Projected Daily Operational Stationary and Mobile Source Emissions

	Emissions in Pounds Per Day					
Emission Source[a, b]	**ROG**	**NO_X**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
Stationary/Area	74.83	10.24	7.52	0.00	0.03	0.03
Mobile	33.59	26.01	332.91	0.81	144.57	27.49
Total Emissions	108.42	36.25	340.43	0.81	144.60	27.52
BAAQMD Thresholds	80	80	NT	NT	80	NT
Significant Impact?	***Yes***	***No***	***NT[c]***	***NT***	***Yes***	***NT***

Source: PBS&J, 2008. Based on year 2030 emission factors.

Notes:

a. NT = No threshold.
b. Estimates are results of modeling using the CARB URBEMIS 2007 version 9.2.4.
c. While there are significance criteria for CO concentrations (as noted on page 3.3-9 of this document), there are no regional emissions thresholds for CO.

AQ-3 Traffic generated by the proposed project would add to traffic volumes at intersections in the project vicinity. This traffic would increase concentrations of carbon monoxide, but not to the extent that ambient air quality standards would be exceeded. As such, project impacts on localized carbon monoxide concentrations would be less than significant. (LTS)

Because project-related traffic would affect intersections that would be operating at Level of Service (LOS) D or worse, under future conditions, project traffic has the potential to generate emissions of CO that could adversely affect localized air quality. The simplified CALINE4 model was used to predict future CO concentrations at selected locations. CO concentrations were modeled at three of the worst operating intersections in the project area to screen for potential hot spots, as shown in Table 3.3-4. All other roadway intersections, due to lesser congestion and traffic, are expected to generate lower CO concentrations and were therefore not modeled. As shown in the table, there are no violations of ambient CO standards at receptor locations 25 feet from an intersection. Reception locations further away would be exposed to even lower CO concentrations. Therefore, CO concentrations at intersections, including the project-related trips, would not exceed the national and State 1-hour and 8-hour

ambient air quality standards for CO, and impacts associated with localized CO would be considered less than significant for the proposed project.

Table 3.3-4
Carbon Monoxide Concentrations At Selected Locations

	One-Hour Average CO (ppm)[a]			Eight-Hour Average CO (ppm)[a]		
Intersection	**Existing**	**2030 No Project**	**2030 with Project**	**Existing**	**2030 No Project**	**2030 with Project**
Railroad Avenue/Leland Road	3.8	3.1	3.1	2.2	1.7	1.7
California Avenue/Harbor Street	3.6	3.0	3.0	2.0	1.7	1.7
Garcia Avenue/Harbor Street	3.5	3.0	3.0	2.0	1.6	1.6

Source: PBS&J, 2008.

Notes:

Ambient CO Standards: One-Hour Average – Federal: 35 ppm; State 20 ppm, Eight-Hour Average – Federal and State: 9 ppm

a. Calculations reflect CO levels at 25 feet from roadway.

AQ-4 The proposed project would place new residential uses within 500 feet of State Route 4, and would potentially expose new sensitive receptors to substantial concentrations of toxic air contaminants. (PS)

TACs are emitted from a variety of sources in the project vicinity. Of primary concern in the project area would be the potential for exposure of new residents to TACs from motor vehicle emissions along SR 4, which is projected to have an average daily traffic volume over 170,000 in 2025.[6] As discussed above, there has been recent guidance provided by CARB regarding potential impacts to new sensitive receptors from TACs (in particular, diesel particulate matter). CARB's recommended screening distance for new sensitive receptors is 500 feet from a high-traffic freeway, such as SR 4. The Railroad Avenue Specific Plan proposes to redevelop areas adjacent to SR 4 with residential uses due to the area's proximity to the planned eBART Station, and the minimum housing unit and ridership thresholds required by MTC and BART, respectively, that must be shown in the Ridership Development Plan to justify the installation of the station. Residential uses proposed for both north and south sides of SR 4 would potentially include residential uses within 500 feet of the closest lane of traffic. The 500-foot buffer proposed by CARB is meant to be a tool for planners to identify areas of potential impact based on worst-case conditions that are present within the State. The guidelines do not take into account conditions, such as topography, wind patterns, and other factors, that would affect dispersal patterns. Because the proposed project is a land use plan, the document contains general site planning and design policies and guidelines related to air quality. Architectural and Site Design Criterion No. 22 requires:

6 City of Pittsburg General Plan, Table 7-3.

All residential developments located within 500 feet of SR4 shall have central heating, ventilation, and air conditioning (HVAC) systems with high efficiency filters, and air intake systems for the HVAC systems shall be located as far away from the roadway as possible and shall include an ongoing HVAC maintenance plan.

A Specific Plan policy addresses this issue as well:

- **Specific Plan Policy 5-P-9** All residential development located within 500 feet of SR4 shall incorporate site and building specific measures such as triple paned windows and internal ventilation systems to reduce the exposure of residents to noise and air quality impacts from vehicles.

While this criterion and policy sets forth general requirements, it is anticipated that each development will be analyzed on an individual basis. Concurrent with the development application, additional analysis would be required for proposed residential to ensure TAC emissions would not adversely impact the proposed residential units. Because the proposed project would have the potential to result in residential uses within CARB's screening distance, this would be a potentially significant impact of the proposed project.

MITIGATION MEASURES. The following mitigation measure is proposed to ensure that exposure to TACs for residents adjacent to SR 4 would not be significant. (LTS)

AQ-4.1 *Implement site and architectural design measures to reduce air quality impacts to residential development located within 500 feet of State Route 4.* As part of the Design Review process for new development, ensure that residential development within 500 feet of State Route 4 contains air quality mitigation measures including, but not limited to, an increase in the distance between residents and the freeway; modification to the location and height of intakes to the ventilation system; addition of HEPA air filtration systems; location of recreational use areas, such as patio areas and balconies, on interior courtyards and shielded by the structure; triple paned windows; central heating, ventilation, and air conditioning (HVAC) systems with high efficiency filters, and the location of air intake systems for the HVAC systems as far away from the roadway as possible; and an ongoing HVAC maintenance plan. These measures shall be designed and implemented consistent with the Specific Plan's Architectural and Site Design Criterion No. 22.

Cumulative Analysis and Mitigation Measures

The geographic context for a discussion of cumulative impacts to regional air quality is the San Francisco Bay Area Air Basin. *BAAQMD CEQA Guidelines* cumulative significance criteria are applied to the cumulative analysis of impacts to regional air quality, as discussed below. The geographic context for localized air quality cumulative impacts, such as CO, is the City of Pittsburg.

AQ-5 Cumulative construction emissions could result in emissions of dust and particulates, which could exceed regional air quality standards. However, development projects proposed under the cumulative scenario would be required to implement measures to control construction emissions. (PS)

Construction of nearby related projects, such as construction of the proposed BART line extension or the Railroad Avenue BART station, could generate daily emissions that would result in potentially significant impacts on an individual project basis. While construction of all of these projects could result in a cumulative impact, implementation of mitigation measures Mitigation Measure AQ-1.1 and AQ-1.2 would reduce individual project contribution to those impacts to a less than significant level. However, projects in the cumulative study area would be required to apply feasible mitigation similar to the proposed project to reduce construction air quality impacts; therefore, the cumulative impact would be less than significant. The proposed project's contributions to this cumulative impact would be less than significant when considered cumulatively.

AQ-6 Since operational emissions from the proposed project would be individually significant, operational emissions would also be cumulatively considerable. (S)

Operational Source Emissions. Operation of foreseeable development projects could result in daily emissions that would exceed BAAQMD thresholds on an individual project basis. The combined effect of mobile and stationary source emissions from build-out of the Specific Plan Area could result in significant cumulative impacts to air quality despite a significant number of policies and requirements within the Specific Plan to reduce VMT and ensure sustainable and energy efficient development. The *BAAQMD CEQA Guidelines* recommend that lead agencies conclude that a significant cumulative air quality impact would result if the proposed project could individually have a significant operational air quality impact.[7] The analysis for Impact AQ-2 indicates that the proposed project would exceed the BAAQMD thresholds of significance for ROG and PM_{10}. Therefore, this EIR concludes that the proposed project's contribution to cumulative ROG and PM_{10} emissions would be considerable.

Traffic Emissions. Localized CO concentrations evaluated under Impact AQ-3 indicate that the proposed project in year 2030, including cumulative traffic conditions, would be much less than the ambient air quality standards. Because the localized CO concentrations around the analyzed intersections would not violate the CO ambient air quality standards in 2030, the proposed project would not result in violations of the CO standard under cumulative conditions. Cumulative impacts would be less than significant.

Toxic Air Contaminants. As indicated in Impact AQ-4, impacts to on-site sensitive receptors located adjacent to SR 4 would be potentially significant. Cumulative projects include the construction of a BART line extension and the Railroad Avenue eBART Station, which would

[7] BAAQMD, BAAQMD, CEQA Guidelines, Assessing the Air Quality Impacts of Projects and Plans, Chapter 2.3, p. 18, April 1996.

be constructed in the SR 4 right-of-way in the project area. The BART extension would include the use of diesel mobile units, which would increase the exposure of residential uses within the project area to diesel emissions. According to the Draft EIR for the East Contra Costa County BART Extension project, the increase in exposure of the closest residential uses would be below the BAAQMD threshold for cancer risk of 10 in one million. The emissions generated by cumulative projects in conjunction with traffic along SR 4 would potentially increase exposure to proposed residential uses within the project area. However, the Specific Plan requirements and policies related to development within 500 feet of SR4 in conjunction with implementation of Mitigation Measure AQ-4.1, impacts to the proposed project would be less than significant, and cumulative impacts would also be less than significant.

Typical mitigation measures for traffic-related air contaminants would call for a reduction in project-related vehicle trips, which would be implemented through adoption of a transportation system management (TSM) program for the proposed development. However, because the proposed project is already a transit-oriented development, with proposed developments within ½ mile of a future transit hub (the proposed Railroad Avenue eBART station), trip reductions for transit have already been accounted for; it would be ineffective and redundant to propose implementation of measures to support trip reductions already proposed as part of the project. Other typical TSM measures, such as inclusion of a shuttle bus for residents and employees, are often proposed as a means of limiting toxic air contaminant production around new development. In this case, such a program would not be necessary as the proposed project would introduce new residential and commercial units within ½ mile of the proposed Railroad Avenue BART station; shuttle bus service would, therefore, be unnecessary to carry new project-related passengers from the eBART station to these nearby new uses. Notwithstanding this fact, a shuttle is proposed as part of the project, to provide service between the new eBART station and downtown Pittsburg, beyond the proposed new development area. In addition, transit service improvements, under the new Specific Plan, would allow for bus departures every 10 – 15 minutes, and would support regional use of the eBART station while controlling the toxic air contaminant releases that could otherwise result from increased regional movement to and from the new eBART station.

MITIGATION MEASURES. The following mitigation measure is proposed to reduce potential regional air quality impacts of the proposed project. However this mitigation measure would not reduce air quality impacts to such a degree that these impacts would become less-than-significant. Therefore, pollutant emissions would remain significant and unavoidable. (S)

AQ-6.1 *Develop and implement a plan to reduce operational air emissions*. Prior to approval of building entitlements and permits, the project developers shall be required to demonstrate to the City that stationary source emissions reduction measures have been included to reduce operational emissions resulting from development in the project area to the maximum extent practicable. A plan for reducing stationary sources shall be approved by City staff. The plan shall include measures such as, but not limited to, incorporating energy-saving appliances for heating and air conditioning units and energy efficient lighting. These reduction

measures may be included as a part of developers' compliance with mitigation measure CC-1.1, Adoption of Additional Specific Plan Policies Pertaining to Greenhouse Gas Emissions. (S)

3.4 NOISE

Introduction

This section of the EIR evaluates the potential for noise and ground-borne vibration impacts resulting from implementation of the proposed project. This includes the potential for the project to cause a substantial temporary and/or permanent increase in ambient noise levels in the vicinity of the project site; exposure of residents or businesses to excessive noise levels or ground-borne vibration; and whether this exposure would be in excess of standards established in the City of Pittsburg General Plan and Noise Ordinance, or any other applicable standards. Standards of impact significance are established on which to base the assessment of noise/vibration impacts. Mitigation measures intended to reduce identified noise impacts are provided.

No comments related to noise were received in response to the NOP.

As discussed in the Initial Study (Appendix A), the project would not result in noise impacts from proximity to a public or private airport and therefore these impacts are not discussed in this EIR analysis.

Setting

Characteristics of Sound, Noise, and Vibration

Sound is created when vibrating objects produce pressure variations that move rapidly outward into the surrounding air. The main characteristics of these air pressure waves are amplitude, which is experienced as a sound's loudness, and frequency, which is experienced as a sound's pitch. The standard unit of sound amplitude is the decibel (dB); it is a measure of the physical magnitude of the pressure variations relative to the human threshold of perception. The human ear's sensitivity to sound amplitude is frequency-dependent; it is more sensitive to sound with a frequency at or near 1,000 cycles per second than to sound with much lower or higher frequencies.

Most "real world" sounds (e.g., a dog barking, a car passing, etc.) are complex mixtures of many different frequency components. When the average amplitude of such sound is measured with a sound level meter, it is common for the instrument to apply different adjustment factors to each of the measured sound's frequency components. These factors account for the differences in perceived loudness of each of the sound's frequency components relative to those that the human ear is most sensitive to (i.e., those at or near 1,000 cycles per second). This practice is called "A-weighting." The unit of A-weighted sound amplitude is also the decibel. In reporting measurements to which A-weighting has been applied, an "A" is appended to dB (i.e., dBA) to make this clear. Table 3.4-1 lists representative environmental sound levels.

Table 3.4-1
Representative Environmental Sound Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	—110—	Rock Band
Jet Fly-over at 100 feet		
	—100—	
Gas Lawnmower at 3 feet		
	—90—	
		Food Blender at 3 feet
Diesel Truck going 50 mph at 50 feet	—80—	Garbage Disposal at 3 feet
Noisy Urban Area during Daytime		
Gas Lawnmower at 100 feet	—70—	Vacuum Cleaner at 10 feet
Commercial Area		Normal Speech at 3 feet
Heavy Traffic at 300 feet	—60—	
		Large Business Office
Quiet Urban Area during Daytime	—50—	Dishwasher in Next Room
		Theater, Large Conference Room
Quiet Urban Area during Nighttime	—40—	(background)
Quiet Suburban Area during Nighttime		
	—30—	Library
		Bedroom at Night, Concert Hall
Quiet Rural Area during Nighttime		(background)
	—20—	
		Broadcast/Recording Studio
	—10—	
Lowest Threshold of Human Hearing	—0—	Lowest Threshold of Human Hearing

Source: California Department of Transportation, *Technical Noise Supplement*, October 1998.

Noise is the term generally given to the "unwanted" aspects of intrusive sound. Many factors influence how a sound is perceived and whether or not it is considered annoying to a listener. These include the physical characteristics of a sound (e.g., amplitude, frequency, duration, etc.), but also non-acoustic factors (e.g., the acuity of a listener's hearing ability, the activity of the listener during exposure, etc.) that can influence the judgment of listeners regarding the degree of "unwantedness" of a sound. Excessive noise can negatively affect the physiological or psychological well-being of individuals or communities.

All quantitative descriptors used to measure environmental noise exposure recognize the strong correlation between the high acoustical energy content of a sound (i.e., its loudness and duration) and the disruptive effect it is likely to have as noise. Because environmental noise fluctuates over time, most such descriptors average the sound level over the time of exposure, and some add "penalties" during the times of day when intrusive sounds would be more disruptive to listeners. The most commonly used descriptors are:

- **Equivalent Energy Noise Level** (L_{eq}) is the constant noise level that would deliver the same acoustic energy to the ear of a listener as the actual time-varying noise would deliver over the same exposure time. No "penalties" are added to any noise levels during the exposure time; L_{eq} would be the same regardless of the time of day during which the noise occurs.
- **Day-Night Average Noise Level** (L_{dn}) is a 24-hour average L_{eq} with a 10 dBA "penalty" added to noise levels during the hours of 10:00 pm to 7:00 am to account for increased sensitivity that people tend to have to nighttime noise. Because of this penalty, the L_{dn} would always be higher than its corresponding 24-hour L_{eq} (e.g., a constant 60 dBA noise over 24 hours would have a 60 dBA L_{eq}, but a 66.4 dBA L_{dn}).
- **Community Noise Equivalent Level** (CNEL) is an L_{dn} with an additional 5 dBA "penalty" for the evening hours between 7:00 pm and 10:00 pm.
- **Maximum Sound Level (L_{max})** is the highest sound level (dBA) occurring over a given time period.
- **Minimum Sound Level (L_{min})** is the lowest individual sound level (dBA) occurring over a given time period.

Community noise exposures are typically represented by 24-hour descriptors, such as a 24-hour L_{eq} or L_{dn}. One-hour and shorter-period descriptors are useful for characterizing noise caused by short-term activities, such as the operation of construction equipment.

Vibrating objects in contact with the ground radiate energy through that medium; if a vibrating object is massive enough and/or close enough to the observer, its vibrations are perceptible. The ground motion caused by vibration is measured in vibration decibels (VdB). The vibration threshold of perception for humans is approximately 65 VdB; at 75 VdB, vibrations become distinctly perceptible to many people; at 100 VdB, minor damage can occur in fragile buildings.

Existing Noise Environment

The Specific Plan Area is adjacent to State Route 4 (SR 4) and includes local roads with high traffic volumes. Traffic is the primary source of noise in the Specific Plan Area. Existing land uses in the Specific Plan Area include primarily residential and commercial.

Noise Measurements. Noise measurements were made on November 12, 2008, at locations within the Specific Plan Area that are proposed for future residential uses under the Specific Plan or that could be affected by traffic noise generated by the proposed project. Existing noise levels were monitored at selected locations in the Specific Plan Area (see Figure 3.4-1 for noise monitoring locations) using a Larson-Davis Model 820 sound level meter, which satisfies the American National Standards Institute (ANSI) for general environmental noise measurement instrumentation. Residential activity, schools, hospitals, churches, and public libraries are classified as noise-sensitive land uses. Noise measurements were made at two locations north of SR 4 and two locations south of SR 4 near the proposed location for the Railroad Avenue eBART Station, one representing the future residential units

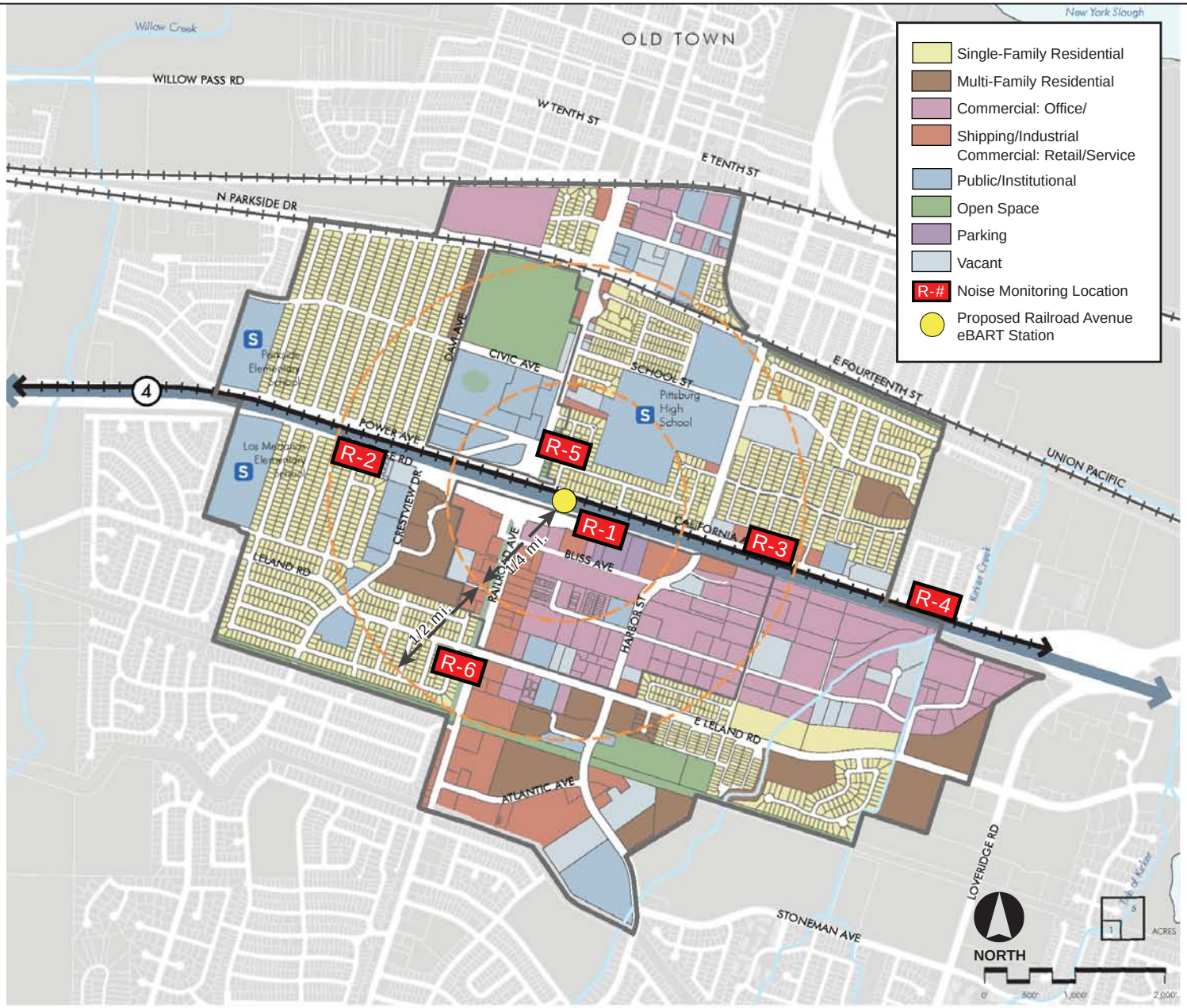

FIGURE 3.4-1
Noise Monitoring Locations

Source: City of Pittsburg, 2008.

where sound walls do not currently exist, and the other representing the location of existing residential uses adjacent to SR 4, which are located behind a sound wall. Two measurements were also taken along Railroad Avenue, one at a future residential location north of SR 4, and the other at existing residential uses south of SR 4 where traffic is projected to increase under future conditions. Results of the noise measurements are provided in Table 3.4-2. The majority of the noise in the project vicinity is attributed to traffic noise from trucks and automobiles along SR 4 and surrounding roadways.

Table 3.4-2
Ambient Noise Measurements, dBA

Noise Receptor[a]	Land Use Description	Noise Level[b]			Primary Noise Source
		L_{eq}	L_{min}	L_{max}	
R 1	Future residential use southeast of the proposed station (no sound wall)	70.1	64.6	76.3	Traffic along SR 4
R-2	Existing multi-family residential south west of the proposed station (behind sound wall)	64.5	58.8	72.3	Traffic along SR 4
R-3	Future residential use northeast of the proposed station (no sound wall)	68.7	61.0	79.3	Traffic along California Avenue and SR 4
R-4	Existing single-family residential northeast of the proposed station (behind sound wall for SR 4)	68.5	59.7	79.3	Traffic along California Avenue and SR 4
R-5	Future residential use along Railroad Avenue, north of SR 4	68.9	51.2	86.2	Traffic along Railroad Avenue
R-6	Existing single family residential along Railroad Avenue, south of SR 4	64.1	51.6	74.9	Traffic along Railroad Avenue

Source: PBS&J, 2008.

Notes:

a. Refer to Figure 3.4-1 for noise measurement locations.

b. All measurements taken on November 12, 2008 between 9:30 a.m. and 12:30 p.m.

Applicable Plans, Policies, and Regulations

Federal

The federal Noise Control Act (1972) addressed the issue of noise as a threat to human health and welfare, particularly in urban areas. In response to the Noise Control Act, the U.S. Environmental Protection Agency (EPA) published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* (EPA 1974). Table 3.4-3 summarizes EPA recommendations for residential and other noise-sensitive land uses (i.e., the yearly average L_{eq} not exceeding 70 dBA or less to prevent measurable hearing loss over a lifetime; L_{dn} not exceeding 55 dBA outdoors and 45 dBA indoors to prevent activity interference and annoyance). The EPA intent

Table 3.4-3
Summary of Noise Levels Identified as Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety[a]

Effect	Level	Area
Hearing	L_{eq} (24 hr.) < 70 dBA[a]	All areas
Outdoor activity interference and annoyance	L_{dn} < 55 dBA	Outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use.
Outdoor activity interference and annoyance	L_{eq} (24 hr) < 55 dBA	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, etc.
Indoor activity interference and annoyance	L_{dn} < 45 dBA	Indoor residential areas
Indoor activity interference and annoyance	L_{eq} (24 hr) < 45 dBA	Other indoor areas with human activities such as schools, etc.

Source: Environmental Protection Agency, *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety,* March 1974.

Note:

a. Noise exposure at the identified level would have to continue over a period of forty years before any hearing loss would result.

was that these findings not necessarily be considered as standards, criteria, or regulatory goals, but as advisory exposure levels below which there is no reason to suspect that the general population would be at risk from any of the identified health or welfare effects of noise.

The EPA report also identified 5 dBA as an adequate margin of safety before an increase in noise level would produce a significant increase in the severity of community reaction (i.e., increased complaint frequency, annoyance percentages, etc.) provided that the existing baseline noise exposure did not exceed 55 dBA L_{dn}.

The Federal Transit Administration (FTA) has developed extensive methodologies and significance criteria for the evaluation of noise impacts from surface transportation modes. Since the FTA has explained the rationale behind its methodologies and significance criteria, they have applicability to the general assessment of noise from transportation sources and not just to those over which the FTA has approval and review authority. The FTA incremental noise impact criteria are presented in Table 3.4-4. These criteria are based on the EPA findings and subsequent studies of annoyance in communities affected by transportation noise. The FTA extended the EPA incremental impact criterion to higher baseline L_{dn}. As baseline L_{dn} increases, it takes smaller and smaller noise increments to attain the same increase in community annoyance (e.g., 5 dBA at 50 dBA L_{dn}, but only 1 dBA at 70 dBA L_{dn}).

The FTA has also developed criteria for judging the significance of construction-related vibration, as shown in Table 3.4-5.

Table 3.4-4
Noise Impact Criteria for Noise-Sensitive Uses (dBA)

	Land Use Categories 1 & 2			Land Use Category 3		
Existing Noise Level	Project Impact Threshold	Combined Noise Level	Allowable Noise Increment	Project Impact Threshold	Combined Noise Level	Allowable Noise Increment
45	52	53	8	57	57	12
50	53	55	5	58	59	9
55	55	58	3	60	61	6
60	58	62	2	63	65	5
65	61	66	1	66	68	3
70	64	71	1	69	73	3
75	65	75	0	70	76	1
80	65	80	0	70	80	0

Source: Federal Transit Administration, Transit Noise Impact and Vibration Assessment, May 2006.

Notes:

Impact criteria are L_{dn} or L_{eq} (peak hour) depending on Land Use Category given below:

Land Use Category 1: Tracts of land where quiet is an essential element in their intended purposes. This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheaters and concert pavilions, as well as National Historic Landmarks with significant outdoor uses. Also included are recording studios and concert halls. The noise metric for Category 1 is the outdoor L_{eq} during the noisiest hour of activity.

Land Use Category 2: Residential units and buildings where people normally sleep. This category includes residential units, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance. The noise metric for Category 2 is the outdoor L_{dn}.

Land Use Category 3: Institutional land uses with primarily daytime and evening uses. This category includes schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds, and recreational facilities can be considered in this category. Certain historical sites and parks are also included. The noise metric for Category 3 is the outdoor L_{eq} during the noisiest hour of activity.

State

The State of California *General Plan Guidelines 2003* promotes the use of the L_{dn} or CNEL descriptors for evaluating land use - noise compatibility. Denotation of a land use as "normally acceptable" implies that the highest noise level in that band is the maximum desirable for existing or conventional construction that does not incorporate any special acoustic treatment. The Guidelines also provide an interpretation as to the suitability of various types of land uses with respect to the range of outdoor noise exposure. The objective of the Guidelines is to provide local community with a means of judging the noise environment it deems to be generally acceptable while recognizing the variability in perceptions of environmental noise that exist between communities and within a given community. The influence of the information presented in EPA levels is evident in the State Guidelines. Most importantly in its choice of noise exposure descriptors (i.e., L_{dn} or CNEL) and of upper limits for the "normally acceptable" exposure of noise-sensitive uses (i.e., 55 dBA L_{dn} for low-density residential, but no more than 5 dBA higher for the other noise-sensitive land use categories).

Table 3.4-5
Ground-Borne Vibration (GBV) Impact Criteria for General Assessment

Land Use Category	GVB Impact Levels (VdB re 1 micro-inch/second)		
	Frequent Events[a]	Occasional Events[b]	Infrequent Events[c]
Category 1: Buildings where vibration would interfere with interior operations	65[d]	65[d]	65[d]
Category 2: Residential units and buildings where people normally sleep	72	75	80
Category 3: Institutional land uses with primarily daytime uses	75	78	83

Source: *Federal Transit Administration, Transit Noise Impact and Vibration Assessment*, May 2006.

Notes:

a. "Frequent Events" is defined as more than 70 vibration events of the same source per day.

b. "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day.

c. "Infrequent Events" is defined as fewer than 30 vibration events of the same source per day.

d. This criterion limit is bases on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration-sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels.

Title 24 of the California Code of Regulations codifies requirements for uniform minimum noise insulation performance standards for new hotels, motels, dormitories, apartment houses, and dwellings other than detached single-family dwellings. Specifically, Title 24 states that interior noise levels attributable to exterior sources shall not exceed 45 dBA CNEL in any habitable room of new dwellings. Dwellings are to be designed so that interior noise levels would meet this standard for at least ten years from the time of building permit application. Interior noise levels can be reduced using noise insulating windows and by using sound isolation materials when constructing walls and ceilings.

Local

Local noise policies and regulations are contained in the City's General Plan and Municipal Code.

General Plan. The Pittsburg *General Plan* guides the physical development and character of the City. The *General Plan* sets forth City policies regarding the types and locations for future land uses and activities and is used by the City Council and Planning Commission in considering planning and land use decisions, including discretionary decisions on the proposed project. Applicable goals and policies from the *General Plan* Chapter 12, Noise, are listed below.

- **General Plan Goal 12-G-1:** Protect public health and welfare by eliminating or minimizing the effects of existing noise problems, and by preventing increased noise levels in the future.
- **General Plan Goal 12-G-2:** Encourage criteria such as building design and orientation, wider setbacks, and intense landscaping in lieu of sound walls to mitigate traffic noise along all major corridors, except along State Route 4.

- **General Plan Goal 12-G-3:** Continue efforts to incorporate noise considerations into land use planning decisions, and guide the location and design of transportation facilities to minimize the effects of noise on adjacent land uses.

- **General Plan Policy 12-P-1**: As part of development review, use General Plan Figure 12-3 to determine acceptable uses and installation requirements in noise-impacted areas.

  Figure 12-3 is based on land use and noise exposure compatibility levels in Appendix A of the *State of California General Plan Guidelines*. The table is consistent with the provision of State law that requires special noise insulation for new multi-family housing units within 60 dB Ldn noise exposure contours. The table's land use categories do not correspond to the land use classifications on the General Plan Land Use Diagram, but to actual uses in development projects.

- **General Plan Policy 12-P-4:** Require noise attenuation programs for new development exposed to noise above normally acceptable levels. Encourage noise attenuation programs that avoid visible sound walls.

- **General Plan Policy 12-P-5**: Require that applicants for new noise-sensitive development, such as schools, residences, and hospitals, in areas subject to noise generators producing noise levels greater than 65 dB CNEL, obtain the services of a professional acoustical engineer to provide a technical analysis and design of mitigation measures.

- **General Plan Policy 12-P-6**: Ensure that new noise-sensitive uses, including schools, hospitals, churches, and homes, in areas near roadways identified as impacting sensitive receptors by producing noise levels greater than 65 dB CNEL (*General Plan* Figure 12-1), incorporate mitigation measures to ensure that interior noise levels do not exceed 45 dB CNEL.

- **General Plan Policy 12-P-7:** Require the control of noise at the source through site design, building design, landscaping, hours of operation, and other techniques, for new development deemed to be noise generators.

- **General Plan Policy 12-P-8:** Develop noise attenuation programs for mitigation of noise adjacent to existing residential areas, including such measures as wider setbacks, intense landscaping, double-pane windows, and building orientation muffling the noise source.

- **General Plan Policy 12-P-9:** Limit generation of loud noises on construction sites adjacent to existing development to normal business hours between 8:00 a.m. and 5:00 p.m.

- **General Plan Policy 12-P-10:** Reduce the impact of truck traffic noise on residential areas by limiting such traffic to appropriate truck routes. Consider methods to restrict truck travel times in sensitive areas.

City of Pittsburg Municipal Code (PMC). The City's Municipal Code provides additional provisions for restrictions and regulations for noise within the City of Pittsburg. The following regulations are provided in the City's Municipal Code which addresses construction noise.

PMC Section 9.44.010, Prohibitions.

H. Exhausts. The discharge into the open air of the exhaust of any steam engine, motorboat, stationary internal combustion engine or motor vehicle, except through a muffler or other device which will effectively prevent loud or explosive noises therefrom.

J. Pile Drivers, Hammers and Similar Equipment. The operation between the hours of 10:00 p.m. and 7:00 a.m. of any pile driver, steam shovel, pneumatic hammer, derrick, steam or electric hoist or other appliance, the use of which is attended by loud or unusual noise, except in case of emergency.

PMC Section 18.82.040, Noise.

A. Each use and activity must comply with Chapter 9.44 PMC.

B. No construction event or activity occurring on any site adjoining a lot located in an R, residential PD or GQ district shall generate loud noises in excess of 65 decibels measured at the property line, except between the hours of 8:00 a.m. and 5:00 p.m.

PMC Section 15.88.060, Grading regulations.

5. All grading and noise therefrom, including, but not limited to, warming of equipment motors in residential zones, or within 1,000 feet of any residential occupancy, hotel, motel or hospital shall be limited between the hours of 7:00 a.m. and 5:30 p.m. weekdays, unless other hours are approved by the city engineer, upon receipt of evidence that an emergency exists which would constitute a hazard to persons or property.

Impact Assessment and Mitigation Measures

Methodology

The analysis of the existing and future noise environments is based on noise level monitoring, noise prediction computer modeling, and empirical observations of receptor noise exposure characteristics.

Construction noise and vibration levels were quantified using equipment noise reference levels and modeling techniques developed by the FTA.

Traffic noise modeling procedures involved the calculation of existing and future vehicular noise levels at selected noise-sensitive uses in the project vicinity in year 2030. Modeling sites were chosen for both on-site and off-site receptors. On-site receptors were based on the proposed location of residential units. Off-site sensitive receptors consist of residential land uses that would potentially be affected by traffic-related noise. The off-site sensitive receptors are primarily located along Railroad Avenue south of SR 4. This task was accomplished using the Federal Highway Administration (FHWA) Traffic Noise Model 2.5 (TNM). The model calculates the average noise level at specific locations based on traffic volumes, average speeds, roadway geometry, and site environmental conditions. The average vehicle noise rates (energy rates) utilized in TNM reflect the latest measurements of average vehicle noise rates for all vehicle classes. Traffic volumes utilized as data inputs in the noise prediction model were provided through the traffic analysis prepared for this EIR (See Appendix D).

Standards of Significance

According to Appendix G of the CEQA Guidelines, impacts on noise are considered significant if the proposed project would:

- Expose persons to or generation of noise levels in excess of standards established in the Pittsburg General Plan or Pittsburg Municipal Code Noise Ordinance.
- Expose persons to or generation of excessive groundborne vibration or groundborne noise levels as shown in Table 3.4-5.
- Lead to a substantial permanent increase in ambient noise levels in the project vicinity above levels without the project, as shown in Table 3.4-4.
- Lead to a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

Environmental Analysis

For each potential impact associated with the proposed project, a level of significance is determined and is reported in the impact statement. Conclusions of significance are defined as follows: significant impact (S), potentially significant impact (PS), less than significant (LTS), or no impact (NI). For each impact identified as being significant (S) or potentially significant (PS), the EIR provides mitigation measures to reduce, eliminate, or avoid the adverse effect. If the mitigation measures would reduce the impact to less-than-significant (LTS) level successfully, this is stated in the EIR. If the mitigation measures would not diminish significant or potentially significant impacts to a less-than-significant level, the impacts are classified as "significant unavoidable impacts (SU)." For this section, NO refers to noise.

NO-1 Development under the Railroad Avenue Specific Plan would expose existing sensitive receptors adjacent to the proposed uses to temporary increases in noise levels associated with construction. This would result in a potentially significant impact. (PS)

Future development pursuant to the Railroad Avenue Specific Plan would involve the use of construction equipment and small power tools, generators, and other equipment that are sources of noise. During each stage of construction there would be a different mix of equipment operating, and noise levels would vary based on the amount of equipment in operation and the location of the activity. As development occurs in the Railroad Avenue Specific Plan Area, noise-sensitive receptors could be located on parcels adjacent to proposed construction areas.

The EPA has compiled data regarding the noise generating characteristics of typical construction activities. These data are presented in Table 3.4-6 and Table 3.4-7. These noise levels would diminish rapidly with distance from the construction activity at a rate of approximately 6 dBA per doubling of distance. For example, a noise level of 86 dBA measured at 50 feet from the noise source would decrease to 80 dBA at 100 feet and to 74 dBA at 200 feet. As indicated in Table 3.4-7, outdoor noise levels from general construction equipment at 25 feet from the construction site would be at 92 dBA or below.[1]

Table 3.4-6
Noise Ranges of Typical Construction Equipment

Construction Equipment	Noise Levels in dBA L_{eq} at 50 feet[a]
Front Loader	73–86
Trucks	82–95
Cranes (moveable)	75–88
Vibrator	68–82
Saws	72–82
Pneumatic Impact Equipment	83–88
Jackhammers	81–98
Pumps	68–72
Generators	71–83
Compressors	75–87
Concrete Mixers	75–88
Concrete Pumps	81–85
Back Hoe	73–95
Pile Driving (peaks)	95–107
Tractor	77–98
Scraper/Grader	80–93
Paver	85–88

Source: US Environmental Protection Agency, Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances, December 1971.

Note:

a. Machinery equipped with noise control devices or other noise-reducing design features does not generate the same level of noise emissions as that shown in this table.

[1] Note that individual construction equipment noise ranges are provided in Table 3.4-6, on this page. However, the EPA compiled additional data on typical outdoor noise construction levels for average combined equipment, and these data appear in Table 3.4-7 on the next page; these do not exceed 92 dBA.

Table 3.4-7
Typical Outdoor Construction Noise Levels

Construction Phase	Noise Level at 25 Feet (dBA L_{eq})	Noise Level at 50 Feet (dBA L_{eq})	Noise Level at 100 Feet (dBA L_{eq})
Ground Clearing	88	82	76
Excavation/Grading	92	86	80
Foundations	83	77	71
Structural	89	83	77
External Finishing	92	86	80

Source: US Environmental Protection Agency, Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances, December 1971.

City of Pittsburg *General Plan* Policy 12-P-9 recommends limiting the generation of loud noises from construction sites to normal business hours between 8 a.m. and 5 p.m. In addition, Pittsburg Municipal Code (PMC) Section 18.82.040 specifies that no construction event or activity on any site adjoining a lot located in an R (residential), PD (Planned Development) or GQ (Governmental/Quasipublic) District shall generate loud noises in excess of 65 dB measured at the property line, except between the hours of 8:00 a.m. and 5:00 p.m. PMC Chapter 9.44 also prohibits the operation of impact equipment such as pile drivers, pneumatic hammers, and other similar equipment during nighttime hours between 10:00 p.m. and 7:00 a.m. Future development permitted by the proposed project would be required to adhere to the PMC's standards for impact equipment. However, the project could result in high noise levels at nearby sensitive uses, such as existing residences in the High School Village subarea or the schools found throughout the Specific Plan Area, during construction. This would be a potentially significant impact of the project.

MITIGATION MEASURES. The following mitigation measure would limit construction noise exposure times and reduce construction noise impacts to the maximum feasible extent. With implementation of these mitigation measures, temporary increases in ambient noise levels during construction would be restricted to daytime hours and would be required to implement noise reduction features where available. Thus, noise from the equipment, used in the manner prescribed above, would have the lowest feasible noise impact on nearby residential units and provision would be made for resolving any noise disturbances that might arise during project construction. As a result, construction noise impacts would he less than significant. (LTS)

NO-1.1 *Implement Construction Best Management Practices to Reduce Construction Noise*. The construction contractor(s) shall implement the following measures during the construction under the Railroad Avenue Specific Plan:

- Restrict construction activities to the hours of 8:00 a.m. to 5:00 p.m.
- Equipment and trucks used for project construction shall utilize the best available noise control techniques (e.g., improved mufflers, equipment

redesign, use of intake silencers, ducts, engine enclosures and acoustically attenuating shields or shrouds, wherever feasible).

- Impact tools (e.g., jack hammers, pavement breakers, and rock drills) used for project construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. However, where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used; this muffler can lower noise levels from the exhaust by up to 10 dBA. External jackets on the tools themselves shall be used where feasible, and this could achieve a reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment, whenever feasible.
- Construction contractor shall use "quiet" gasoline-powered compressors or other electric-powered compressors, and use electric rather than gasoline or diesel powered forklifts for small lifting.
- Stationary noise sources, such as temporary generators, shall be located as far from adjacent receptors as possible, and they shall be muffled and enclosed within temporary sheds, incorporate insulation barriers, or other measures to the extent feasible.
- Erect temporary plywood noise barriers around the construction site, to shield adjacent uses; and
- Prohibit trucks from idling along residential streets serving the construction site.

NO-2 Development under the Railroad Avenue Specific Plan would not generate excessive groundborne vibration. This would be considered less-than-significant impact. (LTS)

Construction activities that would occur during development of the Railroad Avenue Specific Plan have the potential to generate low levels of ground-borne vibration. Table 3.4-8 identifies various vibration velocity levels for the types of construction equipment that would operate during construction.

Table 3.4-8
Vibration Source Levels for Construction Equipment

	Approximate VdB				
	25 Feet	**50 Feet**	**60 Feet**	**75 Feet**	**100 Feet**
Large Bulldozer	87	81	79	77	75
Loaded Trucks	86	80	78	76	74
Jackhammer	79	73	71	69	67
Small Bulldozer	58	52	50	48	46

Source: Federal Railroad Administration, 1998.

Construction vibration could affect the nearby residential and other vibration sensitive-land uses. Based on the information presented in Table 3.4-8, vibration levels could reach 87 VdB in areas within 25 feet of proposed construction activity. This would exceed the 80 VdB threshold for residences and buildings where people normally sleep (see Table 3.4-5). However, the construction activities would be limited to daytime hours between 8:00 a.m. through 5:00 p.m. in accordance with the Pittsburg General Plan and Mitigation Measure NO-1.1. Thus, construction would not occur during recognized sleep hours. Impacts regarding the exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels would be less than significant due to the limited hours of operation.

NO-3 The Railroad Avenue Specific Plan proposes residential land uses in areas where ambient noise levels currently exceed acceptable levels for new residential uses. This is a potentially significant impact of the project. (PS)

The proposed Specific Plan designates multi-family residential areas adjacent to SR 4 (refer to Figure 3.4-1 for locations of on-site receptors). The Pittsburg General Plan specifies acceptable and unacceptable noise exposures for various land uses, including residential uses. As shown in Table 3.4-2, existing noise levels in the proposed residential areas adjacent to SR 4 would be approximately 70.1 dBA without sound walls and 64.5 dBA with sound walls for receptors south of SR 4 (receptors R-1 and R-2 as indicated in Figure 3.4-1), and approximately 68 to 69 dBA north of SR 4 with or without sound walls (receptors R-3 and R-4 as indicated in Figure 3.4-1). Existing noise levels along Railroad Avenue north of SR 4, where new residential areas are proposed, are approximately 69 dBA (receptor R-5 as indicated in Figure 3.4-1).

According to the City's noise compatibility guidelines, noise levels under 60 dBA are considered to be "normally acceptable" for new residential uses, and noise levels between 65-70 dBA are considered to be "conditionally acceptable" when noise reduction and insulation measures are incorporated into project design. The City's General Plan contains policies directed at development of residential uses within areas above normally acceptable levels. These include the following:

- General Plan Policy 12-P-4 which requires noise attenuation programs for new development exposed to noise above normally acceptable levels;
- General Plan Policy 12-P-5 which requires that applicants for new noise-sensitive development in areas subject to noise levels greater than 65 dB CNEL, obtain the services of a professional acoustical engineer to provide a technical analysis and design of mitigation measures; and
- General Plan Policy 12-P-6 which ensures that new noise-sensitive uses in areas near roadways that produce noise levels greater than 65 dB CNEL incorporate mitigation measures to ensure that interior noise levels do not exceed 45 dB CNEL.

The Specific Plan also contains policies related to noise mitigation through site and architectural development.

- **Specific Plan Policy 5-P-10** All residential development located within 500 feet of SR4 shall incorporate site and building specific measures such as triple paned windows and internal ventilation systems to reduce the exposure of residents to noise and air quality impacts from vehicles. In addition to General Plan and Specific Plan policies, Title 24 requires interior noise levels to be 45 dBA or below in new multi-family residential uses. The proposed project would be required to comply with the Title 24 requirement for all multi-family uses; the acoustical study discussed above would also require incorporation of interior residential noise attenuation features. It is anticipated that the measures proposed under such a study would be sufficient to reduce interior ambient noise levels in compliance with the interior noise standards.

Compliance with City requirements and Title 24 would reduce interior noise levels below the standards for multi-family uses; however, exterior noise levels could still exceed the City's standards. Therefore, this is a potentially significant impact of the project.

MITIGATION MEASURES. The following mitigation measure is proposed to ensure that all feasible measures to reduce exterior noise levels at new residential uses, such that they would not be significant. Based on existing noise levels, described above, for areas adjacent to SR 4, noise levels could be feasibly reduced to below 70 dBA with appropriate noise attenuating measures, as measured in the adjacent existing residential areas. Noise levels between 65 and 70 dBA would be within the City's normally acceptable noise levels for new residential uses. Therefore, with mitigation, this would be a less than significant impact. (LTS)

NO-3.1 *Implement site and architectural design measures to reduce noise levels for new residential development with ambient noise levels greater than 65 dBA CNEL.* Per the General Plan, new development located near a roadway that produces noise levels greater than 65 dBA CNEL (measured at the façade of a proposed residential use) shall be required to have an acoustical analysis prepared by a qualified acoustical engineer to ensure that all feasible site planning and architectural design measures were incorporated to reduce interior noise levels to a maximum of 45 dB CNEL. Measures to achieve acceptable noise levels include adjusting the configuration of the proposed residential buildings and placing exterior living areas such as patios and balconies away from high traffic roadways. Recommendations from the acoustical study must be incorporated into building and site design and submitted to the City for approval prior to issuance of a building permit.

NO-4 The Railroad Avenue Specific Plan would not substantially increase ambient noise levels at existing sensitive receptors in the vicinity of the project area. This is considered a less-than-significant impact. (LTS)

The Railroad Avenue Specific Plan would permit new residential and commercial uses in an already developed area of the City, resulting in an increase in vehicle trips generated in the project area. In addition, the replacement of existing uses with new residential uses would result in a redistribution of traffic along area roadways resulting in decreased traffic volumes along some area roadways and increases along others. In areas where the traffic volumes would increase, the proposed project would add to noise levels at existing uses along those roadways. For this analysis, the road segments of most concern are those bordered by residential uses and that would have a traffic volume increase as a result of the proposed project. The traffic analysis prepared for the specific plan by Wilbur Smith Associates (see Section 3.2, Transportation), determined that the highest traffic volume increase with adjacent residential uses was along the segment of Railroad Avenue, south of Leland Road. Predicted noise levels were derived using TNM. The model indicates that traffic noise levels would increase along Railroad Avenue by 1.8 dBA when compared to existing conditions, and 0.2 dBA when compared to future no project conditions. Because existing noise levels are approximately 65 dBA, the proposed project's contribution would be considered a less-than-significant impact.

Cumulative Analysis

The geographic context for cumulative impacts from localized construction and stationary source noise includes areas immediately surrounding the project area. For cumulative vehicular noise impacts, the cumulative context is based on the traffic analysis, which includes existing and future developments and encompasses a larger study area.

NO-5 Construction activity from the proposed project in combination with other foreseen development projects would not have cumulative noise effects. (LTS)

Noise impacts from construction sources are localized in nature because noise intensity decreases substantially with distance (i.e., by 6 dBA with each doubling of source-receptor distance); construction vibration levels decrease even faster. It is anticipated that build-out of the Specific Plan Area will occur over a twenty year period with the majority of development occurring after construction of the eBART extension and Railroad Avenue eBART Station. Substantial construction-related noise and vibration would likely affect only areas in close proximity to each of the individual construction sites. It is unlikely that construction noise or vibration from these other construction sites, would jointly affect the same sensitive receptors. Further, with implementation of Mitigation Measures NO-1.1, the proposed project would be required to implement Best Management Practices to reduce potential noise impacts to the maximum feasible extent. Thus, the contribution of the proposed project to potential cumulative construction noise impacts at sensitive uses near the project area (specifically the subarea projected to accommodate future growth) and near other construction sites would be less than significant.

NO-6 The proposed project would not substantially contribute to traffic noise levels along SR 4 and other area roadways in combination with noise from other foreseeable development in the project area. This is considered a less-than-significant impact. (LTS)

With implementation of the proposed project and other foreseeable development in the region, traffic is projected to increase along SR 4 and local roadways. Traffic increases along the area roadways were included in the noise projections addressed under Impact NO-4.

Noise levels would also increase in the project area with construction of the eBART line extension and Railroad Avenue eBART Station. Noise from eBART train activity was addressed in the Draft EIR for the East Contra Costa County eBART (eBART) Extension project. According to the EIR, noise levels from BART trains would increase noise levels in the project area by approximately 0.3 dBA over existing conditions. The eBART Draft EIR also indicates that the traffic volumes along SR 4 between Railroad Avenue and Loveridge Road would increase by about 50 to 60 percent with a noise level increase of about 2 dBA. The cumulative noise increase from BART activity and additional traffic along SR 4 would also be about 2 dBA. This would exceed the FTA's criterion of 1 dBA for a significant noise level increase in areas with existing noise levels of approximately 70 dBA. While the proposed project would contribute to the 50 to 60 percent traffic increase along SR 4 (an increase of about 75,000 trips based on existing traffic volumes), the proposed project would only generate about 9,000 daily trips, most of which would not be regional trips along SR 4. Therefore, the project's contribution to the noise level increase along SR 4 would not be cumulatively considerable.

Noise levels at the proposed residential uses within the Specific Plan Area would also increase as a result of cumulative projects. However, even with the cumulative noise level increase of 2 dBA, existing General Plan and State law requirements would ensure that interior noise levels would be reduced to meet the standards, and Mitigation Measure NO-3.1, would require that architectural and site design measures be implemented to reduce noise levels to within the City's "conditionally acceptable" level for new residential uses.

Because the proposed project would not cause a cumulatively considerable increase in traffic noise levels along SR 4 and noise levels at the proposed residential uses would be within the City's "conditionally acceptable" level for new residential uses, the proposed project would have a less-than-significant cumulative impact.

3.5 CULTURAL RESOURCES

Introduction

This section of the EIR assesses potential effects to cultural resources that could result from implementation of the Railroad Avenue Specific Plan. Cultural resources are defined as prehistoric and historic-period archaeological resources and historic-period buildings and structures. This section briefly describes the cultural setting of the project area and its overall cultural resource sensitivity. Applicable state, federal, and local regulations are identified, followed by impact analysis and mitigation measures, where available, to reduce adverse impacts on cultural resources.

This section of the EIR is based on a cultural resources records search conducted by the Northwest Information (NWIC) Center of the California Historical Resources Information System (CHRIS) in March 2008, a search of the Native American Heritage Commission's (NAHC) sacred lands database, and information gathered by PBS&J.

No comments were received during the NOP comment period concerning cultural resources.

Setting

Cultural Overview

Regional Prehistory. A number of archaeological sites have been excavated in the region, and have been found to date between about 7500 B.C. and the historic contact period. However, settlement may have begun more than 10,000 years ago. The project area settlement period was characterized by three cultural patterns:[1] Windmiller Pattern, Berkeley Pattern, and Augustine Pattern. These patterns are discussed below.

Windmiller Pattern. The Windmiller period represents the oldest permanent occupation in the Delta region of central California and dates from approximately 3,000 to 1,500 B.C. Most of what is known about the Windmiller culture comes from burial sites, which are usually found on knolls near or within the riverine floodplain. Occupations generally were located near valley-oak parklands and chaparral of the lower foothills, but groups also spent part of the year in the Sierra foothills. Large numbers of projectile points and quantities of animal bone in Windmiller sites indicate that the Windmiller Pattern was characterized by extensive hunting of large mammals (elk, deer, antelope), small mammals (especially rabbits), and waterfowl. Fishing using fish spears, hooks, and fish line sinkers was also prevalent. The presence of mortars at these sites indicates that, at this time, people consumed acorns and perhaps other seeds. Windmiller people were also skilled in manufacturing flaked and ground lithic artifacts, including charmstones, and also made bone, baked clay, basketry, and shell items.

[1] Archaeologists use the term "cultural pattern" to describe a configuration of basic traits which have similar technological skills, tools, economic modes, mortuary practices, and ceremonial practices.

Berkeley Pattern. The subsequent Berkeley Pattern probably first appeared about 1500 B.C. in the San Francisco Bay Area, and gradually spread into the interior. The Berkeley Pattern is characterized by a dietary emphasis on acorns and increased use of mortars and pestles, as well as a well-developed bone industry, marked by distinctive diagonal flaking of large concave-base points, and certain forms of beads and ornaments.[2] Mortuary patterns are more diverse than in the Windmiller Pattern, and included both burials and cremations. There is some evidence of social status differentiation in Berkeley Pattern grave goods.

Augustine Pattern. The more recent Augustine Pattern is typified by hunting, gathering, and fishing, and is associated with greatly increased populations and extensive social networks. Social stratification, accompanied by "elaborate ceremonialism," cremation of high status individuals, and grave good burning, was well developed. Important technological innovations include the use of the bow and arrow, and the manufacture of coiled baskets and shaped mortars and pestles. The Augustine Pattern may have begun as early as the first century A.D.[3]

It appears that sedentary village life in interior Contra Costa County began between 2500 B.C. and A.D. 1 and that an increasingly complex social organization gradually emerged, including an "evolution from an egalitarian society… to a system of social ranking based upon ascribed status."[4] A complicated picture has emerged which shows a gradual cultural expansion and replacement of populations over the millennia, culminating in the expansion of Bay Miwok populations into the west delta region around 900-1000 A.D.[5]

The most extensive and significant excavations in east Contra Costa County took place in the 1980s and 1990s as a result of the development of the Vasco and Kellogg Reservoirs, south of the project area.[6] Radiocarbon dates from archaeological site Ca-CCo-696 indicate that the Kellogg Creek area was occupied by at least 9800 years ago, and perhaps before, by Paleoindians. Under three meters of deposit (with one meter of sterile earth above it), a paleosol, or ancient buried soil horizon, was found that contained large obsidian spear or dart points and chipped and ground tools. Another paleosol, dated to 3000-2000 years ago, was found in the same site under a meter of soil. It contained 170 human graves, as well as hearths, possible house floors, grinding and hunting tools, and ceremonial objects. Although human activity might have taken place between these two periods of human use, there were intervening periods of climatic instability and any site evidence might have been swept away.

More recent excavations in 2005 and 2006 at Ca-CCo-548, near the John Marsh House on Marsh Creek to the west of Brentwood and Byron, have yielded cultural evidence from a large village site and a major prehistoric cemetery. Almost 500 burials and numerous associated artifacts have been found.

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2 Moratto, Michael J., *California Archaeology,* 1984.
3 Moratto, Michael J., *California Archaeology,* 1984.
4 Moratto, Michael J., *California Archaeology,* 1984.
5 Bennyhoff, James A., *Variation with the Meganos Culture*. In *Toward a New Taxonomic Framework for Central California Archaeology*, 1994.
6 Bramlette, Alan G. et al., *Archaeological Resources Inventory for Los Vaqueros Water Conveyance Alignments, Contra Costa County, California*. 1991; Ziesing, Grace, ed., *From Rancho to Reservoir: History and Archaeology of the Los Vaqueros Watershed, California*, 1997.

Dating for this site is incomplete, but probably ranges from between 6000-7000 years before present to about 1500 years before present.

Ethnography. Early publications dealing with the distribution of linguistic groups recognized three major groups in the region, namely, Eastern Miwok (Bay Miwok and Plains Miwok), Costanoan/Ohlone, and Northern Valley Yokuts. Pittsburg was within the territory of the Bay Miwok groups, including the Ompin and Julpun groups.[7]

The Miwok were successful food collectors and hunters, living adjacent to the great bays and waterways of the region, and relying heavily on shellfish and aquatic animals for food. In the interior, a plentiful variety of plant foods were gathered on a seasonal basis. Of these, acorns were the most important vegetal staple since they could be stored in great quantity. The major game hunted was deer, elk, and antelope. Rabbits and other small animals, game birds, waterfowl, and fish were also important sources of food. The Miwok manufactured stone, bone, and shell tools and ornaments and had a well-developed fiber crafts industry, especially basketry. For the native people of east Contra Costa County, the landscape itself was sacred. A number of groups from as far away as the Sierra Nevada revered Mount Diablo as a place to pray and hold ceremonies, and the mountain figured in a number of world creation myths.

Ethnohistory. Establishment of Spanish missions in the San Francisco Bay Area, beginning with Mission San Francisco in 1776, had an immediate impact on native peoples. Because of their relative distance from the missions, people in the project area were somewhat protected from missionization until the second or third decade of the 19th century. After secularization of the missions in the 1830s, some native peoples went to work on nearby ranchos, perhaps gravitating to home lands, but little information is available about this period.

The Gold Rush of 1848 brought a huge influx of Americans, as well as other nationalities, resulting in the end of the Bay and Valley native populations. Little is known about Native Americans in Contra Costa County during this period, although at least one report confirms that there were still some ex-Mission Indians living in the east county in the 1850s and 1860s.[8] Whether any of these were descendants of the Ompin or Julpun Bay Miwok is unknown.

History. From the days of the earliest European explorers in the 1770s, the project area and environs have been a key link in a regional transportation network tying the cities along the San Francisco Bay to the interior hinterlands to the east. The area's proximity to San Francisco, the largest population center of the western United States during the second half of the 19th century, was an important factor in regional development, as was the fact that two large Mexican era land grants occupied key parts of east Contra Costa County.

Early Settlement. The project area was located in the Rancho Los Medanos, which ran from the San Joaquin riverbank south to the hills leading to Mount Diablo. The Rancho was purchased in 1849 by

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7 Milliken, Randall, *Ethnogeography of the Los Vaqueros Region*. In *Native American History Studies for the Los Vaqueros Project: A Synthesis*, 1997.

8 Loud, L.L., Field Notes, CCo-241 (Nelson Mound No. 250), n.d.

Col. J.D. Stevenson, a New Yorker, and Dr. W.C. Parker.[9] They laid out the "City of New York of the Pacific" that same year.[10] Col. Stevenson named his ranch New York Ranch. A nearby river landing, called Pittsburg Landing, became a major shipping point. By 1911, New York of the Pacific had officially become the City of Pittsburg.[11]

Coal Mining and Grain. The end of the Gold Rush saw the beginnings of industrialization in California, a process centered in San Francisco. Discovery of soft coal deposits in 1852 in the foothills of Mount Diablo, south of the project area, helped accelerate the industrialization. Exploitation of these coal seams, located in an approximately six-mile-long belt four to five miles south of the river front, began in 1859, and by the 1860s, small towns had begun to grow at convenient points adjacent to the best coal deposits. During the next several decades, the mining towns of Nortonville, Somersville, Stewartsville, Judsonville, and West Hartley prospered, then disappeared.

In the late 1860s, the Black Diamond Coal Mining Company Railroad was constructed from the mines across Los Medanos Rancho to the river at the location of today's town of Pittsburg. Eventually three railroads were built from the mines to the waterfront. One of these routes is still called Railroad Avenue today. The last of these three coal transportation railroads, the Empire Railroad, was located farthest to the east. It was built from the coal towns of Stewartville and Judsonville to Antioch in 1877–1878. This railroad was about five and a half miles long connecting the Empire Coal Mine to tide-water at Antioch, where the coal was loaded on barges. The location where it crossed the Southern Pacific Railroad became known as "Empire," and was later developed as a brick and pottery manufacturing center.[12]

Another major economic mainstay of east Contra Costa County during the 1860s and 1870s was grain (wheat and barley) farming. Antioch and New York of the Pacific were important shipping points. This pattern changed in 1876–1878 when the Southern Pacific's "San Pedro and Tulare Railroad" was constructed through the agricultural region.

Railroads, Oil, and the Early Industrial Revolution, 1870s–1900s. Prior to 1878, wagons, horses, stage lines, buckboards, and riverboats were the key means of transport. After that, railroads took over. The Southern Pacific Railroad became the primary mode of grain shipping. The arrival of the Southern Pacific Railroad also resulted in the establishment of a number of small stations: Los Medanos, Prince, Antioch, Jersey, Newlove, and Neroly. A number of these stopping places typically had wood frame buildings for passengers and freight along with a loading platform.[13]

Construction of the railroad also marked the development of an oil transportation corridor along the railroad's route. During the first years of the 20th century, the California oil industry was growing rapidly, and the Standard Oil Company built a major refinery at Richmond in 1901–1902. The

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9 Gudde, Erwin C., *California Place Names Fourth Edition*, 1998, page 293.

10 Gudde, Erwin C., *California Place Names Fourth Edition*, 1998, page 293.

11 Hoover, Mildred B. et al., *Historic Spots in California*, 1990.

12 California State Mining Bureau, *Seventh Annual Report of the State Mineralogist*, 1888; *Twelfth Annual Report of the State Mineralogist*, 1894; Hoover, Mildred B. et al., *Historic Spots in California*, 1966; Hohlmayer, Earl J., *Looking Back: Tales of Old Antioch and Other Places*, 1991.

13 Signor, John R., *Southern Pacific's Western Division*, 2003.

Standard Oil Company then built an eight-inch pipeline approximately 280 miles along the Southern Pacific right-of-way, to transport crude oil from the newly discovered Kern County oil fields to this refinery.

The 20th Century and the Arrival of New Industries and Big Investors. During the early years of the 20th century, the project area became attractive to big investors as a location for industrial and agro-industrial development. San Francisco businessman C.A. Hooper purchased the Rancho Los Medanos in 1903. Hooper's large industrial establishments in and around Pittsburg and Antioch attracted other businesses, including oil refineries and a PG&E steam electric plant, and the area was transformed into a major industrial center. By 1939, Contra Costa County had become the fourth largest manufacturing center in California, behind only Los Angeles, San Francisco and Alameda counties, largely on the strength of the Hooper-established facilities on the Los Medanos grant.[14]

Recent Times: State Route 4 and Suburban Growth. Following World War II, the project area has been characterized by large-scale suburban growth, spurred by the advent of mass automobile ownership and the construction of new highways, such as SR 4, which linked Alameda and Contra Costa counties. Use of these highways greatly increased following the opening of the Caldecott Tunnel in the 1930s and the World War II economic boom after 1945.

Cultural Resources

NWIC Records Search. A cultural resources records search conducted by the NWIC in March 2008 identified 27 cultural resource surveys (i.e., cultural resource inventory and evaluation efforts) that have been conducted within and adjacent to the project area. These 27 surveys resulted in the recordation of 49 resources, including 24 resources within the project area boundary and an additional 25 within ¼ mile. The majority of the 49 recorded resources are single family residences. Other resources included a culvert, railroad features (e.g., spur and alignment), a public housing complex, bridges, a commercial building, a church, a school, and a multi-family residence. Only three of these 49 resources have been recommended as eligible for the National Register of Historic Places (NRHP) and/or the California Register of Historical Resources (CRHR), namely, the Contra Costa Canal, the Contra Costa Canal Bridges, and the National Guard Armory.[15]

The Contra Costa Canal was evaluated in 2005 and recommended as eligible for listing on the NRHP at the local level under Criterion A for its importance in the economic and industrial development of eastern Contra County.[16] The Contra Costa Canal Bridges, although evaluated at a later time, were recommended eligible for listing on the NRHP as contributing elements to the Contra Costa Canal. None of these bridges is located within the Specific Plan Area. The third historic-age resource is the

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[14] Hohlmayer, Earl J., *Looking Back: Tales of Old Antioch and Other Places*, 1991; U.S. Bureau of the Census, *Census of Manufacturers, 1940*, 1942.

[15] Resources identified through Northwest Information Center, 2008, Records Search Results for the Railroad Avenue Specific Plan, March 14. These search results are on file with the City of Pittsburg Planning Department.

[16] JRP Historical Consulting, 2005, Department of Parks and Recreation Site Record, Contra Costa Canal (P-07-002695 [Revised]), November. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, California.

National Guard Armory located in the Civic Center subarea of the Specific Plan Area. While this structure is not currently on either the CRHR or the NRHR, it has been recommended as eligible for listing on the NRHP under Criterion C as a significant military resource type that retains integrity of location, design, setting, materials, feeling, and association.[17] While the Contra Costa Canal and the National Guard Armory are not currently listed on the NRHP, CRHR, or a local historic register, because these resources have been determined to be eligible for listing on the NRHP, they are both considered historical resources pursuant to CEQA (see "State Regulations" under "Applicable Policies and Regulations" below for a definition of "historical resource" pursuant to CEQA).

Native American Consultation. PBS&J cultural resources staff requested the Native American Heritage Commission (NAHC) to search its sacred lands database to determine if any Native American cultural resources are located on or near the project site. The NAHC response letter stated that the search of the sacred lands database failed to indicate the presence of Native American resources in the immediate project area. The NAHC letter included a list of Native American organizations and individuals who may have knowledge of cultural resources in the project area. Letters that included a brief description of the project and a project map were sent to each organization/individual identified on the NAHC list. Table 3.5-1 indicates how and when the organization/individual was contacted and their response, if any. As of the printing of this document, PBS&J has received no responses from tribal representatives indicating the presence of Native American cultural resources in the project area. However, the absence of site-specific information in the sacred lands database or through correspondence with tribal representatives does not indicate the absence of cultural resources in the project area or the immediate vicinity. Copies of Native American correspondence are included as Appendix E of this EIR. Three Native American tribes were provided Notices of Preparation at the time the Initial Study was published. These tribes include the Amah/Mutsun Tribal Band, the Indian Canyon Mutsun Band of Costanoan, and the Ohlone Indian Tribe.

Table 3.5-1
Native American Tribal Representatives Contacted

Organization/Individual	Initial contact (Date letter sent)	Response
Katherine Erolinda Perez	October 7, 2008	None received
The Ohlone Indian Tribe, Andrew Galvan	October 7, 2008	None received
Trina Marine Ruano Family, Ramona Garibay	October 7, 2008	None received

Source: PBS&J, 2008.

[17] Jones and Stokes, 2000, National Guard Armory, Department of Parks and Recreation Site Record, Contra Costa Canal (P-07-002510), August. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, California.

Camp Stoneman Warehouses. In 1942, the U.S. War Department acquired 2,841 acres of land in Pittsburg, California to construct a large-scale Army staging area and rifle range training area called Camp Stoneman. At its peak operation, the camp functioned as a small city capable of accommodating 20,000 troops. According to a 2003 Site Assessment performed by the California Department of Transportation, only 19 of the original Camp Stoneman buildings remain, including 17 warehouses, a maintenance shop, and the camp chapel which has been relocated. The project area includes two historic-period warehouses associated with the no longer extant Camp Stoneman.

Two of the original warehouses are located on the south side of Bliss Avenue, between Harbor Street and Railroad Avenue in the Transit Village subarea. They are separated from the other remaining Camp Stoneman warehouses by the Harbor Street/Bliss Avenue interchange. The warehouses within the project area are large, wood frame, rectangular plan buildings on concrete slab foundations. The buildings have low pitched almost flat, gabled roofs with asbestos vergeboard additions that continue along the lateral eaves. A row of sheet metal vent stacks spans the length of the buildings along the roof ridgeline. The exteriors have been re-clad in asbestos siding. There is a central, double width, horizontal sliding door composed of louvered wood planks and half timbering in each gable end flanked by a multi-light, horizontal sliding, metal sash window. The lateral facades are punctuated by a rhythmic pattern of identical doors and windows with the addition of four-light, fixed, metal sash windows and divided into distinctive bays (five on the northernmost warehouse and four on the southernmost warehouse) by a series of inverted U-shaped external buttresses projecting from the facades.

Applicable Plans, Policies and Regulations

Federal

Federal regulations for cultural resources are primarily governed by Section 106 of the National Historic Preservation Act (NHPA) of 1966, which applies to actions taken by federal agencies. The goal of the Section 106 review process is to offer a measure of protection to sites that are determined eligible for listing on the NRHP. The criteria for determining NRHP eligibility are found in 36 Code of Federal Regulations (CFR) Part 60. Section 106 of the NHPA requires federal agencies to take into account the effects of their undertakings on historic properties and affords the federal Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertakings. The Council's implementing regulations, "Protection of Historic Properties," are found in 36 CFR Part 800. The NRHP criteria (contained in 36 CFR 60.4) are used to evaluate resources when complying with NHPA Section 106. Those criteria state that eligible resources comprise districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

a) are associated with events that have made a significant contribution to the broad patterns of our history; or

b) are associated with the lives of persons significant in our past; or

c) embody the distinctive characteristics of a type, period, or method of construction, or that possess high artistic values, or that represent a significant distinguishable entity whose components may lack individual distinction; or

d) have yielded or may be likely to yield, information important to history or prehistory.

Archaeological site evaluation assesses the potential of each site to meet one or more of the criteria for NRHP eligibility based upon visual surface and subsurface evidence (if available) at each site location, information gathered during the literature and records searches, and the researcher's knowledge of and familiarity with the historic or prehistoric context associated with each site.

The American Indian Religious Freedom Act, Title 42 United States Code, Section 1996, protects Native American religious practices, ethnic heritage sites, and land uses.

State

Under CEQA, public agencies must consider the effects of their actions on both "historical resources" and "unique archaeological resources." Pursuant to Public Resources Code Section 21084.1, a "project that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant effect on the environment." Section 21083.2 requires agencies to determine whether proposed projects would have effects on "unique archaeological resources."

"Historical resource" is a term with a defined statutory meaning (see Public Resources Code, Section 21084.1 and CEQA Guidelines, Section 15064.5, subdivisions (a) and (b)). The term encompasses any resource listed in or determined to be eligible for listing in the CRHR. The CRHR includes resources listed in or formally determined eligible for listing in the NRHP, as well as some California State Landmarks and Points of Historical Interest.

Properties of local significance that have been designated under a local preservation ordinance (local landmarks or landmark districts) or that have been identified in a local historical resources inventory may be eligible for listing in the CRHR and are presumed to be "historical resources" for purposes of CEQA unless a preponderance of evidence indicates otherwise (Public Resources Code, Section 5024.1 and California Code of Regulations, Title 14, Section 4850). Unless a resource listed in a survey has been demolished, lost substantial integrity, or there is a preponderance of evidence indicating that it is otherwise not eligible for listing, a lead agency should consider the resource to be potentially eligible for the CRHR.

In addition to assessing whether historical resources potentially impacted by a proposed project are listed or have been identified in a survey process, lead agencies have a responsibility to evaluate them against the CRHR criteria prior to making a finding as to a proposed project's impacts to historical resources (Pubic Resources Code, Section 21084.1 and CEQA Guidelines, Section 15064.5 (a) (3)). In general, an historical resource, under this approach, is defined as any object, building, structure, site, area, place, record, or manuscript that:

a) Is historically or archeologically significant, or is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political or cultural annals of California; and

b) Meets any of the following criteria:

   1) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;

   2) Is associated with the lives of persons important in our past;

   3) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or

   4) Has yielded, or may be likely to yield, information important in prehistory or history.

(CEQA Guidelines, Section 15064.5 (a) (3))

Potential eligibility also rests upon the integrity of the resource. Integrity is defined as the retention of the resource's physical identity that existed during its period of significance. Integrity is determined through considering the setting, design, workmanship, materials, location, feeling, and association of the resource.

For historic structures, CEQA Guidelines Section 15064.5 (b) (3) indicates that a project that follows the Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings, or the Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings (1995) shall mitigate impacts to a level of less than significant.

Archaeological resources can sometimes qualify as "historical resources" (CEQA Guidelines, Section 15064.5 (c)(1)). In addition, Public Resources Code Section 5024 requires consultation with the Office of Historic Preservation when a project may impact historical resources located on State-owned land.

As noted above, CEQA also requires lead agencies to consider whether projects will impact "unique archaeological resources." Public Resources Code Section 21083.2, subdivision (g), states that "'unique archaeological resource' means an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

a) Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.

b) Has a special and particular quality such as being the oldest of its type or the best available example of its type.

c) Is directly associated with a scientifically recognized important prehistoric or historic event or person.

(Public Resources Code, Section 21083.2, subdivision (g)).

Treatment options under Section 21083.2 include activities that preserve such resources in place in an undisturbed state. Other acceptable methods of mitigation under Section 21083.2 include excavation and curation or study in place without excavation and curation (if the study finds that the artifacts would not meet one or more of the criteria for defining a "unique archaeological resource").

Advice on procedures to identify cultural resources, evaluate their importance and estimate potential effects is given in several agency publications such as the series produced by the Governor's Office of Planning and Research (OPR). The technical advice series produced by OPR strongly recommends that Native American concerns and the concerns of other interested persons and corporate entities including, but not limited to, museums, historical commissions, associations and societies, be solicited as part of the process of cultural resources inventory. In addition, California law protects Native American burials, skeletal remains and associated grave goods regardless of their antiquity and provides for the sensitive treatment and disposition of those remains.

Section 7050.5(b) of the California Health and Safety Code specifies protocol when human remains are discovered. The code states:

> In the event of discovery or recognition of any human remains in any location other than a dedicated cemetery, there shall be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent remains until the coroner of the county in which the human remains are discovered has determined, in accordance with Chapter 10 (commencing with Section 27460) of Part 3 of Division 2 of Title 3 of the Government Code, that the remains are not subject to the provisions of Section 27492 of the Government Code or any other related provisions of law concerning investigation of the circumstances, manner and cause of death, and the recommendations concerning treatment and disposition of the human remains have been made to the person responsible for the excavation, or to his or her authorized representative, in the manner provided in Section 5097.98 of the Public Resources Code.

CEQA Guidelines Section 15064.5 (e) requires that excavation activities be stopped whenever human remains are uncovered and that the county coroner be called in to assess the remains. If the county coroner determines that the remains are those of Native Americans, the NAHC must be contacted within 24 hours. At that time, the lead agency must consult with the appropriate Native Americans, if any, as timely identified by the NAHC. Section 15064.5 directs the lead agency (or applicant), under certain circumstances, to develop an agreement with the Native Americans for the treatment and disposition of the remains.

As of March 1, 2005, Senate Bill 18 (Government Code Sections 65352.3, 65352.4) requires that, prior to the adoption or amendment of a general plan or specific plan proposed on or after March 1, 2005, a city or county must consult with Native American tribes with respect to the possible preservation of, or the mitigation of impacts to, specified Native American Places, features, and objects located within that jurisdiction. On January 29, 2008, City staff sent a Local Tribal Consultation Request letter to the NAHC that provided the type of project, location and brief description of the project. On February 14, 2008, the NAHC responded with a letter and a consultation list of three tribal contracts whose tribes have traditional lands or cultural areas located within the

General Plan boundaries. On October 7, 2008, the City sent the Notice of Preparation, a project description and project map to all three tribal contacts listed on the NAHC consultation list. No comments have been received from any of the consultation tribes or other Native American groups in the area.

Local

The following goals and policies are taken from the Historical and Cultural Resources section of the Resource Conservation Element of the *General Plan* and the Pittsburg Municipal Code (PMC).

- **General Plan Goal 9-G-12:** Encourage the preservation, protection, enhancement and use of structures that
  - Represent past eras, events and persons important in history;
  - Provide significant examples of architecture;
  - Embody unique and irreplaceable assets to the City and its neighborhoods; and
  - Provide examples of the physical surroundings in which past generations lived.
- **General Plan Goal 9-G-13:** Encourage municipal and community awareness, appreciation, and support for Pittsburg's historic, cultural, and archeological resources.
- **General Plan Policy 9-P-34:** Encourage the preservation of varied architectural styles that reflect the cultural, industrial, social, economic, political and architectural phases of the City's history.
- **General Plan Policy 9-P-35:** Expand the role of the City's Historical Resources Commission, currently responsible for only the New York Landing Historical District, to include all historical resources. The Commission should be responsible for designating historical resources, and acting as the community's liaison on these issues. However, the role of reviewing development proposals and remodeling in the Historical District should be transferred to the Planning Commission.
- **General Plan Policy 9-P-36:** Provide for the educational and cultural enrichment of this and future generations by fostering knowledge of our heritage.
- **General Plan Policy 9-P-37:** Refine the New York Landing Historical District to designate and preserve historical structures not currently located within the district boundaries.
- **General Plan Policy 9-P-38:** Explore mechanisms to incorporate Pittsburg's industrial heritage in historic and cultural preservation.
- **General Plan Policy 9-P-39:** Ensure the protection of known archeological resources in the City by acquiring a records review for any development proposed in areas of known resources. If such resources are found, limit urban development in the vicinity or account for the resources.

- **General Plan Policy 9-P-40:** In accordance with State law, ensure the preparation of a resource mitigation plan and monitoring program by a qualified archeologist in the event that archeological resources are uncovered.
- **General Plan Policy 9-P-41:** If archeological resources are found during ground-breaking for new urban development, halt construction immediately and conduct an archeological investigation to collect all valuable remnants.

As a part of the City's Design Review process, PMC Section 18.36.220 establishes standards for review of Designated Historic Buildings and all properties located in a Designated Historic District. These standards require specific findings be made to ensure that proposed work does not adversely affect the exterior character defining features of designated contributing historic buildings and that the proposed improvements compliment adjacent development within the Designated Historic District. While there is not currently a designated historic district within the Specific Plan Area, a District could be formed in the future as structures age and become eligible for historical resource status. In the event that a Historic District is formed in the Specific Plan Area, this provision of the PMC would apply to all future development within or adjacent to the District.

Impact Assessment and Mitigation Measures

Methodology

The impact analysis for cultural resources is based on the findings and recommendations of the cultural resources records search conducted for the proposed project by the NWIC and correspondence with the NAHC and NAHC-identified Native American individuals and organizations. The records search conducted for the proposed project indicated that the project area has been subjected to 27 cultural resource surveys and investigations and 49 resources have been recorded within or within ¼ mile of the project boundary. No additional archaeological resource surveys were conducted for the preparation of the cultural resources analysis of the EIR. The Camp Stoneman buildings within the project boundary were surveyed and evaluated by a PBS&J cultural resources professional who meets the Secretary of the Interiors qualifications for Architectural Historian. The following analysis was done at a programmatic level for the entire Specific Plan area and incorporated the analysis and findings of the Pittsburg 2020 *General Plan* and the *General Plan* EIR. All future projects would be subject to project-specific review and environmental analysis based on the specific parameters of the project. Impact analyses and mitigation measures provided below are also informed by the provisions and requirements of federal, state, and local laws and regulations that apply to cultural resources.

Standards of Significance

For the purposes of this EIR, impacts on cultural resources are considered significant if the proposed project would:

- Cause a substantial adverse change in the significance of a historical resource as defined in CEQA Guidelines Section 15064.5.
- Cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Guidelines Section 15064.5.
- Directly or indirectly destroy a unique paleontological resource or site, or unique geological feature.
- Disturb any human remains, including those interred outside of formal cemeteries.

Environmental Analysis

For each potential impact associated with the proposed project, a level of significance is determined and is reported in the impact statement. Conclusions of significance are defined as follows: significant impact (S), potentially significant impact (PS), less than significant (LTS), or no impact (NI). For each impact identified as being significant (S) or potentially significant (PS), the EIR provides mitigation measures to reduce, eliminate, or avoid the adverse effect. If the mitigation measures would reduce the impact to less-than-significant (LTS) level successfully, this is stated in the EIR. If the mitigation measures would not diminish significant or potentially significant impacts to a less-than-significant level, the impacts are classified as "significant unavoidable impacts (SU)." For this section, CR refers to cultural resources.

CR-1 Implementation of the proposed project would not cause a substantial adverse change in the significance of a historical resource as defined in CEQA Guidelines Section 15064.5. (PS)

A cultural resources records search conducted by the NWIC identified numerous cultural resource surveys that have been conducted within and adjacent to the project site. Of the 24 resources previously within the project boundary, only three were recommended eligible as historical resources: the Contra Costa Canal, the Contra Costa Canal Bridges, and the National Guard Armory.

Contra Costa Canal and Bridges. The Contra Costa Canal Bridges are a contributing feature to the Contra Costa Canal; they are only mentioned separately here because they were recorded separately. The Contra Costa Canal is located along the southern boundary of the project area and the associated bridges that were recommended eligible are located outside of the project area completely. While the Contra Costa Canal is not listed on the NRHP, CRHR, or a local historic register, it has been determined eligible for listing on the NRHP and is therefore considered an historical resource pursuant to CEQA. No modifications or demolition is proposed in relation to the Contra Costa Canal. Therefore, the proposed project would not have an impact on the Canal or the bridges associated with the canal.

National Guard Armory. The National Guard Armory is located at the northwest corner of Davi and Power avenues, which is within the project area. While the National Guard Armory is not listed on the NRHP, CRHR, or a local historic register, it has been determined eligible for listing on the NRHP and is therefore considered an historical resource pursuant to CEQA. At this time, no changes or alterations are proposed for the Armory as part of the implementation of the Specific Plan; however, the site has been identified as a potential future redevelopment site, which could result in a significant impact on a potential historical resource. Prior to redevelopment of the Armory, the site will be subject to project-specific CEQA review and will be required to comply with requirements of the Historical Resources Commission process, per General Plan Policy 9-P-35 and Pittsburg Municipal Code Section 18.36.

Camp Stoneman. Two warehouses associated with Camp Stoneman, which were previously unrecorded, were recorded and evaluated as a part of this EIR. These two historic-period warehouses are located on the south side of Bliss Avenue, between Harbor Street and Railroad Avenue, within the Transit Village subarea. According to a 2003 Site Assessment performed by the California Department of Transportation, only 19 of the original Camp Stoneman buildings are extant, including 17 warehouses, a maintenance shop, and the camp chapel which has been relocated. Of these remaining buildings, only the two warehouses on the south side of Bliss Avenue are located on the west side of Harbor Street, and those warehouses are separated geographically from the remaining Camp Stoneman buildings. As previously discussed, the loss of the other associated buildings and the presence of non historic-age infill in the area detract from the warehouses' integrity of setting and feeling. The exterior re-cladding has altered the buildings' integrity of workmanship, design, materials, and feeling. Furthermore, these warehouses are of common design and lack individual architectural merit. Therefore, these warehouses do not appear to qualify as historical resources as defined in CEQA Guidelines Section 15064.5. While the Camp Stoneman buildings are associated with an important historic event, they do not retain sufficient integrity to merit inclusion in the NRHP or the CRHR and are not considered historical resources as defined by CEQA.

Other Resources. Based upon previous cultural resource surveys and research, the Pittsburg area has a rich history of historic-period settlement. The area is currently designated for urban development and future development projects within the project area will be subject to project-specific CEQA review and will be required to comply with requirements preset forth in General Plan Policy 9-P-35 and PMC Chapter 18.36. While there have been many studies within the Specific Plan Area, the entire area has not been surveyed and project-specific details concerning future development projects that could result from the Specific Plan are not known; therefore, there is the possibility that significant resources discussed above and/or previously unrecorded historic-period resources could be adversely affected by future development within the project area (e.g., demolition, relocation, or alteration of historic-period buildings or structures). Impacts on historical resources that could result from implementation of the project are therefore considered potentially significant..

MITIGATION MEASURE. The following mitigation measure would reduce the impact to a less-than-significant level by requiring that the City Historic Resources Commission/Planning Commission or a qualified professional conduct site-specific cultural resource investigations for applicable future developments within the project area. The investigations shall include, but not be limited to, the preparation of technical reports or memoranda that include specific methods for eliminating or reducing impacts on historical resources. This mitigation measure would reduce the impact to historical resources to a less-than-significant level. (LTS)

CR-1.1 *Historical Resources Review*. Prior to issuance of a development permit for improvements or alterations on a building or structure in the Specific Plan Area that is 45 years or older, or that is adjacent to a building or structure 45 years old or older, the City shall require the project sponsor (a) to submit an application for review to the City Historic Resources Commission/Planning Commission, or (b) to retain a cultural resource professional who meets the Secretary of the Interior's Professional Qualifications Standards for Architectural History. The City Historic Resources Commission or the certified cultural resources professional shall evaluate the building or structure that is 45 years or older and determine if it qualifies as an historical resource (as defined in Public Resources Code, Sections 21084.1 and 21083.2 and CEQA Guidelines, Section 15064.5) and if its historic merit would be adversely affected by the proposed development. Whether the historical resource consideration is conducted under the auspices of the City Historic Resources Commission/Planning Commission or an investigation is completed by a professional retained by the project applicant, the results shall be documented. The results of any historic investigation shall be documented in a technical report or memorandum that (a) identifies and evaluates any historical resources that could be adversely affected by the development and (b) includes recommendations and methods for eliminating or reducing impacts on historical resources. Where historical resources are proposed for demolition, the investigation shall consider whether there is a feasible non-demolition option.

As determined necessary by the City, environmental documentation (e.g., CEQA documentation) prepared for future development within the project site shall reference or incorporate the findings and recommendations of the technical report or memorandum. The project applicant shall be responsible for implementing methods for eliminating or avoiding impacts on historical resources identified in the technical report or memorandum. The technical report or memorandum shall be submitted to the City for approval as part of the development application, and the Historic Resources Commission/Planning Commission shall base its decision about the validity of the building as a historical resource and any potential required mitigations based on that decision on the staff report, technical memorandum or report or other acceptable form of documentation.

CR-2 Implementation of the proposed project could cause a substantial adverse change in the significance of an archaeological resource or disturb human remains, including those interred outside of formal cemeteries; however, adherence to existing General Plan Goals, Policies, and Mitigations would reduce this to a less-than-significant impact. (LTS)

A cultural resources records search conducted by the NWIC identified numerous cultural resource surveys that have been conducted within and adjacent to the project site, but no significant historic or prehistoric archaeological resources were identified within the project site. PBS&J cultural resources staff requested the NAHC to search its sacred lands database to determine if any Native American cultural resources are located on or near the project site. The NAHC response letter stated that the search of the sacred lands database failed to indicate the presence of Native American resources in the immediate project area. The NAHC letter included a list of Native American organizations and individuals who may have knowledge of cultural resources in the project area. Letters that included a brief description of the project and a project map were sent to each organization/individual identified on the NAHC list. As of the printing of this document, PBS&J has received no responses from tribal representatives indicating the presence of Native American cultural resources in the project area. However, the absence of site-specific information in the sacred lands database or through correspondence with tribal representatives does not indicate the absence of cultural resources in the project area or in the immediate vicinity.

Based upon previous cultural resource surveys and research, the Pittsburg area has been inhabited by prehistoric and historic peoples for thousands of years, and the absence of recorded resources does not preclude the possibility that previously undiscovered prehistoric or historic-period archeological resources or human remains could be present and adversely affected by development of the project area (e.g., grading, excavation, trenching, and other earth-disturbing activities). Given the intensity of prehistoric and historic-period use and occupation of the project area, the project area is considered sensitive for previously undiscovered or unrecorded cultural resources and human remains. The *General Plan* includes goals and policies to reduce potential impacts to archeological resources to a less-than-significant level.

General Plan Policy 9-P-39: Requires that development proposals in areas of known resources acquire records reviews and limitations to development and accounting for resources when applicable.

General Plan Policy 9-P-40: Requires the preparation of a resources mitigation plan and monitoring program by a qualified archeologist in the event that archeological resources are uncovered.

General Plan Policy 9-P-41: Requires that all construction shall be halted immediately and an archeological investigation be conducted in the event that archeological resources are found during ground breaking activities for new development. Potential impacts on archaeological resources from project-related earth-disturbing activities are, therefore, considered less-than-significant through the adherence to existing *General Plan* Goals, Policies and mitigations.

Cumulative Analysis

The cumulative context for the cultural resources analysis includes the East Contra Costa County region as a whole. While the project-specific impact analysis for cultural resources necessarily includes separate analyses for historic-period resources and archaeological resources, the cumulative analysis combines these resources into a single, non-renewable resource base and considers the additive effect of project-specific impacts to significant regional impacts on cultural resources.

CR-3 The proposed project, in combination with other projects in East Contra Costa County region, could cause a substantial adverse change in the significance of cultural resources. (LTS)

Because all cultural resources are unique and non-renewable members of finite classes, all adverse effects or negative impacts erode a dwindling resource base. Federal, state, and local laws protect cultural resources in most instances. Even so, it is not always feasible to protect cultural resources, particularly when preservation in place would frustrate implementation of projects. For this reason, the cumulative effects of development in the East County region are considered significant. However, the *General Plan* EIR (2001) identified that with the policies included in the General Plan, that the potential for development under the General Plan to cumulatively impact archeological resources would be reduced to a less-than-significant level. The potential impacts to archeological resources from the increased density permitted by the proposed project are congruent with the City of Pittsburg's General Plan and would be subject to the same goals and policies of the General Plan related to historical and cultural resources. Such policies, which were included as mitigation measures in the General Plan EIR, require the records reviews for development in areas of known archeological resources, immediate cessation of construction activities upon discovery of archeological resources, and the preparation of a resources mitigation plan and monitoring program by a qualified archeologist in the event that archeological resources are uncovered. Given existing General Plan goals, policies and mitigations in place to protect archeological remains, and that fact that each future new development project within the Specific Plan Area would undergo project-specific CEQA review as part of the Design Review project, this cumulative impact would be *less than significant* for archeological resources and remains.

Implementation of Mitigation Measure CR-1.1 would substantially limit the project's contribution, and this cumulative impact on historical resources would be less-than-significant. This mitigation measure would require that the Historic Resources Commission/Planning Commission or a qualified professional to conduct site-specific cultural resource investigations for applicable future developments within the project site. The investigations shall include, but not be limited to, the preparation of technical reports or memoranda or staff report, that

includes specific methods for eliminating or avoiding impacts on cultural resources if it is determined that the subject building is a historical resource under local and State criteria.

3.6 PUBLIC SERVICES

Introduction

This section identifies the public services impacts of the Railroad Avenue Specific Plan. For the purposes of this analysis, public services include (a) police protection, (b) fire protection, (c) school capacity, (d) libraries, (e) community centers, and (f) parks, public recreational facilities and open space resources.

Agencies providing these public services and utilities were contacted to obtain information regarding available service levels, and current or anticipated service changes or constraints that may arise from adoption of the proposed project. Potential impacts to public services are evaluated during the short-term construction and long-term operation of the proposed project. One comment letter was received on potential public service impacts during the public comment period. This letter related to public school facilities and the Pittsburg Unified School District's potential inability to serve the new residents without funding for school expansion and operations, particularly at the elementary and junior high school levels. The potential impact to schools is discussed below.

Setting

Police Services

Police services in the City are provided by the Pittsburg Police Department. The Pittsburg Police Department (Department), located at 65 Civic Avenue, provides assistance on calls within the City and responds to requests for mutual aid and safety cover for officers of the Contra Costa County Sheriff (safety officers for the community of Bay Point), the Contra Costa Community College District Police, and BART Police.

The Department is currently staffed by 76 sworn officers, including seven administrative officers, two Code Enforcement officers and two School Resource officers; and 28 non-sworn employees. According to ABAG data, the City of Pittsburg's 2005 population was approximately 62,400, and is projected to rise to 78,100 by the year 2030 (an increase of approximately 15,700 residents or 25.2 percent).[1] Currently, police staffing is at a ratio of 1.2 officers per 1,000 residents. The City of Pittsburg General Plan, Policy 10-P-39 goal is to "strive to maintain a ratio of 1.8 sworn police officers per 1,000 residents".[2] Using the Association of Bay Area Government's (ABAG's) population data as the basis for analysis,[3]

[1] Association of Bay Area Governments, *Projection 2007*, December 2006.

[2] City of Pittsburg. Pittsburg 2020: A vision of the 21st Century. City of Pittsburgh General Plan. 2004.

[3] Association of Bay Area Governments, *Projection 2007*, December 2006.

there is currently a shortfall of officers in the City of Pittsburg.[4] In telephone communications with the City of Pittsburg Police Department, a spokesman[5] stated that the Department is currently effective and supported by the community, but observed that an addition of ten officers would increase the Department's effectiveness in the near term.

The City is divided into nine beat districts, with one patrol officer assigned to each beat district. Beat officers also provide assistance to the beat officers in other beat areas. The project area sits generally within beat districts two, three, and six. Three patrol officers are currently assigned to these beats.

Fire Protection and Emergency Medical Response

Fire protection and emergency medical services in the Specific Plan Area are provided by the Contra Costa County Fire Protection District (CCCFPD). CCCFPD follows the nationally recognized standard that they "shall have the capability to deploy an initial full alarm assignment within an 8-minute response time to 90 percent of the incidents."[6] This response time standard assumes that the fire personnel and equipment are in quarters (i.e., at their fire stations) and are not on other emergency calls. All CCCFPD firefighters are licensed Emergency Medical Technicians (EMT) who are trained to provide basic emergency medical services. CCCFPD firefighters are also trained to respond to hazardous materials incidents. Additionally, CCCFPD has a mutual aid agreement with the East Contra Costa Fire Protection District (ECCFPD) for emergency response.

The CCCFPD serves an area greater than the City of Pittsburg, and includes the cities of Antioch, Clayton, Concord, Lafayette, Martinez, Pleasant Hill and San Pablo. It also serves all unincorporated areas nearby the above-mentioned cities, including Alamo, Bay Point, El Sobrante, North Richmond and Pacheco. The entire Fire District consists of approximately 406 personnel, including 344 uniformed personnel with 12 Battalion Chiefs, and approximately 62 civilian personnel. In 2007, CCCFPD was dispatched to approximately 57,000 calls for service, of which approximately 46,800 were Emergency Medical Service (EMS) calls. The remaining calls were related to structure fires, hazards, public services, mistaken alarms, false alarms and other non-fire calls.[7]

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4 Note that the use of a ratio comparing police officers to 1,000 residents is somewhat artificial, as it does not reflect the number of policing hours that are, or will be, spent on policing local businesses and their non-resident patrons. While the current ratio-based staffing formula does not directly consider policing requirements of commercial floor area, existing businesses and residents are both effectively policed under the current ratio. It is therefore apparent that the ratio has been adjusted to allow for both resident and business policing, despite the ratio's apparent reference to the resident population only. This ratio therefore remains an effective tool for determining proper police staff levels if the Railroad Avenue Specific Plan is approved, and is a standard ratio employed by agencies to establish police levels in California cities.

5 Telephone communication, September 3, 2008, Lieutenant Wade Derby.

6 National Fire Protection Association, NPFA 1710, Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public, 2001.

7 Ted Leach, Fire Prevention Technician, Contra Costa County Fire Protection District, electronic communication, October 10, 2008.

The City of Pittsburg is served by Battalion 8, which has three stations located in the City of Pittsburg itself. The three fire stations operated by CCCFPD are Stations 84, 85 and 87.[8] During 2007, Stations 84, 85 and 87 responded to a total of 4,423 calls, of which 2,925 involved EMS, 873 were mistaken alarms, 196 were calls for public services, 104 were calls for false alarms, and 25 were for other non-fire related services. Less than 75 calls were related to structure or vegetation fires.

Two of the three Pittsburg fire stations will serve the project area. Station 84, which is currently located in downtown Pittsburg, will be relocated to Railroad Avenue and Civic Avenue in the High School subarea, across the street from the Civic Center subarea. Station No. 85, which is currently located within the project area at 2555 Harbor Street, is being relocated to Loveridge Road, just south of Leland Road. The entire Specific Plan Area will be within a maximum 1.5 mile response radius called for under the *General Plan* (see General Plan Figure 11-2), and will be subject to approximately 1.5 to 2.5 minute response times for fire service. The new Station 85 is currently under construction, and the existing station house will remain in operation until the new building is completed. Station 85 is equipped with one Type 1 engine company (Engine 85) which is equipped to respond to structure fires, including those that require a taller-than-conventional ladder for firefighting access. Station 85 also has one Type 3 wildland unit, equipped to respond wildland fires as well as provide additional manpower on structure fires and otherwise support the Type 1 fire engines. The station is staffed by three personnel, 24 hours per day. A standard 24-hour shift is staffed by one Captain, one engineer and one firefighter/paramedic.[9]

Schools

The City of Pittsburg is served by three school districts: Pittsburg Unified School District, Antioch Unified School District, and Mt. Diablo Unified School District. The Specific Plan Area is served solely by the Pittsburg Unified School District (PUSD). The PUSD is a K – 12 district with eight elementary schools, three junior high schools, one comprehensive high school and one continuation high school. The elementary schools include Foothill Elementary, Heights Elementary, Highlands Elementary, Los Medanos Elementary, Marina Vista Elementary, Parkside Elementary, Stoneman Elementary and Willow Cove Elementary. The two middle schools are Hillview Junior High and Rancho Medanos Junior High. Pittsburg High School is the primary high school in the City. Of these schools, only three physically fall within the Specific Plan Area: Los Medanos Elementary School, Parkside Elementary School, and Pittsburg High School. The PUSD also provides adult education in English as a Second Language (ESL), Adult Literacy, General Education Development (GED) preparation, career training, and related courses.

The project would be served by three elementary schools. The Parkside Elementary School would serve new residents in the Civic Center subarea. Heights Elementary School and Los Medanos Elementary School would serve the Transit Village subarea. Middle school students would attend either

[8] Ian Hardage, Fire Prevention Technician, Contra Costa County Fire Protection District, email correspondence with Bay Area Economics, January 24, 2007.

[9] Ted Leach, Fire Prevention Technician, Contra Costa County Fire Protection District, electronic communication, October 10, 2008.

Rancho Medanos Junior High School or Hillview Junior High School. All high school students in the Specific Plan Area would attend Pittsburg High School. Table 3.6-1 summarizes the schools and enrollment that would serve development in the Specific Plan Area.

The Marina Vista Elementary School opened for first classes in the Fall of 2008. This new school is expected to serve the downtown area. A new junior high school, Rancho Medanos, opened in the Fall of 2008 replacing Central Junior High School. While the student capacity levels have not yet been set for either of these schools, the addition of Marina Vista and Rancho Medanos Junior High School are expected to reduce the burden on the current schools and would provide additional capacity to be filled, in part, by the new residents in the Specific Plan Area.[10]

Table 3.6-1
Schools within or near Specific Plan Area and Enrollment: 2007-2008

School	2007-2008 Student Enrollment
Los Medanos Elementary School	625
Heights Elementary School	578
Parkside Elementary School	578
Marina Vista Elementary School*	NA
Rancho Medanos Middle School	NA
Hillview Middle School	1,018
Pittsburg High School	2,494
Pittsburg Unified School District	**9,451**

Source: California Department of Education. DataQuest. http://data1.cde.ca.gov/dataquest/page2.asp?level=School&subject=Enrollment&submit1=Submit. Accessed November 17, 2008.

Notes:

*: Marina Vista Elementary School and Rancho Medanos Middle School opened Fall 2008. No enrollment data is available for 2007-2008.

Libraries

The Pittsburg Library is the community library that serves the City of Pittsburg, including the Specific Plan Area. The Pittsburg Library is a branch of the Contra Costa County Library and is located in the Civic Center Plaza, within a quarter mile of the center of the Specific Plan Area and the proposed eBART station at Railroad Avenue. The Pittsburg Library hours of operation are:

- Monday: 12:00 p.m. – 8:00 p.m.
- Tuesday, Wednesday and Thursday: 10:00 a.m. – 8:00 p.m.
- Friday: 12:00 p.m. – 6:00 p.m.
- Saturday: 10:00 a.m. to 6:00 p.m.
- Sunday: Closed

[10] Tim Galley, Director of New Construction Facilities, Maintenance Ground, Technology, E-rate and CTE, Pittsburg Unified School District. Electronic communication, October 16, 2008.

The library experiences high neighborhood patronage levels for a library of its size, due to its convenient location and easy access when compared to other branches of the Contra Costa Library system in cities of a similar size. Library data indicate that there were 23,165 library patrons during the month of June 2008. Although this total patronage count includes repeat patrons, this constitutes gross patronage equivalent to 36 percent of total population levels and reflects a one-percent increase in year-over-year patronage levels (from June of 2007 to June of 2008). Of the 23,165 patrons, approximately 11,584 borrowed library materials, equivalent to 18 percent of the total population; this reflects a one-percent increase in year-over-year borrowing levels. Of those patrons who did not borrow library materials, many used library computers for activities such as job-hunting, filling out job applications, completing homework, and research. Other patrons came to the library for special activities and programs, such as legal counseling and children's book events.

Recreational and Cultural Programs

There are three community centers within the City of Pittsburg, two of which are located within the Specific Plan Area: the Pittsburg Community Center for Senior Services at 300 Presidio Lane (the southwest corner of E. Leland and Harbor Streets) and the Pittsburg Community Center Teen Services within City Park. The Pittsburg Community Center for Senior Services is located approximately 0.5 miles, and the Pittsburg Community Center Teen Services approximately 0.4 miles, from the proposed Railroad Avenue eBART station, which sits at the center of the Specific Plan Area. In addition, the Buchanan Park Community Center at 4150 Harbor Street is readily accessible to Specific Plan Area residents although it is outside of the Specific Plan Area (south). The Buchanan Park Community Center is approximately 1.25 miles south of the proposed Railroad Avenue Station and is available for general public use. At present, these community centers are used to host a variety of community events and leisure time activities. In the 2005-06 Fiscal Year, 517 residents participated in recreation classes, 8,737 residents participated in the swim program, and 320 residents participated in the softball program.[11]

Parks

The City of Pittsburg is 18.35 square miles in size, of which 17.3 square miles are on land, and the remainder is a marina on the Sacramento Delta. On its 17.3 square miles of land base, the City has 312 acres of parks and recreational facilities, contained in 24 parks and recreation areas. It has 10 miles of landscaped street medians and public planter beds, and five miles of public trails.

Pittsburg's Public Works Department manages the maintenance of the City's park facilities, and the Recreation Department manages the operation of the parks. The Development Services Department is responsible for acquisition and development of park facilities.

[11] *Public Review Draft, East Contra Costa County Sub-Regional Municipal Service Review and Sphere of Influence Updates*, Contra Costa Local Agency Formation Commission, August 28, 2008.

All of the City's neighborhood parks are located near collector streets in residential neighborhoods, while community parks line arterial roadways and serve the larger City population. City Park, the largest park located within the Specific Plan Area at 28 acres, is a community park that lies between the Civic Center and downtown Pittsburg, and features several baseball diamonds, volleyball courts, an all weather soccer field, and a large group picnic area with a bandstand. The Specific Plan Area also contains Small World Park (8 acres) and the northeastern boundary of the specific plan area is the western boundary of Central Park (8 acres).

Applicable Plans, Policies and Regulations

City of Pittsburg General Plan

The following policies of the City of Pittsburg *General Plan* are applicable to the proposed project:

Health and Safety Element. The General Plan contains the following policies that would be directly related to implementation of the Specific Plan:

- **General Plan Policy 10-P-36**: Maintain, modernize, and designate new sites for emergency response facilities, including fire and police stations, as needed to accommodate population growth.

- **General Plan Policy 10-P-39**: Strive to maintain a ratio of 1.8 sworn police officers per 1,000 residents.

Public Facilities Element. The Specific Plan Area is in an urbanized part of the City where there is minimal risk of wildfires. There is one existing and one planned fire station in the Specific Plan Area (General Plan Figure 11-2); therefore, the entire Specific Plan Area falls within the 1.5 mile response radii area for fire services consistent with General Plan Policy 11-P-26.

Open Space, Youth and Recreation Element. The *General Plan: Open Space, Youth, and Recreation Element* outlines the City's approach to developing parks, open spaces and trails, and the City's approach to supporting recreational, cultural, and educational programs and facilities. The goals and policies are further split under several categories, including those listed below:

Education Facilities

- **General Plan Goal 8-G-10**: Ensure that school facilities maintain adequate capacity to provide for current and projected enrollment.

- **General Plan Policy 8-P-41**: As part of development review for large residential subdivisions (greater than 100 units), evaluate the need for new school sites. If needed, encourage subdivision design to accommodate school facilities and cooperate with the school district in acquisition of those sites.

- **General Plan Policy 8-P-42**: Cooperate with local school districts to develop joint school/park facilities, which provide an increased variety of recreational opportunities close to many residential areas. Additionally, work with school districts to develop public parks adjacent to school facilities.

- **General Plan Policy 8-P-45**: Promote use of the educational and cultural resources available at the Pittsburg Library.

Parks

- **General Plan Goal 8-G-2**: Develop a high-quality public park system for Pittsburg that provides varied recreational opportunities accessible to all City residents (General Plan Goal 8-G-1) and provide parks that reflect the diversity of Pittsburg's natural setting, including creeks and waterways, tree stands, rock outcroppings, and topography.

- **General Plan Policy 8-P-1**: Maintain a neighborhood and community park standard of 5 acres of public parkland per 1,000 residents.

- **General Plan Policy 8-P-2**: Pursue the development of park and recreation facilities within reasonable walking distance of all homes.

- **General Plan Policy 8-P-3**: Develop public parks and recreational facilities that are equitably distributed throughout the urbanized area, and provide neighborhood recreation facilities in existing neighborhoods where such facilities are presently lacking.

- **General Plan Policy 8-P-4**: Consider park accessibility, use and character as more valuable than size in the acquisition and development of new parks.

- **General Plan Policy 8-P-5**: Maintain park and recreation facility standards for new development to serve both residents and employees, attainable through dedication of parkland or payment of in-lieu fees.

- **General Plan Policy 8-P-7**: Encourage the development or provision of facilities that cater to diverse recreational interests.

- **General Plan Policy 8-P-11**: Encourage dedication of fully developed parks rather than in-lieu fees. When in-lieu fees are collected, ensure that they are spent acquiring and developing new park sites or enhancing existing park facilities.

- **General Plan Policy 8-P-12**: Ensure that all parks acquired through dedication are at least 2 acres in size within new residential developments (target 5 acres). Accept smaller visual open space areas in new commercial and industrial development for parkland dedications.

- **General Plan Policy 8-P-16**: Encourage dedication of public parks in new residential developments with more than 150 units.

Recreational and Cultural Programs

- **General Plan Goal 8-G-9**: Provide a diversity of recreational and cultural opportunities, including facilities and programs targeted toward local youth and senior residents (General Plan Goal 8-G-8), and promote the arts as an integral component of Pittsburg's quality of life, economic vitality, and efforts to build a safe and healthy community.

- **General Plan Policy 8-P-27**: Locate community facilities in and adjacent to public parks, where possible. Encourage community organizations to utilize these and other park facilities for recreational and cultural activities.

- **General Plan Policy 8-P-34**: Explore and develop new funding options for maintenance of public art, in partnership with private developers.

- **General Plan Policy 8-P-35**: Encourage collaboration among artists, art organizations, and other community partners, including businesses, educational institutions, and individuals, for acquisition and maintenance of public art.

- **General Plan Policy 8-P-38**: Support the preservation, maintenance, and development of community cultural facilities that provide gathering places for cultural exploration, expression, and inspiration.

Railroad Avenue Specific Plan

The Specific Plan contains proposed goals and policies related to parks, open space, and recreation including the following:

- **Specific Plan Goal 5-G-1**:Provide a range of parks, open spaces and public facilities in the Specific Plan Area to meet the diverse needs of residents, employees, students and visitors.

- **Specific Plan Goal 5-G-2**: Design and install facilities specifically oriented towards meeting the needs of area youth.

- **Specific Plan Policy 5-P-1**: Integrate high quality public facilities including public meeting places, a teen center and an upgraded library into the area to support the needs of visitors, workers, students and residents.

- **Specific Plan Policy 5-P-2**: Require new development in the Transit Village and Civic Center sub-areas to dedicate land or to build the proposed public pathways and trails into new development to create a strong network of parks, plazas and pathways that are consistent with those shown on the Land Use Plan.

- **Specific Plan Policy 5-P-4**: Work with the Pittsburg Unified School District, the Contra Costa County Courts and other institutional partners to identify opportunities for joint facility use and cooperative facility planning.

- **Specific Plan Policy 5-P-6**: Allow installation of public art to fulfill a portion of the landscaping and parkland dedication requirements for commercial and mixed use developments at the discretion of the City Planner, Planning Commission or City Council, as appropriate.

Impact Assessment and Mitigation Measures

Standards of Significance

The proposed project would result in significant public service impacts if the project would trigger the need for new police, fire department, school facilities, libraries or parks in order to maintain acceptable service ratios, response times, adequate education and recreation facilities, and the construction of those facilities were to cause significant environmental impacts.

Environmental Analysis

For each potential impact associated with the proposed project, a level of significance is determined and is reported in the impact statement. Conclusions of significance follow the statements of impact, and are defined as follows: significant impact (S), potentially significant impact (PS), less than significant (LTS), or no impact (NI). For each impact identified as being significant (S) or potentially significant (PS), the EIR provides mitigation measures to reduce, eliminate, or avoid the adverse effect. If the mitigation measures would reduce the impact to less-than-significant (LTS) level successfully, this is stated in the EIR. If the mitigation measures would not diminish significant or potentially significant impacts to a less-than-significant level, the impacts are classified as "significant unavoidable impacts (SU)." For this section, the italicized PS impact heading refers to public services (and not a "potentially significant" impact level).

PS-1 The Specific Plan would require an increased level of police services. However, the increased level of police services would not be large enough to trigger the need for construction of new facilities that could adversely affect the physical environment, or affect human health and safety. Impacts would be less than significant. (LTS)

The City of Pittsburg Police Department (Department) does not have excess capacity, as defined in the City's Municipal Plan. The Department would, therefore, have to add officers to patrol the development and new residents proposed in this project.

The proposed Specific Plan would allow construction of 1,845 households by 2030. ABAG estimates, in *Projections 2007,*[12] that average household size in 2030 will be 3.07 people, so the addition of the forecasted 1,845 households would bring approximately 5,664 new residents

[12] Association of By Area Governments, *Projection 2007*, December 2006.

to the project area. To comply with the City of Pittsburg's ratio of 1.8 officers per 1,000 residents (per General Plan Policy 10-P-39), ten additional police officers would be required to serve the 5,664 new residents anticipated upon build-out of the Specific Plan Area.

In August 2005, the City of Pittsburg authorized a special tax on all new development (special tax No. 2005-1), to fund a Community Facilities District (CFD). This annual special tax pays for new authorized police services in the City. These services include police protection for the residents of the CFD (both sworn and non-sworn personnel), as well as equipment and support staff, to deliver patrol, investigations, community policing, traffic, criminal justice, and code enforcement services. The special tax applies to all new residential and non-residential development as well as expansions of existing development that will result in new, occupied square footage. These revenues would provide the funding for the ten additional officers and policing infrastructure needed under Specific Plan build-out conditions (2030). No other police services would be required and, therefore, no additional mitigation would be required to ensure adequate police staffing levels upon adoption of the Specific Plan.[13]

Current Department facilities would have sufficient capacity to house the additional ten police staff required to meet project-related demand.[14] No new facility would be required to house new staff, the construction of which could result in an impact to the environment.

Impacts on police services, as a result of the adoption of the proposed Specific Plan, would be less than significant.

PS-2 The Specific Plan could increase the need for fire protection and emergency response during operations; however, the increased demand would not result in the expansion or construction of facilities that would result in a physical effect. (LTS)

The Specific Plan Area is served by Station 85, a part of Battalion 8. Station 85 is equipped with one Type 1 engine company (Engine 85) and one Type 3 wildland unit Type 3 wildland units fight wildland fires, provide additional manpower on structure fires, and carry a second rescue tool (support) to the Type 1 fire engines. Type 1 fire engines are equipped with a turntable ladder, which is used to gain access to fires occurring at height, where conventional ladders carried on other appliances might not reach. The station is staffed with three personnel, 24 hours per day. The three CCCFPD fire stations located within the City of Pittsburg keep nine firefighters on active duty on a daily basis.

The proposed development associated with the Specific Plan would include 1,845 new residential units and approximately 988,449 square feet of new commercial space. Per ABAG's projections,[15] and as mentioned under Impact PS-1, the 1,845 new households would result in approximately 5,664 new residents in the Specific Plan Area.

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13 City of Pittsburg. City Council. Resolution No. 05-10343. August 2005.

14 Ibid.

15 Association of By Area Governments, *Projection 2007*, December 2006.

For all new development within the Contra Costa County, the CCCFPD imposes a fire facility impact fee of $235 per residential unit, and $0.15 per square foot for other commercial and industrial development. The fire facility impact fee is collected at the time of building permit issuance, and provides a funding source from new development for fire protection capital improvements to serve new development. The fee assures that new development within Contra Costa County (such as that in the Specific Plan Area) is provided with adequate fire protection facilities and services. The fire facility impact fee would ensure that Battalion 8, which serves the Specific Plan Area, is adequately staffed and equipped with fire engines and other vehicles, and has all the necessary medical response, hazardous materials, training, and other specialized fire fighting equipment to serve the Specific Plan. [16]

Because the CCCFPD would be adequately staffed and equipped, and facility expansions in order have already been planned and funded, no new expansion or construction of facilities would be needed to house local firefighters. Impact fees collected from future development within the Specific Plan would fund new firefighters, equipment, and facilities to respond to fire-fighting needs of new development in the proposed Specific Plan area; therefore, the proposed Specific Plan would result in less-than-significant impact with regards to fire protection and emergency response.

PS-3 The Specific Plan would increase the number of school children in the area of the proposed development; however, the new development under the proposed Specific Plan would be subject to SB 50 School Impact Fees, which would mitigate impacts to less than significant. (LTS)

The project proposes the addition of 1,845 new residential units. The State of California has determined that housing units yield approximately 0.7 students per unit.[17] Applying this factor to the 1,845 units that would potentially be built within the proposed Specific Plan Area yields approximately 1,287 students anticipated to enroll in PUSD schools.

If an equal proportion[18] of these students joins each of the thirteen grade levels (from K – 12), approximately 594 children of these students would be expected to attend local elementary schools, 297 children would be expected to attend local middle schools and 396 children would be expected to attend Pittsburg High School.

[16] Contra Costa County Fire Protection District. Fire Facilities Impact Fee Study and Report. October 11, 2005.

[17] State of California Enrollment Certification/Projection, School Facility Program, Form SAB 50-01, http://www.documents.dgs.ca.gov/opsc/Forms/SAB_50-01.pdf, accessed August 13, 2008.

[18] The equal proportion refers to the total students generated by the proposed project (1,287) divided by thirteen (the number of total grades, K-12), and then multiplied by number of grades accommodated at each schooling tier, e.g. elementary school (grades K – 5), junior high school (grades 6 – 8), and high school (grades 9 – 12).

The project would be served by three elementary schools. The Parkside Elementary School would serve new residents in the Civic Center subarea. Highlands Elementary School and Los Medanos Elementary School would serve the Transit Village subarea. Middle School students would attend either Rancho Medanos or Hillview Middle School. All high school students would attend Pittsburg High School, which has a current enrollment of 2,494 students.

While an addition of 1,287 students to PUSD would be considered a potentially significant increase that could impact the capacity of the schools serving the area of the proposed Specific Plan, the new residential and commercial development would be subject to SB 50 School Impacts fees to fund acquisition of land, and construction, maintenance and operating costs of schools, and new project area residents would be subject to taxes to help finance the maintenance and operations of the schools. These funding sources would reduce any potential impact to less-than-significant levels.

Proposition 1A/Senate Bill 50 (SB 50 – Chapter 407, Statutes of 1998) is a school construction measure that defines the Needs Analysis process in Government Code Sections 65995.5-65998. Under the provisions of SB 50, school districts may collect fees to offset the costs associated with increasing school capacity as a result of development. Under this statute, payment of statutory fees by developers would serve as total mitigation, under CEQA, to satisfy the impact of development on school facilities. Because the anticipated increase of student enrollment that would result from the new development would be fully mitigated under the terms of SB 50, the project would have a less-than-significant impact on area schools.

PS-4 The proposed Specific Plan development would not result in the construction or expansion of libraries or other community services, which could in turn result in adverse environmental impacts. (LTS)

Library. The Pittsburg Library is the community library that serves the City of Pittsburg, including the Specific Plan Area. Total library use is expected to rise as residents move into the new homes proposed by the Specific Plan. Patrons and employees of new commercial space in the Civic Center and Transit Village subareas would also have easy access to the library. Library use by new and existing Pittsburg residents, as well as non-resident employees, would likely rise as a result of the proximity of the library to the transit hub, and the project's emphasis on creating a more pedestrian-friendly environment within the Specific Plan Area.

A library expansion project is included in the Specific Plan project to serve additional patrons, and would ensure that the proposed Specific Plan development would have a less-than-significant impact on library services in the City of Pittsburg. The proposed development and expansion of the library facility, from approximately 7,100 square feet to 11,900 square feet, would be located in the ground floor of the Civic Tower office building on the southeast corner of the Civic Center block within a quarter of a mile of the planned eBART station. Specific construction impacts of the Civic Tower building were analyzed under a separate environmental review, but this project was also included in the current analysis for its potential to contribute to traffic, air quality and noise impacts. The development and improvement of the

library facilities, to the extent proposed under the Specific Plan would mitigate potential public service impact to libraries as a result of implementation of the Specific Plan. There would be no significant impacts to library services, as a result of implementation of the proposed Specific Plan.

Community Centers. Community centers, such as the Pittsburg Community Center for Senior Services and the Pittsburg Community Center Teen Services would also see an increase in usage with the new development. The increase in usage to the community centers could result in the need for new or expanded facilities, which would be deemed potentially significant.

The Specific Plan recommends specific goals and policies to expand and improve community facilities to provide a range of recreational opportunities for residents and visitors to the Specific Plan Area. The land use plan for the Specific Plan Area features school grounds and community facilities. These open space and community resources would be linked via a network of dedicated pedestrian greenways, trails, and pedestrian-friendly corridors both within the Specific Plan Area and to the rest of the City through existing and planned bicycle routes, sidewalks, and trails. Three specific improvements to community center facilities and services are identified in the Specific Plan, which would provide additional community facilities and amenities. These projects are:

- Relocate the Teen Center from Railroad Avenue and Power Avenue to a new facility at City Park or other appropriate location.
- Continue to provide resources for and operate the Senior Center in its current location.
- Coordinate with Pittsburg Unified School District to use fields and other school facilities at Parkside Elementary School, Los Medanos Elementary School, and Pittsburg High School as amenities available to the entire community during school off-hours.

There is no potential for a physical impact to the environment as a result of the implementation of these projects due to the fact that continued operations would be maintained within existing facilities. The Specific Plan would call for more efficient use of the facilities or a sharing of the facilities for multiple uses (i.e. courthouse as public meeting space, school district offices as training facility). The expanded use of these existing facilities could require additional use of resources, to support building systems during expanded hours of operations (including increased heating, ventilation, and water needs). However, the new activities that would be accommodated in these existing facilities would otherwise potentially require new development and construction to create alternative facilities in which they could be accommodated. Therefore, despite the potential increase in resource use to support additional use of the existing facilities, the intensification of these facilities' use would have an overall beneficial indirect impact on the environment. Therefore, these community amenity improvements would generally have a less-than-significant impact on the environment.

The analysis performed for this EIR does not include a project-level review of the aforementioned public facilities improvements and library relocation/expansion, but focuses on program-level impacts. Other than the specific projects just mentioned, no project-level environmental analysis is included in this EIR. All projects proposed in the Specific Plan area will be subject to separate environmental review under CEQA, at the time the specific projects are submitted to the City of Pittsburg.

PS-5 The proposed Specific Plan development would result in increase in population which would require the need for additional open space and parks. (LTS)

The City of Pittsburg has about 394.4 acres of parkland in the City park system.[19] These parks range in size from one quarter-acre mini-park to the 190-acre Stoneman Park. The Delta De Anza Trail runs east-west through the City for nearly 4.8 miles along the Mokelumne Aqueduct, and approximately 78 acres of this trail lie within the City of Pittsburg. The Eight Street Linear Park is a linear greenway that runs through the City's older neighborhoods in and near downtown. City Park and Small World parks are located within the Specific Plan Area, while Central Park is located at the northeastern boundary of the Specific Plan Area. The City of Pittsburg *General Plan* sets a neighborhood and community park standard of five acres per 1,000 residents. According to ABAG, the City of Pittsburg had a population of approximately 62,400 in 2005,[20] at which time, the City of Pittsburg's 394.4 acres of existing and planned parkland met the desired ratio of 5 acres per 1,000 residents. As of today, the City of Pittsburg continues to meet the desired ratio of 5 acres per 1,000 residents.

The Specific Plan proposes to add 1,845 new residential units, which would introduce approximately 5,664 new people to the area, resulting in a city total of about 70,000 (population for 2008 is estimated to be approximately 64,500). (This is assuming there would be 3.07 people per household, as per ABAG expectations provided in *Projections 2007*.) Per the city park standard in the General Plan, the minimum acreage needed to satisfy the 5 acres per 1,000 residents would be 350 acres. The Specific Plan would add approximately 5 acres of open space and parklands (described below), which would bring the new total of parkland and open space acreage, including trails, to 399.4 acres, which would adequately meet the ratio of 5 acres per 1,000 residents. Furthermore, City Park is a 28 acre park set near the middle of the Specific Plan area, and Small World Park is a five acre park just southeast of the Transit Village sub-area. With the addition of 5 acres of new parkland in the Specific Plan area, there would be a total of 38 acres of parkland located within the Specific Plan Area, and 33 acres of parkland within ½-mile of the planned eBART station. This maximum ½ mile walking distance is consistent with the City's *General Plan*. As such, the proposed Specific Plan would not produce a need for construction of new parks and/or open spaces, and would have no potential

[19] Acreage includes park facilities within the City of Pittsburg, as specified in the City of Pittsburg General Plan. Park facilities include community parks, neighborhood parks, mini parks, and trails/trailheads. Trails/trailheads include the Delta De Anza trail, which is approximately 78 acres.

[20] Association of By Area Governments, *Projections 2007*, December 2006.

park construction-related impact on the community and the environment. No impacts are expected to occur on open space and/or recreation facilities.

The Specific Plan recommends specific goals and policies to expand open space and facilities in the area, to improve existing parks and facilities, and to provide an enjoyable transit experience for riders. The land use plan for the Specific Plan Area features pocket parks, transit plazas, city parks, playfields, school grounds, and community facilities. These open space and community resources would be linked via a network of dedicated pedestrian greenways, trails, and pedestrian-friendly corridors both within the Specific Plan Area and to the rest of the City through existing and planned bicycle routes, sidewalks, and trails. These projects are:

- A large plaza near the intersection of Railroad Avenue and Bliss Avenue;
- A secondary plaza on the north side of Bliss Avenue, midway between Railroad Avenue and Harbor Street with a connection to the multi-use path that runs parallel to Highway 4;
- A 1.5-acre neighborhood park between Bliss Avenue and Garcia Avenue, with potential program elements such as a basketball court, benches and tables, interactive water features, and both hardscape and landscape;
- Two greenways that run north to south from Garcia Avenue to East Leland Road that provide Transit Village residents and visitors with pedestrian-friendly connections to commercial businesses along East Leland Road;
- A multi-use pathway along the north side of SR 4 from Davi Avenue to Railroad Avenue;
- A 12-foot-wide multi-use pathway along the south side of SR 4 between Railroad Avenue and Harbor Street;
- A 12-foot-wide multi-use pathway within the existing greenbelt along the west side of Railroad Avenue between SR 4 and the Delta De Anza Trail; and
- An east-west greenway from the western terminus of Clark Avenue that provides pedestrian-friendly connections for Transit Village residents to commercial services along Railroad Avenue.

While the Specific Plan calls for open space for recreational purposes, it is recognized that the Specific Plan Area is primarily urban infill and large open spaces would not be consistent with the high density character of the type of smart growth development being promoted within the Specific Plan Area, Therefore, the Specific Plan also calls for the installation of multi-use trails, outdoor plazas and hardscape areas as well as public art to fulfill a portion of the landscaping and parkland dedication requirements for commercial and mixed use developments at the discretion of the City Planner or Planning Commission, as appropriate (Specific Plan Policy 5-P-6).

Cumulative Analysis

No significant impacts to public services would result from the implementation of the Railroad Avenue Specific Plan. Police and fire services would automatically receive additional funding as a result of

development, so any potential impacts to Police and fire services would be essentially self-mitigating to the extent required with any new residential development in the project area. The proposed project's impacts to police and fire services would, therefore, not contribute to any cumulatively considerable impacts on the sufficiency of these services.

The library expansion, that would be part of the Specific Plan, would improve upon the library's current capacity to serve the community, when compared with current service levels, and would also ensure that the new development would be adequately accommodated by the community library system.

The proposed project, in combination with other projected development, would still satisfy the City's park standards in accordance with the General Plan. In addition, the Specific Plan calls for other types of open space that is unique to higher density urban spaces such as plazas, public art and a network of pedestrian and bicycle trails throughout the Specific Plan Area. The proposed project would, therefore, have no significant impacts to public services, when considered in a cumulative context.

3.7 UTILITIES

Introduction

Provision of adequate utilities such as water, drainage, sewer, power, and communication is important in serving the needs of communities. A guaranteed supply of these utilities ensures a safe, healthy, and attractive environment for existing and planned urban development.

This section describes the potential utilities impacts associated with the proposed Specific Plan. The utilities discussed in this section include drinking water, waste water, storm drainage, solid waste, communication, and electrical power.

One comment letter was received regarding Utilities, in response to the Notice of Preparation released on October 1, 2008. This letter requested that the number of additional units be clearly identified, for both the proposed project and project alternatives, so that these units and their needs can be considered as part of a wastewater treatment plant expansion plan.

Setting

Drinking Water

Water Supply and Storage. Contra Costa Water District (CCWD) supplies water to the City of Pittsburg from water diverted from Old River near Discovery Bay and Rock Slough near Knightsen.

The primary conveyance facility for CCWD water supply is the Contra Costa Canal which carries water from Rock Slough for deliveries throughout CCWD's service area. The Canal is approximately 48 miles long, with the major deliveries within the first 19 miles, which run from Rock Slough to the Shortcut Pipeline near the Bollman Water Treatment Plant. The first 4 miles of the canal are unlined and run from Rock Slough to Pumping Plant 1. The remaining reaches are concrete lined, with capacities ranging from approximately 22 cfs to 350 cfs. Four pumping plants within the first 7.1 miles of the canal lift water 124 feet to flow the remaining length of the main canal by gravity. The Ygnacio Relift Pump Station diverts water from the main canal into the 5-mile Ygnacio Loop. The canal has several in-line siphons, culverts, and check structures, as well as a 1/4-mile long tunnel. The Shortcut Pipeline conveys water from Reach 9 of the canal to the Bollman Water Treatment Plant and to the City of Martinez and Shell Oil Company as well as some smaller wholesale industrial customers.

CCWD's storage reservoirs include Mallard, Contra Loma, Martinez and Los Vaqueros. Mallard Reservoir provides water to Bollman Water Treatment Plant and is used as a storage facility for emergency use, flow regulation, and to provide blending of the different sources of supply during winter months when Mallard Slough water is used. The reservoir has a usable capacity of about 2,100 acre-feet, which is currently equivalent to about two weeks of supply during maximum demand. Contra Loma Reservoir is used primarily as a regulating reservoir for peak demands, short-term (1 to 7 days)

supplies and for emergency storage for CCWD's customers. The reservoir has an available capacity of about 1,700 acre-feet. Martinez Reservoir, located in the City of Martinez, is at the terminus of the Canal and the Shortcut Pipeline and provides regulating storage to capture flows from Canal operations. The Martinez Reservoir has an available capacity of about 230 acre-feet.

The Los Vaqueros Reservoir is a 100,000 acre-foot reservoir and is located eight miles south of the City of Brentwood. The reservoir stores higher quality Delta water for blending with the Delta supply during dry periods when sodium and chloride levels typically increase. Besides improving water quality for CCWD's approximately 510,000 customers, the reservoir stores water for emergency supply (minimum 3-month emergency supply) and for operational flexibility to protect fisheries.

CCWD's current contract for its entire service area is for 174 million gallons per day (mgd). CCWD has negotiated additional water rights with a number of local districts and private entities, including the East Contra Costa Irrigation District, to meet projected annual demands through 2040 through phased components.[1] With these augments, CCWD's total annual projected water supply would be 217 mgd.[2]

In addition to CCWD water supply, the City of Pittsburg supplements its water supply with groundwater from the Bodega Court and Rossmoor (located at Dover Way and Frontage Road) well, which has a yield of approximately 1.3 mgd. The City of Pittsburg also operates its own water supply treatment plant with a capacity of 32 mgd, sufficient to meet the 2020 maximum day requirements of 30.5 mgd.

Contra Costa Water District Urban Water Management Plan. The City of Pittsburg has included the development area and build-out demands for the proposed Specific Plan Area in its Urban Water Management Plans (UWMP). Water suppliers are required under the California Urban Water Management Act to develop an UWMP to pursue the efficient use of available supplies. The City of Pittsburg's UWMP identifies the availability of sufficient water supply to meet future needs projected to build out at 2030 under all conditions including normal, single dry year, and multiple dry years.

The UWMP is an update to the plan adopted by the District's Board of Directors in December 2000 and is prepared in compliance with the California Urban Water Management Planning Act. All publicly and privately owned water supplies that directly or indirectly provide water for municipal purposes to more than 3,000 customers, or supply more than 3,000 acre-feet annually, are required to prepare an UWMP. An UWMP is required in order for a water supplier to be eligible for Department of Water Resources (DWR) administered State grants and loans and drought assistance. The UWMP documents the District's planning activities to ensure adequate water supplies to meet existing and future demands for water. This five-year update of the UWMP incorporates the recommendations of the District's Future Water Supply Study, which was completed in 1996 and updated in 2002. The UWMP presents forecasted supplies and demands, describes the District's conservation programs, and identifies recycled water opportunities to the year 2030. As presented in the UWMP, Table 3.7-1 summarizes the

[1] Contra Costa Water District, *Future Water Supply Implementation Draft EIR*, 1998.

[2] City of Pittsburg, *General Plan, Pittsburg 2020: A Vision for the 21st Century*, 2004.

past, current and projected water demand for the CCWD District (by water use sectors). Table 3.7-2 summarizes the projected water supply through the year 2030.

Table 3.7-1
Past, Current and Projected Water Use (af/yr)

Water Use Sectors[a]	2000	2005	2010	2015	2020	2025	2030
Water Service Area							
Municipal	47,057	52,383	57,708	63,862	70,015	73,912	77,809
Major Industrial/Irrigation/Ag	34,836	53,507	72,177	72,177	72,177	72,177	72,177
Unincorporated Areas	233	259	284	305	326	349	371
Subtotal	82,126	106,148	130,169	136,344	142,518	146,438	150,357
Other Use Areas[b]	51,536	59,152	64,531	67,056	69,482	70,762	71,943
Total Service Area	133,662	165,300	194,700	203,400	212,000	217,200	222,300

Source: Contra Costa Water District. Urban Water Management Plan 2005, December 2005.

Notes:

a. This water use sector includes the City of Pittsburg, as well as Antioch, Bay Point, Brentwood, Martinez, and Oakley.

b. Walnut Creek and unincorporated areas

Table 3.7-2
Project Water Supply 2010-2030

	2010	2015	2020	2025	2030
Projected Supply (af/yr)	240,300	244,200	246,500	249,100	249,100

Source: Contra Costa Water District, Urban Water Management Plan 2005, December 2005.

Wastewater

The Delta Diablo Sanitation District (DDSD) provides sewer treatment service to the City of Pittsburg. The DDSD treatment plant is located north of SR 4, just east of the City of Pittsburg city limits. Existing DDSD wastewater treatment facilities have a capacity of 16.5 mgd. Additionally, the DDSD has adopted a District Master Plan that includes a phased treatment plant expansion to ultimately provide 24 mgd capacity (average dry weather flow) in order to accommodate anticipated growth in the City of Pittsburg, City of Antioch and unincorporated Bay Point.[3]

The City of Pittsburg 2005 Water and Sewer Facility Reserve Charges study indicates that in some areas, new development will connect to the existing wastewater infrastructure, while in other areas new infrastructure will need to be built.[4] The City of Pittsburg has planned for wastewater infrastructure needs through updated system master plans, the annual budget, rate structures, and five-year Capital

[3] City of Pittsburg, *General Plan; Pittsburg 2020: A Vision for the 21st Century*, 2004.

[4] Contra Costa Local Agency Formation Commission, *Water and Wastewater Services Review for East Contra Costa County,* 2007.

Improvement Program (CIP) that includes an annual water main/service/valve replacement program, and wastewater pipeline CCTV inspection program to extend the life of the infrastructure.[5]

Recycled Water

The DDSD Recycled Water Facility (RWF) provides tertiary treatment[6] in the process of reclaiming wastewater for use in cooling at power plants and landscape irrigation at several parks in Pittsburg. The RWF provides up to 8,600 acre-feet per year of tertiary treated water for use at two power plants and for irrigation at the Delta View Golf Course, Stoneman Park, and City Park within Pittsburg.[7] The Pittsburg Recycled Water Project included the construction of 2.5 miles of piping, a pump station and 1 million gallon recycled water tank at the golf course to deliver recycled water to select parks within the City of Pittsburg to offset irrigation demands for potable water.[8]

Storm Drainage

The cities of Pittsburg and Antioch, and the Contra Costa County Flood District own and operate a series of drainage ponds, basins, and culverts in the project area. Existing drainage along the SR 4 median, which intersects the project area, consists of a longitudinal underdrain system collecting storm water flows, and discharge points at various existing highway cross culverts along SR 4. Existing culverts were deemed deficient when calculated runoff exceeded culvert capacity.[9] As part of the SR 4 roadway improvement projects, the California Department of Transportation (Caltrans) and Contra Costa Transportation Authority (CCTA) are proposing minor storm drain improvements in the SR 4 median to adequately drain stormwater. Modifications to the system would involve installation of junction boxes/inlets or alteration of existing flow lines of inlets or culverts to connect to the proposed underdrain system. These improvements would ensure the continued effective and efficient storm drainage of existing stormdrain infrastructure, and adjacent to, the project area.[10]

Solid Waste

Solid waste services are provided by Pittsburg Disposal Services. Residential and commercial solid waste is disposed at Potrero Hill Landfill, located east of Suisun City, while non-recyclables industrial waste is transported to Keller Canyon Landfill, located southeast of the City of Pittsburg City limits. These landfills have replaced the Contra Costa Sanitary Landfill.

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5 City of Pittsburg, *5 Year Capital Improvement Program*. http://www.ci.pittsburg.ca.us/Pittsburg/Government/Departments/Engineering/engg-cip-imp-prog.htm, accessed November 7, 2008.

6 Tertiary treatment is a process that includes flocculation, filtration and disinfection to further remove bacteria and viruses from wastewater that has already undergone primary and secondary treatment.

7 Delta Diablo Sanitation District Recycled Water Facility. http://www.ddsd.org/recycled.html, accessed December 3, 2008.

8 City of Pittsburg, *5 Year Capital Improvement Program*, accessed online at internet address http://www.ci.pittsburg.ca.us/Pittsburg/Government/Departments/Engineering/engg-cip-imp-prog.htm, accessed November 7, 2008.

9 Caltrans, *Initial Study/Environmental Assessment on Route 4 in Contra Costa County from Railroad Avenue to Loveridge Road*, 2001.

10 Project Plans for Construction on State Highway in Contra Costa County, State Contract No. 04-228594, July 11, 2008

Potrero Hills Landfill is a regional waste disposal facility that primarily serves the central portion of Solano County and a number of surrounding counties through contracts with private haulers, including Contra Costa County and City of Pittsburg. A Class III landfill, it began operating in 1986 and has a current projected life of 17 to 20 years. Potrero Hills Landfill Company owns adjacent acreage that will be added to the existing facility as expansion becomes necessary.[11]

Keller Canyon Landfill is a wholly-owned subsidiary of Allied Waste Industries. The Keller Canyon Landfill opened on May 7, 1992 as a Class II Landfill operating under permit number 07-AA-0032. The facility accepts municipal solid waste, non-liquid industrial waste, contaminated soils, ash, grit and sludges. Keller Canyon Landfill covers 2,600 acres of land; 244 acres are permitted for disposal. The site currently handles 2,500 tons of waste per day, although the permit allows up to 3,500 tons of waste per day to be managed at the facility.[12] In 2005, the City of Pittsburg residential daily disposal was 3.1 pounds per residents per day. Comparatively, in 2001 the daily disposal was 2.7 and in 2003, 2.6 pounds. [13]

A voluntary curbside recycling program is in place in the City of Pittsburg. The program is operated by Pittsburg Disposal Services (PDS). Materials accepted for recycling include plastic, glass, aluminum, tin, newspaper, white and colored paper, magazines, and cardboard. Recyclables are picked up once a week along with regular waste, and then processed at a facility owned by PDS. In addition, yard waste collection services are provided every other week. The City of Pittsburg has met the required diversion rates established by the California Integrated Waste Management Board. In 1989, California passed Assembly Bill 939 (AB 939), also known as the California Integrated Waste Management Act, which requires each city and county, to not only develop a source reduction and recycling plan, but to reach a 50% diversion rate by January 1, 2000. The overall diversion rate for the City of Pittsburg in 2003 and 2005 was 53%, while in 2001 was 57%.[14]

Pursuant the California Integrated Waste Management Act (1989), the City's Source Reduction and Recycling Element (SRRE) documents how source reduction, recycling, composting, and public education will contribute to the diversion of solid wastes from local landfills. The City has been aggressive in implementing the programs outlined in the SRRE to reach the mandated 50 percent diversion goal set by the California Integrated Waste Management Act of 1989. While the City has reached this goal, it continues to use source reduction, recycling, composting, and public education programs to maintain and improve this goal.[15]

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[11] City of Pittsburg. *General Plan. Pittsburg 2020: A Vision for the 21st Century Draft Environmental Impact Report*. SCH No. 1999072109. January 2001. http://www.ci.pittsburg.ca.us/Pittsburg/Government/Departments/Planning-Building/gen-plan-eir.htm. Accesed November 7, 2008.

[12] Keller Canyon Landfill Company. Keller Canyon Landfill. www.alliedwasteservicesofcontracostacounty.com/facilities_keller_canyon.cfm. Accessed; November 7, 2008.

[13] California Integrated Waste Management Board. Jurisdiction Profile for the City of Pittsburg. http://www.ciwmb.ca.gov/Profiles/Juris/JurProfile1.asp?RG=C&JURID=375&JUR=Pittsburg. Accessed: November 7, 2008.

[14] California Integrated Waste Management Board. Jurisdiction Profile for the City of Pittsburg. http://www.ciwmb.ca.gov/Profiles/Juris/JurProfile1.asp?RG=C&JURID=375&JUR=Pittsburg. Accessed: November 7, 2008.

[15] City of Pittsburg. City of Pittsburg General Plan 2020, Public Facilities Element. August, 2001.

Communications

Cable and telephone utilities in the project area are owned and operated by Comcast and AT&T. Communication utilities run parallel to, but outside of, the SR 4 right-of-way. These communications lines serve, and physically bisect, the project area.

Electrical Power

PG&E is the main provider of electricity to Contra Costa County. PG&E obtains its energy supplies from power plants and natural gas fields in northern California and from energy purchased outside its service area and delivered through high voltage transmission lines and pipelines. The PG&E utility system in the Specific Plan Area consists of transmission lines rated at 21 kilovolts (kV) and 60 kV, supported by wooden poles. PG&E utilities in the vicinity of the area of the proposed Specific Plan include overhead power lines and a substation located west of the Specific Plan Area in the PG&E powerline easement corridor that bisects the City of Pittsburg from the Mirant Power Plant to the hillside in the southern part of the City.

Applicable Plans, Policies and Regulations

Construction Regulations

California has established laws to protect infrastructure from damage caused by construction activities. According to the California Government Code (Sections 4216-4216.9), contractors are required to notify and coordinate with appropriate groups before beginning ground-disturbing construction activities. Contractors are required to paint the area to be disturbed and notify Underground Service Alert (USA) at least 2 days before commencing any digging. USA then notifies its subscribing members of the proposed excavation.

City of Pittsburg General Plan

The *General Plan* Public Facilities Element and *General Plan EIR* identified the following policies to reduce potential impacts to water, drainage, sewer, power, and communication from new development:

Water Supply and Distribution

- **General Plan Goal 11-G-2:** Continue to implement water conservation policies to ensure adequate supplies of water in the future.

- **General Plan Policy 11-P-2:** Implement, as needed, replacements and/or expansions to the existing system of water mains through the City's Capital Improvement Program.

- **General Plan Policy 11-P-3:** Continue water district and user conservation efforts to help reduce demand in light of recent Contra Costa Water District raw water reductions.

- **General Plan Policy 11-P-4:** Work with CCWD to develop a program ensuring adequate provision of raw water supplies during potential emergency water demands.

- **General Plan Policy 11-P-7:** Ensure that new residential, commercial, and industrial development equitably shares costs associated with providing water services to areas of urban expansion within the Planning Area.

- **General Plan Policy 11-P-8:** Develop and implement a Recycled Water Ordinance, requiring the installation and use of recycled water supplies from the new Delta Diablo Sanitation District Reclamation Plant.

Wastewater Collection and Treatment

- **General Plan Goal 11-G-3:** Plan for expansion of the City's wastewater collection system, in order to provide necessary infrastructure for projected urban growth through 2020.

- **General Plan Policy 11-P-11:** Work with Delta Diablo Sanitation District in planning the expansion of the wastewater treatment plant.

- **General Plan Policy 11-P-15:** Work with Delta Diablo Sanitation District to promote the use of recycled water for irrigation of large planted areas, such as business/industrial campus projects, City parks, and street medians.

- **General Plan Policy 11-P-18:** Ensure that new residential, commercial, and industrial development equitably share costs associated with providing wastewater services to areas of urban expansion within the Planning Area.

Solid Waste

- **General Plan Goal 11-G-6:** Continue reduction and recycling efforts within the City to divert increasingly larger portions of the waste stream from local landfills.

- **General Plan Goal 11-G-7:** Manage solid waste so that State Diversion goals are met.

- **General Plan Policy 11-P-20:** Work with Pittsburg Disposal Services to increase participation in curbside recycling programs for residential neighborhoods.

- **General Plan Policy 11-P-21:** Promote the importance of recycling industrial and construction wastes.

- **General Plan Policy 11-P-23:** Encourage builders to incorporate interior and exterior storage areas for recyclables into new or remodeled residential, commercial, and industrial structures.

Railroad Avenue Specific Plan

The Specific Plan, if adopted, would contain the following goals and policies related to utilities:

- **Specific Plan Goal 7-G-2:** Encourage new development within the Specific Plan Area to incorporate energy efficient and sustainable building principles.

- **Specific Plan Policy 7-P-2:** Promote building design that improves energy efficiency by incorporating natural cooling and passive solar heating, where possible. This may include extended eaves, window overhangs, awnings and tree placement for natural cooling and building and window orientation to take advantage of passive solar heating.

- **Specific Plan Policy 7-P-3:** Where possible, integrate solar generating structures with varied functions into the urban fabric including, but not limited to, bus shelters, parking lots, street lights and other public infrastructure.

- **Specific Plan Policy 7-P-5:** Encourage developers to utilize low-impact development (LID). LID addresses stormwater treatment through small, cost-effective landscape features located at the site level. These landscape features, known as Integrated Management Practices (IMPs), are the building blocks of LID. IMPs include planter strips, rooftop gardens, planter boxes, and pervious concrete pavers.

- **Specific Plan Policy 7-P-6:** Encourage developments on adjacent and/or contiguous lots within the Specific Plan Area, and particularly within the Transit Village and Civic Center sub-areas, to jointly meet Provision C3 requirements through shared swales and other integrated management practices.

- **Specific Plan Policy 7-P-7:** New projects shall incorporate water conservation measures including but not limited to low flow showers and toilets, low flow and gray water irrigation systems and the use of drought tolerant landscaping.

- **Specific Plan Policy 7-P-8:** All commercial and residential development shall provide trash enclosures that can accommodate receptacles for garbage, recycling and green and food waste collection when it is available from Pittsburg Disposal on a city-wide basis.

- **Specific Plan Policy 7-P-9:** Trash enclosures shall be constructed of masonry material with self-enclosing doors and have a second access in accordance with Title 18 of the PMC. All enclosures shall be constructed of high quality materials, and the design and color shall be coordinated with the proposed development.

Impact Assessment and Mitigation Measures

Standards of Significance

The proposed project would result in significant utility impacts if it were to:

- Exceed water demands, such that new or expanded distribution system and/or entitlements are needed;
- Exceed wastewater flows that exceed collection and treatment capacity;
- Result in solid waste generation levels that exceed available disposal capacity;
- Exceed capacity of, or support inefficient use of, local energy sources.

Environmental Analysis

To determine impacts for each resource, a level of significance is determined and reported in the impact statement. Conclusions of significance are defined as follows: significant (S), potentially significant (PS), less than significant (LTS), no impact (NI), and beneficial (B). If the mitigation measures would not diminish potentially significant or significant impacts to a less-than-significant level, the impacts are classified as "significant and unavoidable effects (SU)." For the purposes of this section, UT refers to utilities.

UT-1 New development would increase the demand for water supply and distribution system; however, future water supply and distribution would be adequately met by water supply available to, and provided by, CCWD and the City of Pittsburg. (LTS)

The projected population growth resulting from new development would be the primary factor affecting the City's water demand. New development proposed under the Specific Plan would result in the construction of approximately 1,845 residential units and approximately 988,449 square feet (sf) of commercial space through the entire new development area (including the Civic Center, Transit Village and High School Village areas) in addition to the development potential assumed in the Pittsburg *General Plan* and evaluated in the *General Plan* EIR. The new residential units and commercial uses would be expected to increase the City's demand for water.

According to the Water System Master Plan projections,[16] the City of Pittsburg is expected to need approximately 14.5 million gallons per day (mgd) of water by 2020. The Master Plan assumes a 1.6 percent annual growth rate for the City of Pittsburg, with average use per person stabilizing at 180 gallons per capita per day (gpcd). This growth would account for and include the new population and commercial use associated with the 1,845 residential units and

[16] City of Pittsburg, Water System Master Plan, December 2000, which is the most current version of this document.

approximately 988,449 sf of commercial space.[17] Total demand that can be attributed to the increase in density attributed to the Specific Plan is projected to reach 30.5 mgd or 5,300 million gallons per year (mgy) by 2020.

Additionally, as stated in Tables 3.7-1 and 3.7-2, the UWMP projects water demand for CCWD of 217,200 acre feet per year (af/yr) by the year 2025 for its service region. At the same time, CCWD's water supply projection for the year 2025 for its entire service regions is approximately 249,500 af/yr. This would adequately accommodate the projected growth planned for 2025, including the proposed development planned under the Specific Plan. The water supply projection for CCWD would also accommodate the distribution needs required by the proposed Specific Plan.

The primary conveyance facility for CCWD water supply is the Contra Costa Canal which carries water from Rock Slough for deliveries throughout CCWD's service, extending 48 miles. The Mallard, Contra Loma, Martinez and Los Vaqueros reservoirs have been adequately sized to accommodate the reserved water for the district's region, and the water needed for the expected growth under the Specific Plan would constitute a portion of these existing reserved waters. Therefore, these distribution facilities would, by definition, adequately accommodate the capacity needed for the expected growth under the Specific Plan.

The *General Plan* presents policies that ensure adequate water supply and distribution system by infrastructure improvements and water conservation efforts. These policies, as stated under Applicable Policies and Regulations, include *General Plan* Policies 11-P-3, 11-P-4, 11-P-7, and 11-P-8. Additionally, Specific Plan Policy 7-P-7, would also apply towards ensuring adequate water supply and distribution system by infrastructure improvements and water conservation efforts. Because existing water supply, supplemental recycled water and distribution capacity, as explained above, would adequately accommodate the development potential assumed in the Specific Plan, impacts related to future water supply and distribution would be less than significant.

UT-2 The proposed new development could exceed current wastewater collection and treatment capacity; however, Delta Diablo Sanitation District facilities would adequately accommodate the projected growth upon implementation of a recently-approved treatment plant expansion project. (LTS)

[17] The Water System Master Plan was prepared before the Railroad Avenue Specific Plan project scope was defined. However, the Water System Master Plan was designed to accommodate population growth through 2020, relying on growth forecasts prepared by ABAG. ABAG's population growth projections, in turn, include all anticipated growth within the City of Pittsburg through 2020. An ABAG spokesman, Hing Wong, confirmed that these ABAG projections for Pittsburg include the growth which would occur under the Railroad Avenue Specific Plan, as currently proposed. Therefore, Water System Master Plan already reflects and assumes the proposed Specific Plan population growth as an underlying assumption.

The DDSD provides sewer treatment service to the City of Pittsburg and owns and operates a wastewater treatment plant with an average dry water flow capacity of 16.5 mgd. In 2006, DDSD treated an average of 14.6 mgd.[18] The treated effluent is discharged to New York Slough and the Sacramento-San Joaquin Delta. The treated effluent is regulated under the National Pollutant Discharge Elimination System (NPDES) permit system, which is administered under the auspices of the Environmental Protection Agency (EPA).

The DDSD has recently adopted a District Master Plan that includes phased treatment plant expansion to ultimately provide 24 mgd capacity (average dry weather flow) in order to accommodate anticipated growth in the City of Pittsburg, City of Antioch and unincorporated Bay Point. This anticipated growth would include the proposed new development under the Specific Plan. The DDSD Master Plan would increase capacity from 16.5 mgd to 24.0 mgd to accommodate anticipated growth in the service area, as forecast by ABAG.[19] According to DDSD, the expansion of DDSD treatment plant would cost approximately $127 million. No timeline has been identified.[20] This expansion would accommodate the new development proposed in the Railroad Avenue Specific Plan, as well as substantial land annexations, and development, expected for the various cities served by the DDSD. The proposed project's anticipated wastewater demands would be a small percentage of the total anticipated wastewater demands resulting from new development in the region, and would not constitute a substantial impact on the DDSD's currently anticipated wastewater processing capacity.[21]

Additionally, the *General Plan* presents policies to promote treatment plant expansion, infrastructure improvements, and use of reclaimed water, all of which would benefit the wastewater collection and treatment capacity for the City of Pittsburg. These policies include:

- **General Plan Policy 11-P-11**: Work with Delta Diablo Sanitation District (DDSD) in planning the expansion of the wastewater treatment plant.
- **General Plan Policy 11-P-15**: Work with Delta Diablo Sanitation District (DDSD) to promote the use of recycled water for irrigation of large planted areas, such as business/industrial campus projects, City parks, and street medians.

Given the current wastewater collection and treatment capacity provided by DDSD, the newly phased treatment plant expansion to ultimately treat up to 24 mgd, and the current policies in the *General Plan Public Facilities Element*, the proposed Specific Plan development would have less-than-significant impacts on current wastewater collection and treatment capacity.

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18 Delta Diablo Sanitation District, http://www.ddsd.org/index.html, Accessed November 8, 2008.

19 City of Pittsburg, *General Plan; Pittsburg 2020: A Vision for the 21st Century*, 2004.

20 Delta Diablo Sanitation District. Memorandum from Gregory Baatrup, Technical Service Manager, to DDSD Board of Directors regarding expansion of the DDSD Regional Treatment Plant to accommodate Ironhouse Sanitary District Flow. November 2005. http://www.ddsd.org/pdfs/regionaltech.pdf. Accessed February 17, 2009.

21 Delta Diablo Sanitation District Fiscal Year 2008/2009 – 2012/2014 Five Year Capital Improvement Program, http://www.ddsd.org/pdfs/CIP2008.pdf, Figure 4 on page E-3, Accessed February 12, 2009

UT-3 The proposed new development associated with the Specific Plan would not require an increase in the available disposal capacity at the Potrero Hill and Keller Canyon Landfill. (LTS)

In 2005, the City of Pittsburg landfill contribution was approximately 84,935 tons of waste. Of the 84,935 tons, 45,016 tons was household waste and the remaining business waste. Household waste materials include organics, paper, plastics, metals, construction and demolition debris, glass, mixed residue, household hazardous waste, and special waste. The remaining waste was categorized as business waste material which, similar to household waste materials, included paper, metal, glass, plastic, organic, construction and demolition debris, hazardous waste, and mixed residue.

The City of Pittsburg, as noted above, disposes its waste into the Potrero Hills Landfill and Keller Canyon Landfill. Potrero Hills Landfill has a daily permitted capacity of 4,330 tons per day. Keller Canyon Landfill currently handles 2,500 tons of waste per day, although the permit allows up to 3,500 tons of waste per day to be managed at the facility.

The increased development assumed under the Specific Plan of 1,845 residential units and 988,449 sf of commercial uses are expected to generate solid waste, but not to levels that would exceed the capacity of the current two landfills (Potrero Hills Landfill and Keller Canyon Landfill), according to a spokesman for Pittsburg Disposal Service (the company that has current contracts to provide the project area's disposal services)[22]. These two landfills have a permitted capacity of 4,330 and 3,500 tons per day, respectively. Additionally, the *Pittsburg General Plan,* presents the following policies that guide and promote waste reduction.

- **General Plan Policy 11-P-19**: Support the implementation of program tasks within the Source Reduction and Recycling Element (SRRE). General Plan Policy 11-P-20 Work with Pittsburg Disposal Services to increase participation in curbside recycling programs for residential neighborhoods.
- **General Plan Policy 11-P-21**: Promote the importance of recycling industrial and construction wastes.
- **General Plan Policy 11-P-22**: Prepare and distribute informational handouts to the public regarding opportunities to reduce waste at homes and businesses, as well as methods of safe disposal of hazardous materials.
- **General Plan Policy 11-P-23**: Encourage builders to incorporate interior and exterior storage areas for recyclables into new or remodeled residential, commercial, and industrial structures.

In addition, the Specific Plan contains policies (Specific Plan Policy Nos. 7-P-8 and 7-P-9) requiring all developments to have trash enclosures constructed of masonry materials with space for recycling and green waste collection if pick-up is available from Pittsburg Disposal, which is consistent with PMC Section 18.80.025, Mechanical and Utility Equipment.

[22] Pittsburg Disposal Service. Telephone conversation with Jim Nejedly, Manager, on October 15, 2008.

As explained above, the Potrero Hills Landfill and Keller Canyon Landfill have adequate capacity to accommodate the future potential growth associated with the proposed Specific Plan. As such, the current permitted capacity at the two landfills, in addition to the policies set forth in the *General Plan* and proposed in the Specific Plan would ensure that impacts related to available disposal capacity are less than significant.

UT-4 The proposed new development associated with the Specific Plan would not substantially increase the demand for, or lead to inefficient use of, local energy sources. (LTS)

Construction and operation of all urban development requires increased energy sources. The proposed increase of both residential and commercial densities and land areas under the proposed Specific Plan would result in increased energy consumption; however, energy consumption would not increase to a level that would increase the need for or result in inefficient use of local energy sources.

Typical urban development consumes energy for both direct and indirect uses. Direct uses primarily include construction: site preparation, grading, and street and utility construction. Direct uses may also include monthly energy consumption through facilities, whereas indirect energy uses are attributed to operation and maintenance of transportation, schools, and other support facilities.

The *General Plan* contains a policy that prescribes and recommends the use of energy-saving design and devices, and is thus targeted at minimizing new energy requirements.

- **General Plan Policy 2-P-19**: Revise the City's Subdivision Ordinance to include provisions for solar access and other energy-savings devices.

The City is currently updating the Housing Element, and several proposed policies and programs would result in increased energy efficiency in the City in general and the Specific Plan Area, in particular. Proposed policies and programs include the following:

- **Proposed General Plan Policy 2.6**: Encourage the incorporation of energy conservation design features in existing and future residential developments to conserve resources and reduce housing costs. Programs could include, but not be limited to, the following:
    - Evaluate new subdivisions for passive solar and cooling opportunities, consistent with the Subdivision Map Act.
    - Enforce the State Energy Conservation Standards for new residential construction and additions to existing structures.
    - Continue to offer rehabilitation loans and possibly grants to low and moderate-income homeowners to improve the energy efficiency of their residence and/or replace existing energy inefficient appliances.

- Support the use of solar heating and other environmentally sound, energy efficient methods for heating and cooling homes, consistent with adopted building, mechanical and plumbing codes.

- Create incentives such as a density bonus or priority permitting for developments that exceed state energy efficiency standards by 20 percent as part of a comprehensive update of the development review design guidelines.

- Work with the Pittsburg Power Company, and other private donors, to develop a grant or long term loan program fund to fund the installation of solar panels on single-family and multi-family residential developments to reduce energy consumption and provide savings to property owners.

- **Proposed General Plan Policy 2.7**: Utilize smart growth principles in the site planning of new subdivisions to enhance the quality of life of Pittsburg residents including, but not limited to, the incorporation of smart growth site planning principles as in new subdivisions as part of a comprehensive update of the development review design guidelines.

In addition to existing and proposed *General Plan* policies, the Specific Plan contains Policies 7-P-2 and 7-P-3 as well as Architectural and Site Design Criteria No. 20 which would prescribe or recommend the inclusion of sustainable site and building design elements into the proposed project, including the selection of energy efficient site and architectural design for all new development. As such, impacts associated with the new development as proposed for Railroad Avenue Specific Plan would be less than significant.

Cumulative Analysis

As discussed above, the proposed project would have no individually significant impacts on utilities. The proposed project would add a maximum of 1,845 new households to the City of Pittsburg between 2009 and project buildout (presumed to occur in 2030). ABAG[23] forecasts that 14,850 new households will be added to the City of Pittsburg between 2005 and 2030. The 1,845 new households proposed under the Railroad Avenue Specific Plan is 12.4% of that total and would, therefore, not constitute a substantial portion of the total cumulative development anticipated before 2030. Likewise, the proposed project's impact on utilities would not be a substantial portion of total cumulative demand, compared with the anticipated construction of 14,850 new households by 2030. Therefore, the proposed project's increased demand for wastewater treatment, potable water delivery, electrical and other energy, and solid waste disposal when considered with all of the energy savings goals and policies set forth in the General Plan and proposed in the Specific Plan, would be considered less-than-significant in a cumulative setting, when compared to the full extent of development anticipated in Pittsburg by the year 2030.

[23] Association of Bay Area Governments (ABAG), *Projections 2007.*

3.8 CLIMATE CHANGE

Introduction

It is widely recognized that anthropogenic emissions of greenhouse gases[1] and aerosols are contributing to changes in the global climate, and that such changes are having and will have adverse effects on the environment, the economy, and public health. These are cumulative effects of past, present, and future actions worldwide. While worldwide contributions of greenhouse gases are expected to have widespread consequences, it is not possible to link particular changes to the environment of California to greenhouse gases emitted from a particular source or location. Thus, while it is possible to inventory a project's greenhouse gas emissions, the environmental effect of those emissions on a local or regional scale, cannot be accurately predicted given existing data.

A technical advisory for preparing CEQA climate change analyses was released by the California Office of Planning and Research (OPR) in June, 2008.[2] OPR also released a draft version of the CEQA Guidelines, with amendments to incorporate procedures for analyzing greenhouse gas emissions, in December, 2008. These documents guide the approaches used to estimate and determine the significance of the Railroad Avenue Specific Plan's greenhouse gas emissions. The analysis in this section also utilizes approaches prepared by a number of professional associations and agencies that have published suggested approaches and strategies for complying with CEQA's environmental disclosure requirements. Such organizations include the California Attorney General's Office (AGO), the California Air Pollution Control Officers Association (CAPCOA), the United Nations and World Meteorological Organization's Intergovernmental Panel on Climate Change (IPCC), and the Association of Environmental Professionals (AEP). Emissions from sources such as construction, vehicles, energy consumption, and solid waste generation are inventoried and discussed qualitatively.

Sources used for this section include energy forecasts and consumption reports produced by the California Energy Commission (CEC); data from the 2007 URBEMIS air quality modeling software; the traffic report prepared for the proposed project; and information from the California Air Resources Board (CARB) and the California Climate Action Team (CAT).

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1 For the purposes of this analysis, the term "greenhouse gases" refers to carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride, those gases regulated under California Assembly Bill 32 and the Kyoto Protocol of the United Nations Framework Convention on Climate Change.

2 OPR, Technical Advisory, CEQA and Climate Change: Addressing Climate Change Through CEQA Review, June 19, 2008.

Setting

Overview of Climate Change

Global climate change refers to changes in the normal[3] weather of the earth measured by alterations in wind patterns, storms, precipitation, and temperature relative to historical averages. Such changes vary considerably by geographic location. Over time, the earth's climate has undergone periodic ice ages and warming periods, as observed in fossil isotopes, ice core samples, and through other measurement techniques. Recent climate change studies use the historical record to predict future climate variations and the level of fluctuation that might be considered statistically normal given historical trends.

Temperature records from the Industrial Age (ranging from the late 18th century to the present) deviate from normal predictions in both rate and magnitude. Most modern climatologists predict an unprecedented warming period during the next century and beyond, a trend that is increasingly attributed to human-generated greenhouse gas emissions resulting from the industrial processes, transportation, solid waste generation, and land use patterns of the twentieth and twenty-first centuries. According to the United Nations Intergovernmental Panel on Climate Change (IPCC), greenhouse gas emissions associated with human activities have grown since pre-industrial times, increasing by 70 percent between 1970 and 2004.[4] Increased greenhouse gas emissions are largely the result of increasing fuel consumption, particularly the incineration of fossil fuels.

The IPCC modeled several possible emissions trajectories to determine what level of reductions would be needed worldwide to stabilize global temperatures and minimize climate change impacts. Regardless of the analytic methodology used, global average temperature and sea level were predicted to rise under all scenarios.[5] In other words, there is evidence that emissions reductions can minimize climate change effects but cannot reverse them entirely. On the other hand, emissions reductions can reduce the severity of impacts, resulting in lesser environmental impacts. For example, the IPCC predicted that the range of global mean temperature change from year 1990 to 2100, given different emissions reductions scenarios, could range from 1.1°C to 6.4°C.

The greenhouse gas emissions from buildout of a single specific plan, of the size of the Railroad Avenue Specific Plan, would not generate sufficient greenhouse gas emissions to measurably influence global climate change.[6] However, cumulative development on a global scale contributes to an

[3] "Normal" weather patterns include statistically normal variations within a specified range.

[4] Intergovernmental Panel on Climate Change, 2007. R.B. Alley et al. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Summary for Policymakers.

[5] Intergovernmental Panel on Climate Change, 2007. R.B. Alley et al. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Summary for Policymakers.

[6] Association of Environmental Professionals (AEP). 2007. Alternative Approaches to Analyzing Greenhouse Gas Emissions and Global Climate Change in CEQA Documents. http://www.califaep.org/userdocuments/File/ AEP_Global_Climate_Change_June_29_Final.pdf; and OPR, Technical Advisory, CEQA and Climate Change: Addressing Climate Change Through CEQA Review, June 19, 2008, p. 6.

irreversible, significant cumulative climate change impact. Consideration of a project's impact to climate change, therefore, is essentially an analysis of a project's contribution to a cumulatively significant global impact through its emission of greenhouse gases.

Greenhouse Gases

Gases that trap heat in the atmosphere are called greenhouse gases because they transform the light of the sun into heat, similar to the glass walls of a greenhouse. Common greenhouse gases include water vapor, carbon dioxide, methane, nitrous oxides, chlorofluorocarbons, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, ozone, and aerosols. Without the natural heat trapping effect of greenhouse gas, the earth's surface would be about 34°C cooler.[7] However, it is believed that emissions from human activities, such as electricity production and vehicle use, have elevated the concentration of these gases in the atmosphere beyond the level of naturally occurring concentrations. Global atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased markedly since 1750 as a result of human activities and now far exceed pre-industrial values.

Climate change results from radiative forcings and feedbacks. Radiative forcing is defined as the difference between the radiation energy entering the earth's atmosphere and the radiation energy leaving the atmosphere. Greenhouse gases allow solar radiation to penetrate the earth's atmosphere but slow the release of atmospheric heat. A feedback is an internal process that amplifies or dampens the climate's response to a specific forcing. For example, the heat trapped by the atmosphere may cause temperatures to rise or may alter wind and weather patterns. A gas or aerosol's global warming potential is defined as its ability to trap heat in the atmosphere; it is the "cumulative radiative forcing effects of a gas over a specified time horizon resulting from the emission of a unit mass of gas relative to a reference gas".[8]

Individual greenhouse gases have varying global warming potentials and atmospheric lifetimes (see Table 3.8-1). The carbon dioxide equivalent is a consistent methodology for comparing greenhouse gas emissions since it normalizes various greenhouse gas emissions to a consistent metric. The reference gas for global warming potential is carbon dioxide; carbon dioxide has a global warming potential of one. By comparison, methane's global warming potential is 21, as methane has a greater global warming effect than carbon dioxide on a molecule to molecule basis.[9] One teragram ([Tg] equal to one million metric tons) of carbon dioxide equivalent (CO_2e) is the mass of a project's emissions of an individual greenhouse gas multiplied by the gas's global warming potential.

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7 CARB, 2006, CARB Proposed Early Actions to Mitigate Climate Change in California.

8 U.S. Environmental Protection Agency (EPA), 2006a, The U.S. Greenhouse Gas Emissions and Sinks: Fast Facts, Office of Atmospheric Programs.

9 EPA, 2006b, Non CO_2 Gases Economic Analysis and Inventory, Global Warming Potentials and Atmospheric Lifetimes, http://www.epa.gov/nonco2/econ-inv/table.html.

Of all greenhouse gases in the atmosphere, water vapor is the most abundant, important, and variable. It is not considered a pollutant; in the atmosphere, it maintains a climate necessary for life. The main source of water vapor is evaporation from the oceans (approximately 85 percent). Other sources include evaporation from other water bodies, sublimation (change from solid to gas) from ice and snow, and transpiration from plant leaves.

Table 3.8-1
Global Warming Potentials and Atmospheric Lifetimes of Select Greenhouse Gases

Gas	Atmospheric Lifetime (years)	Global Warming Potential (100 year time horizon)
Carbon Dioxide	50–200	1
Methane	12 ±3	21
Nitrous Oxide	120	310
HFC-23	264	11,700
HFC-134a	14.6	1,300
HFC-152a	1.5	140
PFC: Tetrafluoromethane (CF_4)	50,000	6,500
PFC: Hexafluoroethane (C_2F_6)	10,000	9,200
Sulfur Hexafluoride (SF_6)	3,200	23,900

Source: EPA, 2006.

Carbon dioxide (CO_2) is an odorless, colorless gas, which has both natural and anthropogenic sources. Natural sources include decomposition of dead organic matter; respiration of bacteria, plants, animals, and fungus; evaporation from oceans; and volcanic outgassing. Anthropogenic sources of carbon dioxide are from burning coal, oil, natural gas, and wood. Concentrations of carbon dioxide were 379 parts per million (ppm) in 2005, which equates to an increase of 1.4 ppm per year since 1960.[10] CO_2 is the most common greenhouse gas generated by California activities, constituting approximately 84 percent of all greenhouse gas emissions.[11] CO_2 emissions attributed to California activities are mainly associated with in-state fossil fuel combustion and fossil fuel combustion in out-of-state power plants supplying electricity to California. Other activities that produce CO_2 emissions include mineral production, waste combustion, and land use changes that reduce vegetation.

Methane (CH_4) is a flammable gas and is the main component of natural gas. When one molecule of methane is burned in the presence of oxygen, one molecule of carbon dioxide and two molecules of water are released. A natural source of methane is from the anaerobic decay of organic matter. Geological deposits, known as natural gas fields, also contain methane, which is extracted for fuel. Other sources are landfills, fermentation of manure, and cattle.

[10] IPCC, 2007, R.B. Alley et al. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Summary for Policymakers.

[11] CEC, 2007, Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004.

Nitrous oxide (N_2O), also known as laughing gas, is produced naturally by microbial processes in soil and water. Anthropogenic sources of nitrous oxide include agricultural sources, industrial processing, fossil fuel-fired power plants, and vehicle emissions. Nitrous oxide also is used as an aerosol spray propellant.

Other gases that contribute to the greenhouse effect include ozone,[12] chlorofluorocarbons (CFCs), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and aerosols. Generally, this analysis focuses on the major sources of greenhouse gases, including carbon dioxide, nitrous oxide, and methane because these are the gases currently regulated in the State of California.

Greenhouse Gas Emissions Inventories

Worldwide, United States, and California Inventories. A greenhouse gas inventory is an accounting of the amount of greenhouse gases emitted to or removed from the atmosphere over a specified period of time attributed to activities by a particular entity (e.g., annual emissions and reductions attributed to the State of California). A greenhouse gas inventory also provides information on the activities that cause emissions and removals, as well as the methods used to make the calculations. In 2004, total worldwide greenhouse gas emissions were estimated to be 49,000 Tg CO_2e.[13] In 2006, greenhouse gas emissions in the U.S. were 7,054 Tg CO_2e, a 14.7 percent increase over 1990 emissions.[14]

California is the second largest contributor of greenhouse gas emissions in the U.S. and the sixteenth largest in the world.[15] In 2004, California produced 427 Tg CO_2e,[16] which is approximately six percent of 2004 U.S. emissions and 0.9 percent of global emissions. In California, the most common greenhouse gas is CO_2 from fossil fuel combustion, which constitutes approximately 81 percent of all greenhouse gas emissions.[17] The remainder of greenhouse gases only makes up a small percentage of the total: nitrous oxide constitutes 6.8 percent, methane 6.4 percent, high GWP gases 3.5 percent, and non-fossil fuel CO_2 emissions constitute 2.3 percent.[18] CO_2 emissions in California are mainly associated with fossil fuel consumption in the transportation sector (41.2 percent) with the industrial sector as the second-largest source (22.8 percent).[19] Electricity production, from both in-state and out-of-state sources, agriculture, forestry, commercial, and residential activities comprise the balance of California's greenhouse gas emissions.

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[12] Ozone is a greenhouse gas; however, unlike other greenhouse gases, ozone in the troposphere is relatively short-lived. It is difficult to make an accurate determination of the contribution of ozone precursors (nitrogen oxides and volatile organic compounds) to global climate change. California Environmental Protection Agency, 2004. Technical Support Document for Staff Proposal Regarding Reduction of Greenhouse Gas Emissions from Motor Vehicles Climate Change Overview.

[13] Intergovernmental Panel on Climate Change, 2007, R.B. Alley et al. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Summary for Policymakers.

[14] EPA, 2008, The U.S. Greenhouse Gas Emissions and Sinks: Fast Facts, Office of Atmospheric Programs.

[15] CEC, 2007, Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004.

[16] CEC, 2007, Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004.

[17] CEC, 2007, Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004.

[18] CEC, 2007, Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004.

[19] CEC, 2007. Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004.

As part of the California Global Warming Solutions Act of 2006 (AB 32), discussed below, CARB is required to establish a statewide greenhouse gas emissions limit for 2020 equivalent to 1990 emissions. In addition, Executive Order S-3-05 sets the following statewide emissions targets: a reduction of greenhouse gas emissions to 2000 levels by 2010, a reduction of greenhouse gas emissions to 1990 levels by 2020, and a reduction of greenhouse gas emissions to 80 percent below 1990 levels by 2050. CARB estimates that California's annual emissions were equivalent to 427 Tg CO_2e in 1990 and 452 Tg CO_2e in 2000.[20]

Table 3.8-2 shows quantified California statewide emissions targets (AB 32 and Executive Order S-3-05 targets) based on the CEC's 2007 Inventory of Greenhouse Gases and Sinks. Table 3.8-2 also indicates how these thresholds compare to future population projections by showing how the reduction thresholds would translate on a per capita basis as California's population increases. This is provided for informational purposes only; there is no adopted per capita goal for greenhouse gas reductions.

Table 3.8-2
California Greenhouse Gas Reductions Targets

Year[1]	Estimated California Population	Reduction Goal	Greenhouse Gas Target (Tg CO_2e)	Per Capita Target (metric tons CO_2e per person)[2]
1990	29,828,000	N/A	427.0	14.3
2000	34,105,437	N/A	452.3	13.3
2010	39,135,676	GHG emissions at or below 2000 levels[3]	452.3	11.6
2020	44,135,923	GHG emissions at or below 1990 levels	427.0	9.7
2050	59,507,876	GHG emissions 80% below 1990 levels[4]	341.6	5.7

Source: Population data are from California Department of Finance, 2007; greenhouse gas targets are derived from CARB, 2007. Greenhouse Gas Emissions Inventory Summary [1990 - 2004].

Notes:

1. Target years specified in Executive Order S-3-05 and/or AB 32. 1990 and 2000 data are provided as a baseline.
2. Calculated by dividing the statewide greenhouse gas target by the projected population for each target year. 1 teragram (Tg) = 1 million metric tons = 1.1023 million short tons CO_2e.
3. Based on 2004 estimate.
4. Calculated by multiplying 427.0 x 80 percent.

[20] CARB, 2007. Greenhouse Gas Emissions Inventory Database [1990 - 2004]. Accessed online August 5, 2008 at: http://www.arb.ca.gov/app/ghg/ghg_sector_data.php

Predicted Effects of Climate Change

Climate change could have a number of adverse effects. Although these effects would have global consequences, in most cases they would not disproportionately affect any one site or activity. In other words, many of the effects of climate change are not site-specific. While this section does not discuss such impacts in detail, the discussion of the proposed project' projected greenhouse gas emissions inherently addresses the proposed project' contribution to worldwide greenhouse gas emissions that cause such effects. A number of general effects are discussed below.

Sea Level Rise and Flooding. The California Climate Change Center predicts that sea level in California will increase between 10.9 to 71.6 centimeters (cm) (0.36 to 2.3 feet) above existing mean sea level (msl) by 2099 as a result of climate change.[21] Measurements taken in the City of Alameda indicate that the current rate of sea level rise is about 0.29 feet per century.[22] Therefore, projected climate change effects on sea level would increase the existing rate of sea level rise by 0.07 to 1.94 feet per century. When combined with astronomical tides, even a 1-foot increase in msl would result in the 100-year event high tide peak occurring at the 10-year event frequency.[23] In other words, the frequency of a current 100-year high tide (about 9.5 feet above current msl) would occur 10 times more often when sea levels increase to 1 foot above current msl.

If sea level rise continues at existing rates, the proposed project area would not be inundated during the study period for this EIR because the proposed project area is more than 15 feet above msl. Therefore, rising sea levels would not be expected to directly affect the proposed project area during the study period of this EIR.

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[21] Cayan, D., P. Bromirski, K. Hayhoe, M. Tyree, M. Dettinger, and R. Flick, 2006, Projecting Future Sea Level: Table 3 Projected global sea level rise (SLR) (cm) for the SRES A1fi, A2, and B1 greenhouse gas emission scenarios. SLR for A2 and B1 scenarios is estimated by combining output recent global climate change model simulations with MAGICC projections for the ice melt component. SLR estimates for A1fi estimated from MAGICC based on A2 temperature changes scaled according to those in A1fi. A Report From the California Climate Change Center CEC-500-2005-2002-SF. p. 19.

[22] Floyd, M., M. Anderson, M. Roos, R. Peterson, M. Perrone, and D. Todd, 2006, Chapter 2: Potential Impacts of Climate Change on California's Water Resources, Table 2-6 Relative Sea Level Trends for Eight Tide Gauges Along the Coast of California with 50 Years or More of Record. p. 2-43. In Medelin, J., J. Harou, M. Olivares, J. Lund, R. Howitt, S. Tanaka, M. Jenkins, K. Madani, and T. Zhu (Eds), Climate Warming and Water Supply Management In California: White Paper. A Report From Climate Change Center CEC-500-2005-195-SF.

[23] Floyd, M., M. Anderson, M. Roos, R. Peterson, M. Perrone, and D. Todd, 2006, Chapter 2: Potential Impacts of Climate Change on California's Water Resources, Figure 2.32 Impact of One Foot Sea Level rise on the Relative Effect of Astronomical tides in the Delta. p. 2-53. In Medelin, J., J. Harou, M. Olivares, J. Lund, R. Howitt, S. Tanaka, M. Jenkins, K. Madani, and T. Zhu (Eds), Climate Warming and Water Supply Management In California: White Paper. A Report From Climate Change Center CEC-500-2005-195-SF.

In the future, precipitation events are predicted to vary in terms of timing, intensity and volume according to many climate change models.[24] Extreme storm events may occur with greater frequency.[25] The effect on peak runoff is not known because most climate change models have not used a temporal (or spatial) scale necessary to identify effects on peak flows and existing precipitation/runoff models for assessing the effects of climate change do not yet adequately predict rainfall/runoff scenarios.[26] Changes in rainfall and runoff could affect flows in surface water bodies, causing increased flooding and runoff to the storm drain system. However, the effect that future changes to the hydrologic cycle may have on the proposed project area is speculative and is not addressed further in this document.

Water Supply. California Health and Safety Code Section 38501(a) recognizes that "[climate change] poses a serious threat to the economic well-being, public health, natural resources, and the environment of California," and notes, "the potential adverse impacts of [climate change] include…reduction in the quality and supply of water to the state from the Sierra snowpack." As most of the State, including the San Francisco Peninsula, depends on surface water supplies originating in the Sierra Nevada this water supply reduction is a concern.

Most of the scientific models addressing climate change show that the primary effect on California's climate would be a reduced snow pack and a shift in stream-flow seasonality. The investigations predict a decrease in snowpack volume from the current 87 percent of historic averages to 83 percent in 2025 and 76 percent in 2050.[27] Changing climatic conditions could also shift the timing of snowmelt, so that peak runoff would occur earlier in the spring. A higher percentage of the winter precipitation in the mountains would likely fall as rain rather than as snow in some locations, reducing the overall snowpack. The end result of this would be that the state may not have sufficient surface storage to capture the resulting early runoff, and so, absent construction of additional water storage projects, a portion of the current supplies would be lost to the oceans, rather than be available for use in the State's water delivery systems.

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[24] EPA, 2008, Climate Change Science: Precipitation and Storm Changes, Accessed January 16, 2009 at: http://www.epa.gov/climatechange/science/recentpsc.html.

[25] EPA, 2008, Climate Change Science: Precipitation and Storm Changes. Accessed January 16, 2009 at: http://www.epa.gov/climatechange/science/recentpsc.html.

[26] Anderson. M. 2006, Chapter 6: Climate Change Impacts on Flood Management p. 6-22 and 6-27. In Medelin, J., J. Harou, M. Olivares, J. Lund, R. Howitt, S. Tanaka, M. Jenkins, K. Madani, and T. Zhu (Eds), Climate Warming and Water Supply Management In California: White Paper. A Report From Climate Change Center CEC-500-2005-195-SF.

[27] San Francisco Public Utilities Commission, 2008, Modeling, Coalition Building, and Adaptation Response: San Francisco's Approach to Climate Change. Presentation made by Michael Carlin, Assistant General Manager, Water Enterprise, April 10, 2008.

This shift could also affect the availability of the seasonal water supply, particularly during the hot summer months. However, during the study period of this EIR, snowpack volumes would likely be within range of current annual variation (with a slight shift in runoff timing).[28] Variation in the annual water supply is discussed in further detail in Section 3.7, Utilities.

Water Quality.[29] Climate change could have adverse effects on water quality, which would in turn affect the beneficial uses (habitat, water supply, etc.) of surface water bodies and groundwater. The changes in precipitation discussed above could result in increased sedimentation, higher concentration of pollutants, higher dissolved oxygen levels, increased temperatures, and an increase in the amount of runoff constituents reaching surface water bodies. Sea level rise, discussed above, could result in the encroachment of saline water into freshwater bodies.

Ecosystems and Biodiversity.[30] Climate change is expected to have effects on diverse types of ecosystems, from alpine to deep sea habitat. As temperatures and precipitation change, seasonal shifts in vegetation will occur; this could affect the distribution of associated flora and fauna species. As the range of species shifts, habitat fragmentation could occur, with acute impacts on the distribution of certain sensitive species. The IPCC states that "20 percent to 30 percent of species assessed may be at risk of extinction from climate change impacts within this century if global mean temperatures exceed 2 to 3°C (3.6 to 5.4°F) relative to pre-industrial levels."[31] Shifts in existing biomes could also make ecosystems vulnerable to invasive species encroachment. Wildfires, which are an important control mechanism in many ecosystems, may become more severe and more frequent, making it difficult for native plant species to repeatedly re-germinate. In general terms, climate change is expected to put a number of stressors on ecosystems, with potentially catastrophic effects on biodiversity.

Human Health Impacts.[32] Climate change may increase the risk of vector-borne infectious diseases found in tropical areas and spread by insects—malaria, dengue fever, yellow fever, and encephalitis. Cholera, which is associated with algal blooms could also increase. While these health impacts would largely affect tropical areas in other parts of the world, effects would also be felt in California. Warming of the atmosphere would be expected to increase smog and particulate pollution, which could adversely affect those with heart and respiratory problems, such as asthma. Extreme heat events would

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[28] San Francisco Public Utilities Commission, 2008, Modeling, Coalition Building, and Adaptation Response: San Francisco's Approach to Climate Change. Presentation made by Michael Carlin, Assistant General Manager, Water Enterprise, April 10, 2008.

[29] IPCC, 2007: Climate Change 2007: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change [Parry, Martin L., Canziani, Osvaldo F., Palutikof, Jean P., van der Linden, Paul J., and Hanson, Clair E. (eds.)]. Cambridge University Press, Cambridge, United Kingdom, 1000 pp.

[30] EPA, 2008, Climate Change – Ecosystems and Biodiversity. Accessed online January 3, 2009 at: http://www.epa.gov/climatechange/effects/eco.html.

[31] IPCC, 2007: Climate Change 2007: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change [Parry, Martin L., Canziani, Osvaldo F., Palutikof, Jean P., van der Linden, Paul J., and Hanson, Clair E. (eds.)]. Cambridge University Press, Cambridge, United Kingdom, 1000 pp.

[32] EPA, 2008, Climate Change – Health and Environmental Effects. Accessed online January 3, 2009 at: http://www.epa.gov/climatechange/effects/health.html#climate.

also be expected to occur with more frequency, and could adversely affect the elderly, children, and the homeless. Finally, the water supply impacts and seasonal temperature variations expected as a result of climate change could affect the viability of existing agricultural operations, making the food supply more vulnerable.

Applicable Plans, Policies and Regulations

Executive Order S-3-05

On June 1, 2005, Governor Arnold Schwarzenegger signed Executive Order S-3-05, setting statewide targets for the reduction of California's greenhouse gas emissions. The Executive Order S-3-05 targets require that greenhouse gases be reduced to:

- 2000 levels by the year 2010,
- 1990 levels by the year 2020, and
- 80 percent below 1990 levels by the year 2050

The text of Executive Order S-3-05 does not explain how the targets should be applied to individual development projects.

Executive Order S-3-05 also established the Climate Action Team (CAT) for State agencies. After numerous public meetings and review of thousands of submitted comments, the CAT released its first report, *Climate Action Team Report to the Governor and the Legislature*, in March 2006, identifying key carbon reduction recommendations. In April 2007, the CAT released a second report, *Proposed Early Actions to Mitigate Climate Change in California*, which identifies numerous strategies for initiation of other climate action regulations and efforts prior to the 2012 deadline. State agencies are moving ahead on many of these Early Actions.

Senate Bill 97

The provisions of Senate Bill 97, enacted in August 2007, direct the Office of Planning and Research (OPR) to propose CEQA Guidelines "for the mitigation of greenhouse gas emissions or the effects of greenhouse gas emissions." SB 97 directs OPR to develop such guidelines by July 2009, and directs the Resources Agency, the agency charged with adopting the CEQA Guidelines, to certify and adopt such guidelines by January 2010. OPR released the *Preliminary Draft CEQA Guideline Amendments for Greenhouse Gas Emissions* (Draft CEQA Guideline Amendments) on January 8, 2009. In addition, an OPR technical advisory (see below), titled *CEQA and Climate Change*, was released in July 2008 and informs the analysis in this EIR.

Draft CEQA Guideline Amendments for Greenhouse Gas Emissions. The Draft CEQA Guidelines Amendments, if adopted, would add new text pertaining to greenhouse gas emissions to the existing CEQA Guidelines (Title 14, Chapter 3 of the California Code of Regulations). A summary of the proposed text revisions is provided below.

Section 15064.4. Determining the Significance of Impacts from Greenhouse Gas Emissions. This section would be added to clarify a lead agency's responsibility in assessing greenhouse gas impacts. The text proposes general considerations that should be weighed when determining the significance of an effect:

- The extent to which the project could help or hinder attainment of State greenhouse gas targets, and its consistency with plans, programs, and regulations adopted for this purpose;
- The extent to which the project may increase the consumption of fuels or other energy resources, especially fossil fuels that contribute to greenhouse gas emissions when consumed;
- The extent to which the project may result in increased energy efficiency and a reduction in overall greenhouse gas emissions from an existing facility; and
- The extent to which the project impacts or emissions exceed any threshold of significance that applies to the project.

Although the Draft CEQA Guidelines Amendments have not yet been adopted, these considerations are weighed in the discussion of the proposed project's impacts, below. The Draft CEQA Guidelines Amendments require that lead agencies "describe, calculate or estimate the amount of greenhouse emissions associated with a project" but leave the choice of a preferred methodology to the lead agency's discretion. Qualitative or other performance-based standards may also be weighed.

Section 15126.4 Consideration and Discussion of Mitigation Measures Proposed to Minimize Significant Effects. The proposed text in this section states that lead agencies "should consider all feasible means of mitigating greenhouse gas emissions associated with the project's energy consumption." Project features and project design may qualify as mitigation. In addition, mitigation may include participation or compliance with a plan or mitigation program that would reduce greenhouse gas emissions. Carbon offsets may also be included as mitigation if part of a "reasonable plan of mitigation that the relevant agency commits itself to implementing."

Section 15130. Discussion of Cumulative Impacts. The proposed text in this section simply states that the project should be considered in the context of past, current and foreseeable development to determine if a cumulatively considerable impact would result.

Proposed CEQA Checklist Questions. Appendix G of the CEQA Guidelines contains a sample checklist that may be used by lead agencies when considering environmental impacts. Two new checklist questions have been proposed for greenhouse gas emissions:

- Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment, based on any applicable threshold of significance?
- Would the project conflict with any applicable plan, policy or regulation of an agency adopted for the purpose of reducing the emissions of greenhouse gases?

However, the Draft CEQA Guidelines Amendments also propose new cautionary text to clarify that the checklist must be used with discretion and may not cover all environmental impacts. The checklist questions are not necessarily intended to serve as significance criteria. Development of significance criteria is left to the discretion of local lead agencies.

OPR Technical Advisory, CEQA and Climate Change. On June 19, 2008, OPR published a technical advisory on CEQA and Climate Change. The technical advisory is one in a series of advisories published by OPR as a service to professional planners, land use officials, and CEQA practitioners. The advisory provides OPR's perspective on the emerging role of CEQA in addressing climate change and greenhouse gas emissions, while recognizing that approaches and methodologies for calculating greenhouse gas emissions and addressing environmental impacts through CEQA review are rapidly evolving. The technical advisory "offers informal guidance regarding the steps lead agencies should take to address climate change in their CEQA documents."[33]

The technical advisory points out that neither CEQA nor the CEQA Guidelines prescribe thresholds of significance or particular methodologies for performing and impact analysis. As stated, "[t]his is left to lead agency judgment and discretion, based upon factual data and guidance from regulatory agencies and other sources where available and applicable."[34] OPR recommends that "the global nature of climate change warrants investigation of a statewide threshold of significance for GHG emissions."[35] Until such a standard is established, OPR advises that each lead agency should develop its own approach to performing an analysis for projects that generate greenhouse gas emissions.[36]

OPR sets out the following process for evaluating greenhouse gas emissions. First, agencies should determine whether greenhouse gas emissions may be generated by a proposed project, and if so, they should quantify or estimate the emission by type or source. Calculation, modeling or estimation of greenhouse gas emissions should include the emissions associated with vehicular traffic, energy consumption, water usage, and construction activities.[37] Agencies should then assess whether the emissions are "cumulatively considerable" even through a project's greenhouse gas emissions may be individually limited. OPR states, "Although climate change is ultimately a cumulative impact, not every individual project that emits greenhouse gases must necessarily be found to contribute to a

[33] OPR, Technical Advisory, CEQA and Climate Change: Addressing Climate Change Through CEQA Review, June 19, 2008, p.2.

[34] OPR, Technical Advisory, CEQA and Climate Change: Addressing Climate Change Through CEQA Review, June 19, 2008, p. 4.

[35] OPR, Technical Advisory, CEQA and Climate Change: Addressing Climate Change Through CEQA Review, June 19, 2008, p. 4.

[36] OPR, Technical Advisory, CEQA and Climate Change: Addressing Climate Change Through CEQA Review, June 19, 2008, p. 5.

[37] OPR, Technical Advisory, CEQA and Climate Change: Addressing Climate Change Through CEQA Review, June 19, 2008, p. 5.

significant cumulative impact on the environment."[38] Individual lead agencies may undertake a project-by-project analysis, consistent with available guidance and current CEQA practice.[39]

Finally, if the lead agency determines emissions are a cumulatively considerable contribution to a significant cumulative impact, the lead agency must investigate and implement ways to mitigate the emissions.[40] OPR states:

> Mitigation measures will vary with the type of project being contemplated, but include alternative project designs or locations that conserve energy and water, measures that reduce vehicle miles travelled (VMT) by fossil-fueled vehicles, measures that contribute to established regional or programmatic mitigation strategies, and measures that sequester carbon to offset the emissions from the project.[41]

OPR concludes that "[a] lead agency is not responsible for wholly eliminating all greenhouse gas emissions from a project; the CEQA standard is to mitigate to a level that is 'less than significant'."[42] The technical advisory includes a list of mitigation measures that can be applied on a project-by-project basis.

Assembly Bill 32

Shortly after the issuance of Executive Order S-3-05, the California State Legislature adopted Assembly Bill 32 (AB 32), the Global Warming Solutions Act of 2006. AB 32 recognizes that California is the source of substantial amounts of greenhouse gas emissions. In the Findings and Declarations for AB 32, the Legislature found that:

> The potential adverse impacts of global warming include the exacerbation of air quality problems, a reduction in quality and supply of water to the state from the Sierra snowpack, a rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to the marine ecosystems and that natural environment, and an increase in the incidences of infectious diseases, asthma and other health-related problems.

To avert these consequences, AB 32 requires CARB, the State agency charged with regulating statewide air quality, to create a plan and implement rules to achieve "real, quantifiable, cost-effective reductions of greenhouse gases." AB 32 requires CARB to design and implement emissions limits, regulations, and other measures, such that statewide greenhouse gas emissions would be reduced to

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[38] OPR, Technical Advisory, CEQA and Climate Change: Addressing Climate Change Through CEQA Review, June 19, 2008, p. 6.

[39] OPR, Technical Advisory, CEQA and Climate Change: Addressing Climate Change Through CEQA Review, June 19, 2008, p. 6.

[40] OPR, Technical Advisory, CEQA and Climate Change: Addressing Climate Change Through CEQA Review, June 19, 2008, p. 6.

[41] OPR, Technical Advisory, CEQA and Climate Change: Addressing Climate Change Through CEQA Review, June 19, 2008, p. 6-7.

[42] OPR, Technical Advisory, CEQA and Climate Change: Addressing Climate Change Through CEQA Review, June 19, 2008, p. 7.

1990 levels by 2020, the same 2020 threshold indicated in Executive Order S-3-05. AB 32 directed CARB to develop early actions to reduce greenhouse gas emissions while also preparing a Scoping Plan to identify how best to reach the 2020 limit. The measures and regulations to meet the 2020 target are to be in effect by 2012.

California Air Resources Board Climate Change Scoping Plan. CARB's *Climate Change Scoping Plan*, adopted on December 11, 2008, reports that CARB has met the first milestones set by AB 32. As discussed above, CARB was required to prepare a historical emissions inventory and set emissions targets for 2020. In December 2007, CARB approved a 1990 emissions inventory of 427 million metric tons of CO_2 equivalents of greenhouse gases. As AB 32 requires that emissions be reduced to 1990 levels by 2020, approval of this inventory effectively determined emissions targets for 2020. As required, CARB has also identified 44 early action measures that could be enforceable on or before 2010. These measures include potential regulations affecting landfills, motor vehicle fuels, refrigerant in cars, port operations and many other sources. Regulatory development for these measures is ongoing.

The Scoping Plan also proposes a comprehensive set of actions designed to reduce overall greenhouse gas emissions in California, including:[43]

- Expanding and strengthening existing energy efficiency programs as well as building and appliance standards;
- Achieving a statewide renewable energy mix of 33 percent;
- Developing a California cap-and-trade program that links with other Western Climate Initiative partner programs to create a regional market system;
- Establishing targets for transportation-related greenhouse gas emissions for regions throughout California, and pursuing policies and incentives to achieve those targets;
- Adopting and implementing measures pursuant to existing State laws and policies, including California's clean car standards, goods movement measures, and the Low Carbon Fuel Standard; and
- Creating targeted fees, including a public goods charge on water use, fees on high global warming potential gases, and a fee to fund the administrative costs of the State's long-term commitment to AB 32 implementation.

The Scoping Plan notes that local governments are "essential partners" in the effort to reduce greenhouse gas emissions, and that they have "broad influence and, in some cases, exclusive jurisdiction" over activities that contribute to greenhouse gas emissions. The Scoping Plan encourages local governments to adopt goals for reducing municipal greenhouse gas emissions and move towards adoption of a goal for reducing community emissions. These targets should parallel the State's commitment to reduce greenhouse gas emissions by approximately 15 percent of current levels by

[43] CARB, December, 2008, Climate Change Scoping Plan, p. ES-3 to ES-4.

2020.[44] The Scoping Plan also observes that "[l]ocal governments have the ability to directly influence both the siting and design of new residential and commercial developments in a way that reduces greenhouse gases associated with vehicle travel, as well as energy, water, and waste"[45] and that "[i]ncreasing low-carbon travel choices (public transit, carpooling, walking and biking) combined with land use patterns and infrastructure that support these low-carbon modes of travel, can decrease average vehicle trip lengths by bringing more people closer to more destinations."[46] It also notes that regional targets will be set and achieved on a regional basis through the SB 375 implementation process, which "maintains regions' flexibility."

Senate Bill 375

Senate Bill (SB) 375, which establishes mechanisms for the development of regional targets for reducing passenger vehicle greenhouse gas emissions, was adopted by the State on September 30, 2008. SB 375 requires CARB to develop vehicular greenhouse gas emissions reduction targets for 2020 and 2035 by September 30, 2010 in consultation with metropolitan planning organizations. SB 375 recognizes the importance of achieving significant greenhouse gas reductions by changing land use patterns and improving transportation alternatives. Through the SB 375 process, regions will develop sustainable community plans designed to integrate development patterns and the transportation network in a way that reduces greenhouse gas emissions while meeting housing needs and other regional planning objectives. However, no sustainable community plans have been adopted to date; therefore, no such plan would apply to the proposed project.

Bay Area Regional Agency Climate Protection Program

The Joint Policy Committee (composed of the Association of Bay Area Governments [ABAG], Bay Area Air Quality Management District [BAAQMD], Bay Conservation and Development Commission [BCDC], and Metropolitan Transportation Commission [MTC]) approved the Bay Area Regional Agency Climate Protection Program on May 4, 2007 (amended July 20, 2007) to mitigate potential effects of climate change. This program includes strategies to:

- Establish management priorities based on impacts, benefits, ease of implementation, and cost-effectiveness;
- Increase public awareness and motivate action through workshops and grass-roots outreach;
- Provide assistance such as standardization of procedures for determining impacts, maintaining and distributing data, model codes and other tools, funding for demonstration projects, and others;
- Reduce driving and promote alternative modes of transportation through mechanisms such as road pricing, mode competitiveness, and regional development planning;

[44] CARB, December, 2008, Climate Change Scoping Plan, p. 27.
[45] CARB, December, 2008, Climate Change Scoping Plan, p. 26.
[46] CARB, December, 2008, Climate Change Scoping Plan, p. 48.

- Prepare to adapt, because regardless of regional reductions in potential causes contributing to global climate change, the region will be affected by changing environmental conditions; and
- Increase the importance of CEQA review of CO_2 impacts, conduct life-cycle costing of all capital projects, encourage energy-efficient development with sliding-scale permit fees, rebates and expedited permit review processes, and return the region's freeways to a maximum of 55 miles per hour.

State Building Standards (Title 24)

California has achieved substantial energy savings and emissions reductions through implementation of aggressive building and appliance standards and utility energy efficiency programs. CARB's Scoping Plan (see discussion of AB 32, above) reported:

> These combined efforts are saving more than 40,000 GWh of electricity annually—enough to power almost six million California homes. Due in part to these successful policies, California uses less electricity per person than any other state in the nation.[47]

However, in spite of these savings, the Scoping Plan notes that "[c]ollectively, energy use and related activities by buildings are the second largest contributor to California's greenhouse gas emissions."[48]

Title 24, Part 6, of the California Code of Regulations (CCR), Energy Efficient Standards for Residential and Nonresidential Buildings (also referred to as the California Energy Code), was adopted in 1978 by the CEC in response to a legislative mandate to reduce California's energy consumption. Title 24, Part 6 is updated frequently, with the most recent update occurring in 2008. Title 24, Part 6 requires to the incorporation of energy conserving features in new construction, and alterations and additions to existing buildings. Although it was not originally intended as a climate change policy, by reducing California's energy consumption, Title 24, Part 6, has become a means of reducing California's greenhouse gas emissions. Energy efficient buildings require less electricity, which results in fewer greenhouse gas emissions.

On July 17, 2008, the California Building Standards Commission (CBSC) adopted the California Green Building Code, which is being codified in Title 24, Part 11, of the California Code of Regulations. As CARB's Scoping Plan explains, "[w]hile the current version of the commercial green building code is voluntary, the CBSC anticipates adopting a mandatory code in 2011, which will institute minimum environmental performance standards for all occupancies."[49]

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[47] CARB, December, 2008, Climate Change Scoping Plan, Appendix C, p. C-90.

[48] CARB, December, 2008, Climate Change Scoping Plan, p. 57.

[49] CARB, December, 2008, Climate Change Scoping Plan, p. 57.

City of Pittsburg General Plan

As noted in Section 3.7, Utilities, there are a number of existing and proposed *General Plan* goals and policies related to reductions in VMT and energy savings including the following:

- **General Plan Policy 2-19:** Revise the City's Subdivision Ordinance to include provisions for solar access and other energy-savings devices.

- **General Plan Goal 7-G-17:** Encourage major employers to develop and implement Transportation Demand Management programs to reduce peak-period trip generation.

- **General Plan Policy 7-P-55:** Encourage major employers (for example: USS-POSCO, DOW Chemical, City of Pittsburg) to adopt Transportation Demand Management programs that would reduce peak-period trip generation by 15 percent or more.

- **General Plan Policy 7-P-56:** Favor Transportation Demand Management programs that limit vehicle use over those that extend the commute hour.

- **General Plan Policy 7-P-57:** During review of development plans, encourage major employers to establish designated carpool parking areas and secure bicycle facilities in preferable onsite locations (for example, under parking shelters or closest to main entryways).

- **General Plan Policy 7-P-58:** Allow the reduction of transportation impact fees on new non-residential development commensurate with provision of Transportation Demand Management measures.

The City is currently updating the Housing Element, and several proposed policies and programs would result in increased energy efficiency in the City in general and the Specific Plan Area, in particular. Proposed General Plan Policy 2.7 (Housing Element) encourages the use of smart growth principles in the site planning of new subdivisions to enhance the quality of life of Pittsburg residents including, but not limited to, the incorporation of smart growth site planning principles as in new subdivisions as part of a comprehensive update of the development review design guidelines.

Proposed General Plan Policy 2.6 (Housing Element) encourages the incorporation of energy conservation design features in existing and future residential developments to conserve resources and reduce housing costs. Programs could include, but not be limited to, the following:

- Evaluate new subdivisions for passive solar and cooling opportunities, consistent with the Subdivision Map Act.

- Enforce the State Energy Conservation Standards for new residential construction and additions to existing structures.

- Continue to offer rehabilitation loans and possibly grants to low and moderate-income homeowners to improve the energy efficiency of their residence and/or replace existing energy inefficient appliances.

- Support the use of solar heating and other environmentally sound, energy efficient methods for heating and cooling homes, consistent with adopted building, mechanical and plumbing codes.
- Create incentives such as a density bonus or priority permitting for developments that exceed state energy efficiency standards by 20 percent as part of a comprehensive update of the development review design guidelines.
- Work with the Pittsburg Power Company, and other private donors, to develop a grant or long term loan program fund to fund the installation of solar panels on single-family and multi-family residential developments to reduce energy consumption and provide savings to property owners.

Impact Assessment and Mitigation Measures

Standards of Significance

Neither the CEQA Guidelines nor any other legislation or regulatory enactment provides numeric or qualitative thresholds of significance for greenhouse gas emissions. The Draft CEQA Guidelines Amendments, released in January 2009, state that each local lead agency must develop its own significance criteria based on local conditions, data, and guidance from public agencies and other sources. The City has determined, based on full consideration of the available information, that, for the purposes of this analysis, the project would result in a cumulatively considerable contribution to significant climate change emissions if it would:

- Fail to implement design measures or policies that would minimize the greenhouse gas emissions associated with Specific Plan development.

Methodology

Greenhouse Gas Emissions Inventory. Greenhouse gas emissions would be generated by the proposed project during construction activities and during operation. Emissions sources would include vehicular emissions, direct area source emissions, indirect electricity emissions, fugitive emissions from solid waste decomposition, fugitive emissions from wastewater treatment, and fugitive emissions from water supply processes. A projected inventory of the proposed project's three key greenhouse gas emissions (CO_2, CH_4, and N_2O) is presented below. These three greenhouse gases represent the majority of the greenhouse gas emissions associated with new development. The inventories prepared for the proposed project demonstrate the increase in emissions that would occur in the project area. This inventory does not take into account Specific Plan policies that would reduce greenhouse gas emissions but represents a "worst case" scenario, a conservative estimate of the greenhouse gases that would result if no emissions reductions efforts were undertaken. The City has not yet completed a citywide inventory that could be used to put the emissions generated under the Railroad Avenue Specific Plan into context, although the City's Public Works Department anticipates releasing such an inventory in the future.

To prepare the inventory, the emissions of the individual gases were estimated, then converted to their CO_2 equivalents (CO_2e) using the individually determined global warming potential of each gas. Thus, total greenhouse gas emissions equals total CO_2 emissions plus total CO_2e emissions from CH_4 and N_2O. No construction phasing information was available for the proposed project because buildout of the Railroad Avenue Specific Plan Area is dependent on market conditions. Total construction emissions were calculated in URBEMIS 2007 and averaged over a 25-year period. Operational emissions were conducted for the entire Railroad Avenue Specific Plan Area assuming full buildout of existing land use designations and zoning and for the opportunity areas specified in the Railroad Avenue Specific Plan. The inventory for the opportunity areas represents the net total increase in greenhouse gases—greenhouse gases associated with buildout of the Specific Plan minus the level of potential development permitted in the *General Plan*. Operational emissions were calculated as follows:

- *Area Source Emissions*. Area source emissions are emissions associated with natural gas usage, landscaping, and other direct fuel consumption. Area source emissions for all land uses were estimated in URBEMIS 2007.

- *Vehicular Emissions*. Mobile emissions, which would be released by project-generated vehicle trips, were estimated in URBEMIS 2007. Generally, mobile emissions are the largest source of emissions associated with new development projects.

- *Electricity Emissions*. Project residents and employees would use electricity for lighting, machinery and other uses. The generation of electricity through the combustion of fossil fuels typically yields CO_2 and, to a much smaller extent, CH_4 and N_2O. Electricity demand for the proposed project was estimated using factors provided by the California Energy Commission (CEC), and greenhouse gas emissions were estimated using California Climate Action Registry (CCAR) emissions factors.

- *Solid Waste Emissions*. Solid waste generated by the proposed project would contribute to greenhouse gas emissions through fugitive methane emissions. However, solid waste inventory models present dramatically varying estimates of greenhouse gas emissions. The emissions from a given project depend on the composition of the waste stream generated by that project. However, emissions from solid waste generally constitute approximately 10 to 20 percent of the total emissions inventory.

- *Water Supply and Wastewater Treatment Emissions*. Greenhouse gas emissions would be generated by the infrastructure used to distribute and treat the domestic water that would supply the proposed project. Fugitive emissions would also be released during treatment of project wastewater. It is not anticipated that such emissions would be substantial relative to other project emissions. In addition, there are no widely accepted inventory methods for water supply and wastewater emissions, and insufficient data is available to provide an accurate quantitative estimate. Therefore, these emissions are discussed qualitatively.

Following presentation of the inventory, the project's emissions reducing features are outlined, and where applicable, additional mitigation is applied.

Consistency with AB 32 and Executive Order S-3-05 Reduction Thresholds. The statewide emissions reduction thresholds in Table 3.8-2 are the only quantitative regulatory thresholds for greenhouse gas emissions available at this time. However, statewide targets do not specify how greenhouse gas emissions reductions should be achieved by sector or by region. The regulations do not contain policies specific to individual development projects. Although CARB is expected to develop standards for implementation of AB 32, no such standards are available at this time to apply to the proposed project. It is conservatively assumed that the proposed project would have a potentially significant impact with respect to AB 32 and Executive Order S-3-05 if it failed to implement feasible emissions-reducing measures.

Environmental Analysis

For each potential impact associated with the proposed project, a level of significance is determined and is reported in the impact statement. Conclusions of significance are defined as follows: significant impact (S), potentially significant impact (PS), less than significant impact (LTS), or no impact (NI). For each impact identified as being significant (S) or potentially significant (PS), the EIR provides mitigation measures to reduce, eliminate, or avoid the adverse effect. If the mitigation measures would reduce the impact to less-than-significant (LTS) level successfully, this is stated in the EIR. If the mitigation measures would not diminish significant or potentially significant impacts to a less-than-significant level, the impacts are classified as "significant unavoidable impacts (SU)." For this section, CC refers to climate change.

CC-1 Greenhouse Gas Emissions. The proposed project could result in a substantial cumulative increase in greenhouse gas emissions. (PS)

Construction Emissions. During buildout of the Railroad Avenue Specific Plan Area, greenhouse gases would be emitted through the operation of construction equipment and from worker and building supply vendor vehicles. Because no construction phasing data are available, the year in which peak construction emissions would occur cannot be determined. However, assuming a 2030 buildout horizon, buildout would generate approximately 239 metric tons CO_2e annually.

Operational Emissions. Emissions would also be released during the operational phase of the proposed project. Table 3.8-3 and Table 3.8-4 show the projected greenhouse gas emissions associated with direct area sources, mobile emissions, and indirect electricity generation.

Table 3.8-3
Annual Direct Area Source and Mobile Emissions

Type of Emissions	CO_2e Emissions (metric tons/year)
Natural gas, landscaping, and hearths	5,185
Vehicles	40,226

Sources: Emissions modeled in URBEMIS 2007 using land use data provided by City of Pittsburg.

Table 3.8-4
Annual Indirect Electricity Emissions

Land Use Category	Buildout	Electricity Factor (kWh/s.f. or du)	Electricity Consumption, Buildout (MWh)	CO_2e Emissions (metric tons/year)
Residential (units)	1,845	3.807	6,038	2,206
Community commercial (sf)	270,949	14.06	3.810	1,392
Public/institutional	304,400	7.46	2,271	830
Business commercial	413,100	17.70	7,312	2,672
Total			*19,430*	*7,101*

Sources:

1. Energy factors for non-residential uses are from CEC, 2006. Commercial End Use Study. Table 8-1.
2. Energy factors for residential uses are from CEC, 2004. California Statewide Residential Appliance Saturation Study. Table 2-3.
3. Emissions factors are from CCAR, 2007. General Reporting Protocol, v.2.2.

Notes: kWh/s.f. or du =kilowatt hour per square foot or per dwelling unit
mWh = megawatt hour
N_2O/mWh = Nitrous Oxide per megawatt hour
H_4/mWh = methane per megawatt hour
CO_2e = carbon dioxide equivalent

Total annual operational emissions associated with Railroad Avenue Specific Plan development would total approximately 52,512 metric tons CO_2e, not including emissions from solid waste, water supply, or wastewater treatment. This estimate does not fully take into account emissions reductions associated with implementation of existing *General Plan* policies or proposed Specific Plan policies and development regulations.

Emissions-Reducing Features. Although the above inventory indicates that the proposed project would result in an increase in greenhouse gas emissions, the Railroad Avenue Specific Plan contains several emissions-reducing design features and policies.

As discussed in the Setting, vehicle trips represent the majority of the greenhouse gas emissions associated with urban development. A primary focus of the Specific Plan is vehicle trip reduction. The Specific Plan proposes mixed-use development, infill development centered on a future eBART Station and a transit hub. The Specific Plan development pattern would also improve pedestrian and transit access to schools, restaurants, retail, and other uses that generate a large number of vehicle trips. The Railroad Avenue Specific Plan is a Priority Development Area[50] under the FOCUS program implemented by ABAG, the Bay Area Air Quality Management District (BAAQMD), San Francisco Bay Conservation and Development Commission (BCDC), and the Metropolitan Transportation Commission (MTC), the primary goal of which is to "encourage future growth near transit". Transit-oriented development, such

[50] FOCUS Joint Policy Committee. No date. Priority Development Area Showcase: Railroad Avenue eBART. Accessed online February 17, 2009 at: http://www.bayareavision.org/pda/contra-costa-county/pittsburg/railroad-ave/.

as that proposed under the Specific Plan, has been demonstrated to result in fewer vehicle trips and reduced VMT.[51] Thus, the proposed development pattern would minimize vehicle trips and VMT and would therefore be expected to have corresponding benefits with respect to greenhouse gas emissions.

Many goals and policies in the Specific Plan are designed to increase density (Specific Plan Policies 3-G-1, 3-P-1, 3-P-4, 3-P-10 and 3-P-11); encourage travelers to use modes of transportation other than single occupancy vehicles (Specific Plan Policies 4-P-5, 4-P-6, 5-P-5, 5-P-7, 6-P-18, 6-P-19, 6-P-20, and 6-P-21); create pedestrian and bicycle pathways as well as a streetscape designed to support pedestrian activity (Specific Plan Policies 3-P-7, 4-P-2, 5-P-2, 6-P-6 and 6-P-9); and, encourage implementation of Traffic Demand Management (TDM) strategies (Specific Plan Policy 6-P-16). Specific Plan Policies 7-P-2 and 7-P-3 encourage sustainable site and building design for new development. By minimizing trips and increasing energy efficiency, these policies would help to offset the greenhouse gas emissions associated with Specific Plan development.

Specific Plan goals and policies that would have emissions-reducing effects include the following:

- **Specific Plan Policy 3-G-1:** Maximize the benefit of the proposed eBART Station and other transit options and increase ridership by creating a high density, mixed-use community around the potential station site and by integrating the area with the surrounding neighborhoods.

- **Specific Plan Policy 3-P-1:** Create a vibrant, mixed-use, transit-oriented development district near the proposed eBART Station.

- **Specific Plan Policy 3-P-4 :** Provide services and amenities that meet the needs of transit riders, local residents, employees, students and visitors such as childcare, education and job skills services, community centers, healthcare services, and neighborhood serving retail in close proximity to the eBART Station.

- **Specific Plan Policy 3-P-7:** Create an integrated network of open spaces and trails that connect different neighborhoods and sub-areas to each other and to transit facilities.

- **Specific Plan Policy 3-P-10:** Residential uses are permitted above ground floor commercial uses in all commercial land use designations. Subject to the discretion of the Planning Commission, mixed use projects in commercial land use designations may receive a 0.25 additional FAR over the maximum permitted FAR in order to accommodate the residential component. The residential floor area shall comprise no

[51] Transit Cooperative Research Cooperative, 2008. Effects of TOD on Housing, Parking, and Travel. TCRP Report Number 128.

less than 25 percent and no more than 75 percent of the total square footage of building developed on site.

- **Specific Plan Policy 3-P-11:** Allow minor deviations from the designated land uses provided that the intent of the predominant land use designation is maintained. Where uncertainty exists regarding the interpretation of a provision of this document to a specific site, the Zoning Administrator shall determine the intent of the provision.

- **Specific Plan Goal 4-G-1:** Provide a safe and inviting pedestrian environment to draw people to and from the eBART Station.

- **Specific Plan Goal 4-G-2:** Celebrate the station area as a major gateway to the city.

- **Specific Plan Goal 4-G-3:** Promote high quality development that is socially and environmentally responsible through the use of high quality, sustainable building materials and practices.

- **Specific Plan Policy 4-P-1:** Require high quality, pedestrian-friendly design and a high level of transparency along street fronts and pathways to activate the street environment, promote social interaction and support crime prevention.

- **Specific Plan Policy 4-P-2:** Incorporate public pathways and greenways throughout private development located within the Civic Center and Transit Village sub-areas to facilitate pedestrian and bicycle movement throughout the Specific Plan Area.

- **Specific Plan Policy 4-P-3:** Provide high quality wayfinding signage throughout the Specific Plan Area.

- **Specific Plan Policy 4-P-4:** Develop incentives to support sustainable practices in site and building design such as improved insulation, operable windows, energy efficient lighting and appliances, solar access, natural ventilation, and permeable paving materials.

- **Specific Plan Policy 4-P-5:** Allow reductions in on-site parking requirements at the discretion of the Planning Commission or City Council as part of project approval for affordable and senior housing developments located within the Transit Village, Civic Center and High School Village subareas.

- **Specific Plan Policy 4-P-6:** As the Specific Plan Area develops, review parking standards within the Transit Village, Civic Center and High School Village sub-areas and incorporate policies such as unbundling parking from residential units, lowering minimum parking requirements, and incorporate parking pricing strategies in order to prioritize pedestrian and bicycle usage.

- **Specific Plan Policy 5-P-2:** Require new development in the Transit Village and Civic Center sub-areas to dedicate land or to build the proposed public pathways and trails into new development to create a strong network of parks, plazas and pathways that are consistent with those shown on the Land Use Plan.

- **Specific Plan Policy 5-P-5:** Create a dedicated bus-only street and lanes with access in both directions in the Transit Village sub-area.

- **Specific Plan Policy 5-P-7:** Install street furniture that improves the transit rider's experience, including bus shelters with seating, interactive bus shelters with GPS tracking to show bus times, and other informational signage.

- **Specific Plan Policy 6-P-6:** Create dedicated mid-block greenway connections throughout the Transit Village and into the Civic Center sub-areas.

- **Specific Plan Policy 6-P-9:** Incorporate traffic calming techniques such as wide sidewalks, narrow streets, bulb outs, on-street parking, and other strategies throughout the Transit Village, Civic Center and High School Village sub-areas.

- **Specific Plan Policy 6-P-16:** Include efficient links between Tri-Delta buses, shuttles, public parking areas and the potential eBART Station. Work with transit providers to ensure matching service spans between buses, shuttles and BART trains.

- **Specific Plan Policy 6-P-18:** Use shuttles to strengthen transit connections between the Specific Plan Area, the Pittsburg/Bay Point BART station and Old Town Pittsburg.

- **Specific Plan Policy 6-P-19:** Develop a bus-only access street in the Transit Village.

- **Specific Plan Policy 6-P-20:** When traffic and parking demand volumes increase as the Specific Plan Area develops, consider amending the General Plan to define the intersections located within the Specific Plan Area as Transit Oriented Development and subject to specific multi-modal as well as vehicular LOS standards.

- **Specific Plan Policy 7-P-2:** Promote building design that improves energy efficiency by incorporating natural cooling and passive solar heating where possible. This may include extended eaves, window overhangs, awnings and tree placement for natural cooling and building and window orientation to take advantage of passive solar heating.

- **Specific Plan Policy 7-P-3:** Where possible, integrate solar generating structures with varied functions into the urban fabric including, but not limited to, bus shelters, parking lots, street lights and other public infrastructure.

- **Specific Plan Policy 7-P-7:** New projects shall incorporate water conservation measures including but not limited to low flow showers and toilets, low flow and gray water irrigation systems and the use of drought tolerant landscaping.

- **Specific Plan Policy 7-P-8:** All commercial and residential development shall provide trash enclosures that can accommodate receptacles for garbage, recycling and green and food waste collection when it is available from Pittsburg Disposal on a city-wide basis.

The following development regulations, specified in Chapter 4 of the Railroad Avenue Specific Plan, would also contribute to reductions in greenhouse gas emissions by enhancing alternative transportation options, enhancing energy efficiency, reducing water use, and minimizing waste. The development regulations vary somewhat for each land use designation, but the overall requirements apply throughout the Specific Plan Area.

- A minimum of one bicycle parking space per 2,500 square feet of gross building area is required. Allow adjacent bicycle parking facilities located on the street, and within public parking garages, to fulfill a portion of this requirement.
- Require 10 to 15 percent of the total lot area to be landscaped. Landscaping may include decorative hardscape, plazas, rooftop gardens, water features, and public art installations.
- Provide clearly-delineated pedestrian-friendly pathways throughout surface parking lots that are separate and distinct from the surface of the lot by using stamped, colored concrete or other decorative material.
- Provide a minimum of one tree per every four parking spaces in surface parking lots.
- Incorporate permeable surfaces and pavers for parking lots, driveways and alleys.
- Public bicycle parking lockers shall be installed on the ground floor of parking garages at a ratio of one bicycle parking locker per 50 parking spaces.
- Utilize ecologically conscious designs that utilize natural light, shade, and energy efficient materials. Projects should include sustainable site and building design elements such as improved insulation, operable windows, energy efficient lighting and appliances, solar energy sources built into the development, natural ventilation and permeable paving materials.

Conclusion. The emissions inventory prepared for the proposed project represents a worst-case scenario and does not take into account the reduction in greenhouse gas emissions that would result from the reduction in trips and VMT and the increase in land use efficiency that would be promoted by the Railroad Avenue Specific Plan. Emissions-reducing features of the Specific Plan are summarized above and would help to minimize the proposed project's greenhouse gas emissions. However, the City has conservatively decided to adopt Mitigation Measure CC-1.1, below, to incorporate additional emissions reductions strategies

recommended by the CAT/CARB Early Action Recommendations report, the 2008 CAPCOA report, the 2008 OPR Technical Advisory, and the Office of the Attorney General (OAG).[52]

MITIGATION MEASURE. Incorporation of Mitigation Measure CC-1.1 would reduce the Specific Plan's contributions to climate change to a less-than-significant level. (LTS)

CC-1.1 *Adoption of Additional Specific Plan Policies Pertaining to Greenhouse Gas Emissions*. The following policies shall be incorporated into the Railroad Avenue Specific Plan to address the greenhouse gas emissions associated with solid waste, utilities, and water use.

- Provide incentives to private developers to incorporate green building practices. Such incentives may include accelerated project review, rebates or low-interest loans for green building improvements, or other programs designed by the City.
- Retrofit municipal water and wastewater systems in the Railroad Avenue Specific Plan Area with energy efficient motors, pumps and other equipment.

Cumulative Analysis

The analysis of the proposed project's climate change impact, discussed above, is essentially an analysis of the Specific Plan's contribution to a cumulatively significant global impact through its emission of greenhouse gases. The cumulative impacts of the proposed project, with respect to the issue of climate change, are therefore captured above, and no further cumulative analysis is necessary.

[52] Descriptions of these reports and agencies are provided in the Applicable Plans and Policies subsection.

Chapter 4
Other Statutory Sections

4.1 INTRODUCTION

The purpose of the Railroad Avenue Specific Plan is to provide a means for ensuring that the Specific Plan Area is developed under a comprehensive plan that is consistent with the provisions of the City's *General Plan*. The *General Plan* contains numerous goals and policies related to the development of a Specific Plan around the planned eBART station (see Appendix F for a complete list of *General Plan* goals and policies related to the Specific Plan). The Specific Plan is consistent with all elements of the *General Plan*, and specifically fulfills the *General Plan*'s policies to create a specific plan for the potential eBART station area featuring a mix of commercial and residential uses with extensive pedestrian amenities and linkages to surrounding neighborhoods. It also fulfills policies to allow for expansion, intensification and densification of commercial and residential uses along the Railroad Avenue corridor closest to the future eBART station. Circulation improvements envisioned by the *General Plan* will also be implemented through the Specific Plan including the extension of Garcia Avenue to Railroad Avenue; development of transit-oriented development patterns such as smaller blocks to support pedestrian activity; and, improvements in public transit amenities by including streetscape amenities such as pedestrian-scaled lighting, benches and bus shelters.

The stated objectives of the Railroad Avenue Specific Plan include meeting City and regional needs for improved access to regional mass transit (e.g., BART) by providing for (a) changes in land use in areas within ½ mile of the proposed Railroad Avenue eBART station, including the allowance of new mixed-use, commercial, and increasingly dense residential development, and (b) development guidelines for land use classifications in the sub-areas in closest proximity to the planned eBART station in order to support a pedestrian and bicycle friendly environment around the Railroad Avenue eBART station. For a complete list of Specific Plan Goals and Policies, see Appendix F of this EIR.[1] Construction of the eBART station is justified under existing zoning regulations, in that the City of Pittsburg can currently meet MTC's density requirement for 2,200 residential units within ½-mile of the planned eBART station under existing zoning.[2] However, the Specific Plan (RDP) contains the additional goals and policies required to create supporting infrastructure and a setting that would make this new development viable and successful as a transit oriented development project. The Specific Plan goals and policies are also required to better support the multi-modal environment that is key to successful transit oriented development. Despite the ability to develop the units, this would not be a successful transit village in that there are limited and undersized sidewalks, few bicycle facilities, limited commercial activity and infrequent transit service to the Specific Plan Area. This Specific Plan would correct for the underutilization of the areas located in closest proximity to the planned eBART station by allowing, not only an increased density on currently underutilized land, but would also create a

[1] Appendix F includes both *General Plan* goals and policies and Specific Plan goals and policies. Specific Plan goals and policies are found toward the latter portion of Appendix F.

[2] Leigha Schmidt, City of Pittsburg Planning Department, by electronic communication on February 11, 2009.

sustainable and inviting multi-modal environment by providing architectural and site design criteria as well as streetscape standards to support a pedestrians and bicyclists. Currently, the Specific Plan area includes a number of vacant lots and development that is relatively spread out, particularly along commercial corridors. If the Railroad Avenue eBART station is built in the proposed location, as expected, the Specific Plan area may reasonably be expected to be developed with the assumed range of mixed use, commercial and residential uses.

4.2 SIGNIFICANT AND UNAVOIDABLE AND SIGNIFICANT IRREVERSIBLE IMPACTS

In accordance with Sections 15126.2(b) and 15126.2(c) of the California Environmental Quality Act (CEQA) Guidelines, this section sets forth those significant environmental adverse impacts (i.e., impacts that cannot be mitigated to a less-than-significant level) that would result from implementation of the Railroad Avenue Specific Plan as evaluated in this EIR.

CEQA requires the decision-maker (lead agency), to balance the benefits of a proposed project against its unavoidable environmental risks in determining whether to approve a project. Where a decision on a project allows the occurrence of significant effects that are identified in an EIR but are not at least substantially mitigated, the lead agency is to adopt a statement of overriding considerations and specify in writing the specific reasons to support its action based on the EIR and/or other information in the record. If a lead agency makes a statement of overriding considerations, the statement should be included in the record of the project approval.[3]

Mitigation measures are established in the various technical sections of this EIR. Where impacts have been identified as a result of the Railroad Avenue Specific Plan and its development components – including the addition of 1,845 new residential units and 988,449 square feet of new commercial floor area on 97 acres out of the total 1,075 Specific Plan Area acres – these measures would mitigate most identified significant or potentially significant impacts to les-than-significant levels.

There would be two significant and unavoidable impacts that would occur in implementing the Railroad Avenue Specific Plan and its development components. First, emissions of ROG, NO_X, and PM_{10} that would: (1) exceed BAAQMD's established significance threshold of 80 pounds per day, (2) contribute substantially to an existing or projected air quality violation, and (3) be inconsistent with regional air quality plans to achieve attainment. As there are no feasible measures to mitigate these effects, this impact would be significant and unavoidable. Second, emissions of ROG and PM_{10} would be cumulatively considerable.

These significant and unavoidable impacts cannot be mitigated to a less-than-significant level, but can be partially mitigated by the requirement that developers of specific development projects, within the Specific Plan area, develop and implement a plan to reduce operational air emissions, as a part of future development (see mitigation measure AQ-6.1). Other typical mitigation measures for traffic-related air contaminants would call for a reduction in project-related vehicle trips, which would be

[3] California Code of Regulations Section 15000, *et seq*.

implemented through the City's adoption of a transportation system management (TSM) program for the proposed development. However, because the proposed project is already a transit-oriented development, with proposed developments within ½ mile of a future transit hub (the proposed Railroad Avenue eBART station), trip reductions for transit have already been accounted for; it would be ineffective and redundant to propose implementation of measures to support trip reductions already proposed as part of the project. Other typical TSM measures, such as inclusion of a shuttle bus for residents and employees, would have limited impact in this instance, as the proposed project would introduce new residential and commercial units within ½ mile of the proposed Railroad Avenue BART station; shuttle bus service would be unnecessary to carry new project-related passengers from the eBART station ½ mile to these nearby new uses. Notwithstanding these facts, the Specific Plan proposes a new shuttle service between the proposed eBART station and downtown Pittsburg, which lies outside of the Specific Plan area, and would also increase bus transit service frequency to support regional use of transit to and from the new eBART station (thereby avoiding an increase in single-occupancy vehicle traffic to and from the eBART station, and avoiding the air quality impacts that would result from this new traffic). While the proposed shuttle and transit improvements could have a beneficial impact on regional air quality, the project-specific and cumulative air quality impacts would remain significant and unavoidable for the proposed project.

Significant irreversible impacts would occur if the proposed project would use nonrenewable resources during the initial and continued phases of the project, or if the project would cause an event to occur that would indirectly lead to irreversible impacts on an environmental resource (for example, if a project provided for a new freeway that would lead to previously undisturbed natural habitat areas). Irreversible impacts could also result if the implementation of the proposed project would lead to potential environmental accidents. The proposed project does not propose the use of significant nonrenewable resources, and includes mitigation measures to support the implementation of environmentally "green" development methods and materials (see mitigation measure CC-1.1). The proposed project also would not indirectly lead to irreversible environmental impacts. Upon implementation of the mitigation measures contained in this EIR (including HAZ-1, from the Initial Study), the proposed project would not lead to environmental accidents that could result in potentially irreversible environmental impacts.

4.3 GROWTH-INDUCING IMPACTS

Section 15126.2(d) of the *CEQA Guidelines* requires the following review of growth inducement in an EIR:

> *Discuss the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects which would remove obstacles to population growth (a major expansion of a wastewater treatment plant might, for example, allow for more construction in service areas). Increases in the population may tax existing community service facilities, requiring construction of new facilities that could cause significant environmental*

effects. Also, discuss the characteristic of some projects which may encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively. It must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment.[4]

In summary, CEQA requires a discussion of how a project could increase population, employment, or housing growth in surrounding areas and the impacts resulting from this growth. CEQA Guidelines indicate that a project would normally have a significant effect on the environment if it would induce substantial growth or concentration of population. This section of the EIR discusses the manner in which the Railroad Avenue Specific Plan could affect such growth.

Growth Defined

When CEQA refers to *induced growth*, CEQA means *all growth – direct* or *indirect*. Growth can be induced in a number of ways, including increases in population, employment, and housing, through the elimination of obstacles to growth, or through the stimulation of economic activity within a region.

Direct growth occurs on a project site with the construction of residential uses leading to an increase in population and commercial uses attracting shoppers from other locations. Indirect growth occurs beyond the project site but is stimulated by a proposed project's direct growth. Such growth is tied to increased direct and indirect investment and spending by residents, employees and businesses. Indirect growth stems from the "induced" employment generated by the economic activity resulting from a project. Indirect employment is generated by a direct increase in economic activity. It is due to the increases in spending that would occur on the part of the businesses, employees, and employee households related to an increase in direct economic activity. It is also due to the additional spending that would occur on the part of suppliers of the goods and services demanded by the projects' direct economic activity (primary and secondary households, businesses and employees). Production, employment, and households would increase with each new round of spending, but at a decreasing rate with each additional round. Indirect growth could have the potential for environmental impacts, but cannot be assumed to automatically create environmental impacts in and of itself.

Measure C Growth Management

Growth management in the City of Pittsburg is enforced through several primary mechanisms, one of which is the Contra Costa Transportation Authority's 1988 Measure C growth management program. Measure C was designed to create a cooperative process for Growth Management on a countywide basis while leaving local authority over land use decisions and the establishment of performance standards. The City of Pittsburg addresses this requirement through the Growth Management Element of the *General Plan* and PMC Section 10.60.020 (adopted in 1997 as Ordinance 1130, Subsection 2), which states that the City's form of compliance with Measure C shall be through their implementation of a Transportation Systems Management program. The program's purpose is to fulfill the following

[4] California Office of Planning and Research, *CEQA – California Environmental Quality Act – Statutes and Guidelines,* as amended December 1, 2001.

goals: (a) promote and encourage the use of transit, ride sharing, bicycling, walking, flexible work hours and telecommuting as alternatives to solo driving; (b) incorporate these goals and objectives into the land use review and planning process; (c) develop proactive programs and/or projects either alone or in conjunction with other jurisdictions, or with local jurisdiction's regional transportation planning committee aimed at achieving these goals; (d) consider the incorporation of appropriate technology designed to facilitate traffic flow, provide transit and highway information, provide trip generation alternatives and related technology into the transportation system; and (e) cooperate with other jurisdictions, the private sector, and transit operators in planning and implementing transportation programs. The proposed project would be consistent with all of these goals, and therefore with the Contra Costa Transportation Authority's Measure C, so the proposed project would not violate growth management controls associated with this measure.

Railroad Avenue Specific Plan

The Railroad Avenue Specific Plan, encompassing an area of about 1,075 gross acres, is proposed to accommodate up to 1,845 residential units and up to 988,449 gross square feet of commercial/retail space. With 1,845 residential units constructed as proposed, the Railroad Avenue Specific Plan would accommodate an increase of about 5,664 persons at build-out. This assumes a household size of about 3.07 persons per unit in the year 2030, consistent with projections of the Association of Bay Area Governments. This population increase would incrementally contribute to stimulating the local economy through increased direct and indirect investment and spending by new residents. The *General Plan* assumes one job per 275 square feet of commercial development (*General Plan*, Table 2-6); therefore, it is assumed that there is potential for approximately 3,500 jobs associated with new commercial development within the Specific Plan Area. This increase could substantially increase the number of jobs in Pittsburg and could thereby improve the jobs/housing balance in the City as a whole.

Project Construction

Project construction would generate jobs in the construction, materials fabrication and supply industries up until the time of construction completion. Project built-out is estimated in 2030 for the purposes of this EIR. The provision of construction jobs would create an indirect demand for local goods and services. Expenditures for construction and expenditures by construction workers would indirectly stimulate employment and sales in the City of Pittsburg and eastern Contra Costa County during the construction period. It is not expected that appreciable numbers of people would establish primary residence in the Pittsburg area or that new businesses would be created as a result of project construction activities given the relatively standard nature of the construction work. Project construction would be expected to employ construction workers already living and working in the Bay Area. As with all economic activity, some of the demand for products and services would be met by firms outside of the local economy. However, no significant labor pool from outside the Bay Area would be expected to temporarily or permanently relocate or commute long distances as a result of constructing the Railroad Avenue Specific Plan.

Infrastructure and Growth Management

New development would result in an increased demand for the provision of utility and public services in the project area. The analysis of the impacts of implementing the Railroad Avenue Specific Plan and its development components finds that the proposed project would contribute to cumulative demands on the water supply, wastewater treatment, drainage facilities, solid waste disposal, energy consumption, police and fire protection services, and recreational and school facilities; however, as noted within Section 3.6, Public Services, and Section 3.7, Utilities, public service and utility capacities either exist or would need to be locally augmented through permit and development impact fees to accommodate the increased residential population of the Railroad Avenue Specific Plan. Despite the increased population, no significant and unavoidable public service or utility impacts were identified for the proposed project.

A municipality's *General Plan*, such as the Pittsburg *General Plan*, identifies the lands that will be allowed to develop and expected future population. The *General Plan* as adopted identifies the allowable growth pattern in Pittsburg and thus highlights the needed expansion or updating of the various regional infrastructure systems that can more specifically be scheduled to maintain adequate services throughout the planning horizon of the *General Plan*. Without such growth management practices, any expansion of an infrastructure system could be considered growth inducing. However, the Railroad Avenue Specific Plan was itself anticipated in the *General Plan* as part of an ongoing and coordinated area-wide planning program that intensifies growth on infill sites at the center of the City around transportation hubs rather than outwardly from the City's edges.

No new infrastructure extensions would be required for the Railroad Avenue Specific Plan and its development components. Water and sewer infrastructure would be upgraded during the Specific Plan buildout period, and transportation improvements are proposed to accommodate anticipated cumulative area-wide development consistent with the goals and policies of the *General Plan* and the Specific Plan. However, no significant expansion for improvements in water and sewer infrastructure would be required in association with the proposed project. Therefore, the proposed project would not be responsible for inducing an increase in utility capacity which would, in turn, induce or allow new growth beyond that analyzed in this EIR. Transportation improvements proposed under the Specific Plan are largely ancillary improvements to support a multi-modal environment and to improve local accessibility to the regional transportation improvements proposed for the eBART extension. As such, the transportation improvement proposed under the Railroad Avenue Specific Plan would not be expected to stimulate additional growth where it has not already been planned and anticipated.

General Plan and Urban Limit Line

The City's growth management Ordinance calls for responsible growth within certain limitations. In accordance with that Ordinance, the Railroad Avenue Specific Plan and its development components would occur within the City's urban limit line (ULL). The ULL is the boundary in which urban development is to be contained within the timeframe of the *General Plan* until 2020. The ULL restricts development to a specific geographic area and defines where open space generally begins. Pittsburg's ULL was most recently updated with voter-approved Measure P in November 2005

The Pittsburg 2020 *General Plan* anticipated development associated with the proposed extension of BART service to Railroad Avenue and State Route 4, and the related Specific Plan project. Therefore, the Specific Plan growth was anticipated under the City's *General Plan* and evaluated under the *General Plan EIR*. This project would not induce substantial growth, or locate growth beyond areas anticipated in the *General Plan;* therefore, the Railroad Avenue Specific Plan and its development components are consistent with the City's *General Plan*.

Implementation of the *General Plan* would advance the policies of the City to promote and facilitate growth within the ULL, thereby minimizing the cost and extent of providing infrastructure services by producing a more compact and efficient pattern of development. This in turn would limit the potential for urban sprawl by focusing growth in an urban area and help to slow the rate at which agricultural lands, open space and areas of habitat value outside the ULL may be converted to urban development.

The Railroad Avenue Specific Plan's residential, commercial and park development components would not involve the notion of growth within the City of Pittsburg jurisdictional boundaries and Urban Growth Boundary. The proposed project would not require the relocation (expansion) of the ULL, nor would it involve any development outside of the ULL.

Growth and the rate of growth shape both the physical and social structure of communities. While the Railroad Avenue Specific Plan and its development components would represent a contribution to growth, it would be urban growth anticipated within the context of the Pittsburg 2020 *General Plan*, and analyzed under the *General Plan EIR*. Implementation of the Specific Plan would not remove obstacles to growth through the provision of new infrastructure capable of serving regional growth. The proposed project would remain consistent with all of the growth management efforts of the City of Pittsburg. The proposed project would comprise a more efficient utilization of existing land resources, and would allow for better utilization of the existing transportation infrastructure by allowing existing commuters to travel further east than the Pittsburg/Bay Point BART Station by BART. It would also support pedestrian, bicycle and transit facilities by strengthening those connections to other modes of transportation other than personal vehicles. There would be no significant impact to growth management and no growth inducement would result from the Railroad Avenue Specific Plan. The proposed Specific Plan project would not generate significant growth-inducing impacts.

4.4 CUMULATIVE IMPACTS

Cumulative impacts would occur when two or more individual effects may not be independently significant but, when considered together, may compound or increase to generate a potential environmental impact. For example, a project may have possible environmental effects which are individually limited but cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are considerable when viewed in connection with the effects of past projects, other current projects and probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time.

Further, as noted in CEQA Guidelines Section 15130(a), "Where a lead agency is examining a project with an incremental effect that is not 'cumulatively considerable', a lead agency need not consider that effect as significant, but shall briefly describe its basis for concluding that the incremental effect is not cumulatively considerable." Section 15130(a)(3) goes on to note, "A project's contribution is less than cumulatively considerable if the project is required to implement or fund its fair share of a mitigation measure or measures designed to alleviate the cumulative impact."

To determine the extent of potential cumulative impacts, this document considers the impacts of the Railroad Avenue Specific Plan in combination with other entitlement and development applications currently under review by the City, in adjacent cities, and in the surrounding region. The projects for which cumulative analysis was considered are included in Table 4-1 (Cumulative Development), below.

Table 4-1
Cumulative Development

#	Approved or Pending Project	Land Use	Status	Size	Location
1	East Street Estates	Single-Family Residential	Under Construction	8 Dwelling Units (DU)	400-412 East 8th St & 399-411 East 9th St
2	Marina Walk	Single-Family Residential	Under Construction	123 DUs	West of Herb White Way
3	Habitat for Humanity Homes	Single-Family Residential	Approved	3 DU	East 14th Street at Harbor Street
4	Vidrio	Mixed-Use	Approved	195 DUs/37,855-sf (restaurant & retail)	West side of Railroad Ave between Fifth and Eighth Streets
5	Entrata	Mixed-Use	Built	28 DUs/8,100-sf (retail & office)	Northeast corner of Railroad Ave and Cumberland St
6	El Matador Restaurant	Restaurant	Built	6,687-sf	95 Bliss Ave
7	Forrest Memorial Christian Center	Religious	Under Construction	5,926-sf	1297 Railroad Ln
8	Marina Commercial Building	Commerical	Approved	22,861 sf	51 Marina Blvd.
9	Empire Business Park	Industrial	Partially constructed	326,000-sf	701 Willow Pass Rd
10	County Courts	Institutional	Approved	3 new Courtrooms (expansion from 4 to 7 courtooms)	Railraod Ave at Center Street

Source: City of Pittsburg, 2008.

This document identifies one impact of the proposed project that would be significant and unavoidable in a cumulative scenario. Cumulative development could result in daily emissions that would exceed BAAQMD thresholds for ROG and PM_{10}. The combined effect of emissions from each of these

individual projects could result in significant cumulative impacts to air quality. The *BAAQMD CEQA Guidelines* recommend that lead agencies conclude that a significant cumulative air quality impact would result if the proposed project would individually have a significant operational air quality impact. The analysis for Impact AQ-2 indicates that the proposed project would exceed the BAAQMD thresholds of significance for ROG and PM_{10}. Therefore, this EIR concludes that the cumulative impact of the proposed project on ROG and PM_{10} emissions would be significant and unavoidable, as there are no feasible measures to mitigate for this effect.

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Chapter 5
Alternatives to the Proposed Project

5.1 INTRODUCTION

This analysis of alternatives to the proposed project is necessary to assure that a full range of options are examined, providing a complete understanding of the effects of full, partial, or no project implementation. This section of the EIR describes alternatives to the proposed project and its development components as proposed, including the No Project Alternative, as required under CEQA.

The purpose of the discussion of alternatives in an EIR is to describe alternatives that are capable of avoiding or substantially lessening any significant environmental effects of a project, even if these alternatives would impede to some degree the attainment of the project objectives or would be more costly (see Chapter 2, Project Description, for a discussion of project objectives).[1]

The range of alternatives includes those that could feasibly accomplish most of the basic objectives of the project and could avoid or substantially lessen one or more of the significant effects.[2] Among the factors that may be taken into account when addressing the feasibility of alternatives for inclusion in an EIR are: site suitability, economic viability, availability of infrastructure, general plan consistency, or other plans or regulatory limitations, including jurisdictional boundaries.[3] An EIR should include sufficient information about each alternative to allow a meaningful evaluation, analysis and comparison with the project as proposed. Any project approvals could be conditioned on the findings of the alternatives analysis.

Chapter 4, Other Statutory Sections, of this EIR discloses two significant and unavoidable impacts, wherein development of the proposed project would create new areas and mobile sources of air pollutants that would generate emissions of ROG, NO_X, and PM_{10}, and emissions of ROG and PM_{10} would be cumulatively considerable. Thus, the range of alternatives presented in this section of the document examines differing project development scenarios that seek: (1) to lessen the significant and unavoidable impacts of the proposed project to a less-than-significant level, (2) less involved or costly means of mitigating the potentially significant impacts of the proposed project to a less-than-significant level, or (3) to lessen the impact of already less-than-significant impacts of the proposed project. The proposed project alternatives include the following:

- No Project alternative
- 75 Percent Residential Development alternative
- Relocated Residential Density alternative

[1] State CEQA Guidelines, Section 15126.6 (b).
[2] State CEQA Guidelines, Section 15126.6 (c).
[3] State CEQA Guidelines, Section 15126.6 (f) (1).

A description of each alternative and its impacts are provided below.

5.2 NO PROJECT ALTERNATIVE

Under the No Project alternative, the land use designations and development program proposed under the Railroad Avenue Specific Plan would not be implemented, and the maximum potential development of the project area would conform to existing development densities, uses, and other controls defined in the City's *General Plan* and Zoning Ordinance. Current land use designations within the project area include: Low, Medium and High Density Residential; Business, Community, and Service Commercial; Public/Institutional; and Open Space. Under the current General Plan land use designations, the assumed development potential would be approximately 1,185 residential units and 1.2 million square feet of commercial development, as shown in Table 5-1, No Project Alternative, below.

Table 5-1
Comparison of Alternatives

Land Use Designation	Gross Area (acres)	Assumed Residential Development	Assumed Commercial Development	Public/Institutional
No Project Alternative				
Civic Center	29.49	94	144,333	174,470
Transit Village	54.37	902	902,171	
High School Village	13.13	188	188,265	
Total	**96.99**	**1,185**	**1,234,769**	**174,470**
75 Percent Residential Density Alternative				
Civic Center	29.49	185	22,550	174,470
Transit Village	54.37	1,002	1,221,335	
High School Village	13.13	197	333,670	
Total	**96.99**	**1,384**	**1,577,555**	**174,470**
Relocated Residential Density Alternative				
Civic Center	29.49	17	22,550	174,470
Transit Village	54.37	1,167	1,221,335	
High School Village	13.13	66	333,670	
Total	**96.99**	**1,250**	**1,577,555**	**174,470**

Source: City of Pittsburg, 2009

The table above shows potential build out in the Transit Village, Civic Center and portions of the High School Village sub-areas where the Specific Plan and this EIR are evaluating land use changes. It is unrealistic to assume that General Plan build out will occur at the maximum allowable level; therefore, the table above contains certain assumptions. One assumption is that all development would be mixed

use based on the nature of the Transit Village concept that calls for a mix of uses in close proximity to transit. It is also assumed that the potential square footage permitted under the Mixed Use assumption would be split evenly between commercial and residential development (with residential units being an average of 1,000 square feet in size). Mid-range assumptions allow a realistic assessment of potential build-out and are consistent with General Plan EIR assumptions of mid- to high-range density and intensity standards (City of Pittsburg General Plan 2020: Draft EIR, 2-4). It is assumed that the remainder of the Specific Plan Area outside of these three sub-areas will remain the same under General Plan and Specific Plan scenarios.

The No Project alternative would conform to buildout scenario under the existing *Pittsburg 2020 General Plan*, and analyzed in the *General Plan EIR*. The No Project alternative would, therefore, generate no environmental impacts beyond those previously analyzed and deemed acceptable at the time of the City Council certification of the *General Plan EIR* and approval of the *General Plan*. From a CEQA perspective, the No Project alternative would have no new impacts (no impacts beyond those currently anticipated and accepted).

Under the No Project alternative, the infrastructure improvements intended to support multi-modal activity such as widened sidewalks, smaller blocks, a transit-only street, bicycle and pedestrian pathways; streetscape, urban design and architectural standards; smart growth focused development standards such as residential minimums, parking maximums, bicycle parking minimums, build to and other site development requirements proposed in the Railroad Avenue Specific Plan would not be implemented. Mixed use development is permitted in the project area, as currently allowed under the *General Plan*, but the commercial land use classifications do not require mixed use development. In the absence of residential minimums, and requirements for mixed use development, it is assumed that fewer residential units would be created than under the proposed project, and new residential development would not necessarily be concentrated around the proposed eBART Station and would not be connected with other mixed use development in a cohesive manner.

Under the No Project alternative, impacts on cultural resources would be less than under the proposed project, although there could still be cultural resource impacts that would require mitigation as currently prescribed for the proposed project. Construction air and noise impacts would still occur under the No Project alternative, as development would occur to the extent allowed under the existing *General Plan*. Air quality impacts for residents living within 500 feet of SR 4 would still occur under the No Project Alternative, because mixed use including residential development could be built in this area under the existing *General Plan*. However, it is likely that fewer residences would be built in this area than under the proposed project, so fewer residences would be potentially affected by these air quality impacts.

The No Project alternative would allow for some increase in transportation impacts, over current levels, and would allow for the associated vehicle-generated ROG and PM_{10} emissions. However, these would be at a lower level than under the proposed project, due to the reduction in residential units created and the resultant reduction in vehicle trips generated within the Specific Plan area. However, the Specific Plan contains TDM and other strategies to reduce VMT that are absent in the *General*

Plan, as described in Sections 3.2, Transportation and 3.8, Climate Change. Impacts on utilities and public services, under the No Project alternative, would be less than under the proposed project. However, these impacts have been found less than significant even under the proposed project scenario. In addition, as vehicle trips represent the majority of the greenhouse gas emissions generally associated with urban development, the effects of this alternative, in terms of climate change, would be less than that of the proposed project.

Development at a reduced density within the project area – as typified by the No Project alternative – would be expected to have slightly reduced environmental impacts as compared to the proposed project. However, potentially significant and unavoidable air quality impacts would still occur for residences located within 500 feet of SR 4, and there would be potentially significant impacts to cultural resources that would be reduced to less-than-significant levels through implementation of the same mitigation measures as included in the proposed project. There would be no additional cumulative impacts, under the No Project alternative, beyond those already identified in the *General Plan EIR*.

5.3 75 PERCENT RESIDENTIAL DEVELOPMENT ALTERNATIVE

The 75 Percent Residential Development alternative assumes that the project is the same in terms of location and use, except that it is reduced in residential density by 25 percent. The reduced density alternative seeks to lessen the significant environmental effects of development of the proposed project. This alternative would provide for overall buildout of the project area at less than an overall density of 14.27 units per acre, as opposed to the 19.02 units per acre under the proposed project. A total of 1,384 residential units (approximately 199 above what is currently permitted under the *General Plan*) would be developed, as compared to a total of 1,845 units as currently proposed with the Specific Plan and addressed in this EIR. The specific environmental impacts that would result from a reduced density alternative would also be similar to the proposed project, though their magnitude would be lessened as a result of fewer residents residing within the project area.

Impacts to public utilities services would remain similar to those described under the project, though reduced slightly due to the general reduction in residences. However, these impacts were identified as less than significant under the proposed project so this reduction would not accomplish a meaningful reduction in the impacts that would otherwise occur under the proposed project. Impacts to cultural resources would remain similar to the proposed project, and would continue to require mitigation on a project by project basis. Therefore, these impacts also would not be meaningfully affected by the adoption of the 75 percent Residential Density alternative.

Similar to the proposed project, construction activities associated with the reduced density alternative could cause potentially significant construction-phase air quality impacts. Mitigation measures like Mitigation Measures AQ-1.1 and AQ-1.2, involving the suppression of particulate matter emissions and construction equipment exhaust control measures would reduce construction impacts to a less-than-significant level

Based on the air quality model URBEMIS, this alternative's motor vehicle ozone precursor emissions would be less than those of the proposed project, but would still exceed the BAAQMD's significance threshold for ROG and PM_{10} (i.e., there would be 99 pounds per day ROG and 106 pounds per day of PM_{10} where 80 pounds per day is the BAAQMD threshold), therefore, the reduced density alternative would still result in a significant and unavoidable impacts with regard to air quality; however, this alternative's NO_x emissions (52 pounds per day) would be less than those of the proposed project. Exposure of new residents to toxic air contaminant emissions would be similar to the proposed project, as there would continue to be new residential uses permitted within 500 feet of SR 4. Therefore, this alternative would result in the same potentially significant but mitigable impacts from exposure of sensitive receptors (residents) to toxic air contaminants. Mitigation measures like Mitigation Measures AQ-4.1 would reduce impacts to residential uses proposed within 500 feet of SR 4 under this alternative to less-than-significant levels, as with the proposed project.

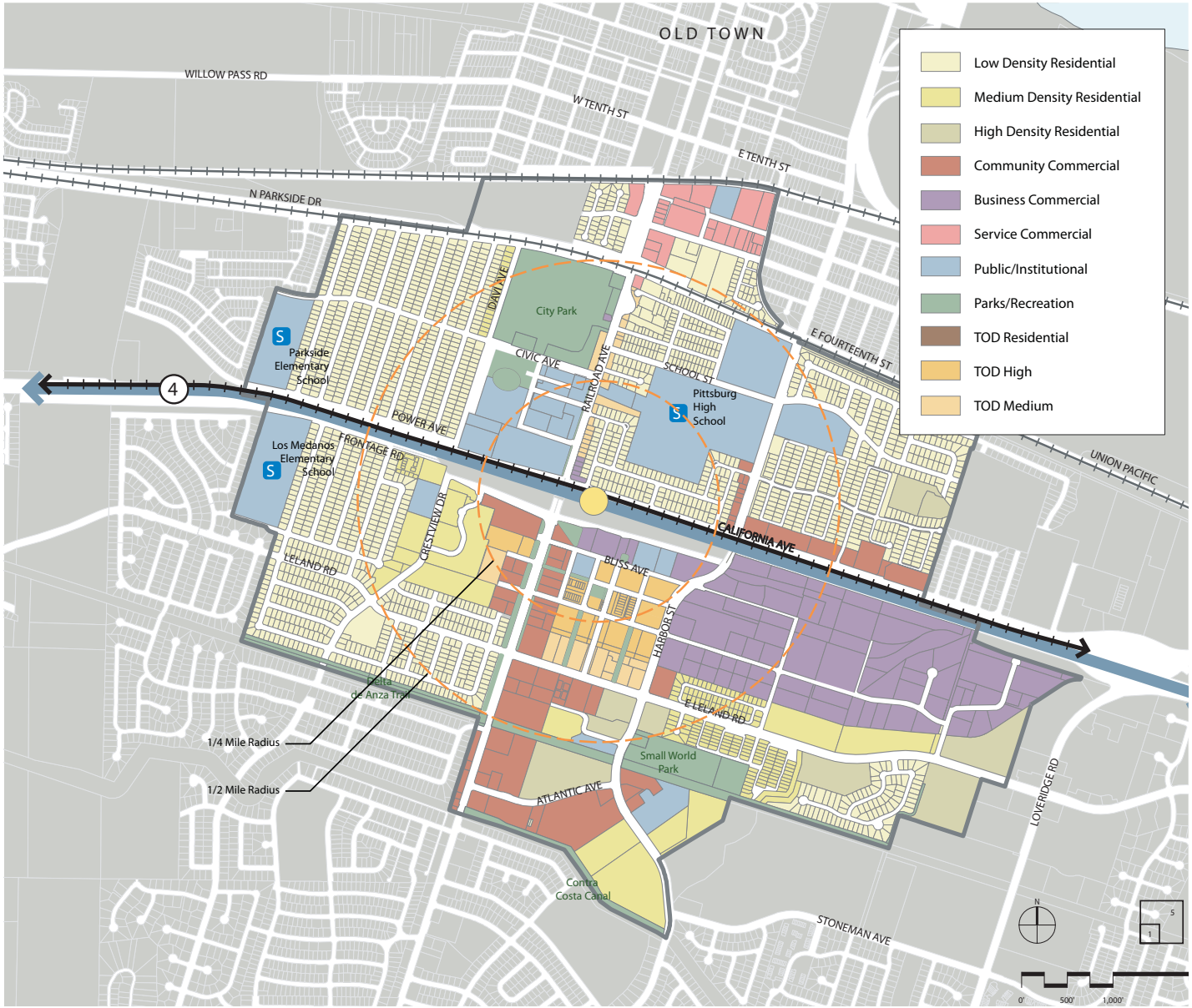
The reduced density alternative would result in a less intense use of the project area than the proposed project. The reduction in residences at the project area under the 75 Percent Residential Density Alternative, when compared to the proposed project, would result in a reduced impact related to traffic on the project area and surrounding infrastructure. Fewer trips would be generated, which would reduce the demand for vehicle parking, bicycle parking, and pedestrian space. However, similar to the proposed project, the reduced density alternative would increase overall transportation activity in and around the project area, when compared to the existing conditions. This would create potentially significant traffic impacts at Harbor Street/Garcia Avenue that would be reduced to a less-than-significant level with the mitigation measures similar to those described for the proposed project. In addition, as vehicle trips represent the majority of the greenhouse gas emissions generally associated with urban development, the effects of this alternative, in terms of climate change, would be less than that of the proposed project.

Cumulative development impacts under the 75 Percent Residential Density alternative would generally be similar to, and not meaningfully reduced when compared with, the proposed project. The 75 Percent Residential Density alternative would have significant and unavoidable project-related and cumulative operational air quality impacts, similar to the proposed project; however, these emissions would be slightly less than would occur under the proposed project.

The cumulative development impacts would generally be expected to be the same for the 75 Percent Residential Density alternative as for the proposed project, including significant and unavoidable project-related and cumulative operational air quality impacts.

5.4 RELOCATED RESIDENTIAL DENSITY ALTERNATIVE

The Relocated Residential Density alternative assumes that the project would proceed within the project area; however, this alternative would relocate the residential units outside of CARB's recommended buffer of 500 feet from SR 4, and remove proposed residential development from the northern part of the Civic Center block. In order to keep the higher residential density achieved in the Specific Plan, the residential development would be moved from these locations to an existing industrial area located at



NORTH

FIGURE 5-1
Relocated Residential Density Alternative

Source: MIG, 2008.

the center of the Transit Village sub-area. Relocating the residential development to the middle of the Transit Village sub-area would result in the eventual displacement of existing, light industrial and commercial development (see Figure 5-1, Relocated Residential Density Alternative). This alternative would thereby avoid the significant (though mitigable) air quality impacts related to the presence of toxic air contaminants within 500 feet of SR 4, as recommended by CARB. In addition, this alternative would address public comments to analyze alternatives where residential would not be located in close proximity of SR 4 and to remove residential uses from the Civic Center block.

The impacts of the Relocated Residential Density alternative would be largely similar to those analyzed under the proposed project, with most of the same land uses, but a reduced number of residences as compared to the proposed project (as shown in Table 5-1, above). This alternative would create a greater potential for residential development to occur on contaminated soil, due to the amount of redevelopment of industrial uses; however, this impact would be mitigated to a less-than-significant level through the implementation of mitigation measure HAZ-1 (requiring a Phase I/II prior to redevelopment of an industrial site).

Impacts to utilities public and services would remain similar to the proposed project, which were identified as less than significant under the proposed project. Impacts to cultural resources would remain similar to the proposed project as well, and continue to require mitigation.

Similar to the proposed project, construction activities associated with the Relocated Residential Density alternative could cause potentially significant construction-phase air quality impacts. Mitigation measures like Mitigation Measures AQ-1.1 and AQ-1.2, involving the suppression of particulate matter emissions and construction equipment exhaust control measures, would reduce construction impacts related to the Relocated Residential Density Alternative to less-than-significant levels, as with the proposed project. However, the project would continue to exceed BAAQMD's significance threshold for ROG and PM as described in the Air Quality analysis section resulting in significant and unavoidable air quality impacts.

Under the Relocated Residential Density alternative, no new residential uses would be constructed within 500 feet of SR 4. Therefore, this alternative would avoid the potentially significant, but mitigable, air quality impacts from toxic air contaminants identified for the proposed project. However, while the Relocated Residential Density Alternative would result in a reduction in the number of residential uses compared to the proposed project, it would also move more homes further from the eBART station, would thereby encourage more private vehicle use, and would reduce some of the efficiencies that would otherwise be gained by creating a dense transit-oriented development project. In addition, it would replace industrial uses, which have relatively low trip generation rates, with residential units, which have relatively high trip generation rates. As a result, the Relocated Residential Density alternative would result in 860 net new daily trips *above and beyond* the proposed project; therefore, this alternative's motor vehicle ozone precursor emissions would be greater than those of the proposed project, and would also exceed the BAAQMD's significance threshold for ROG and PM_{10}. In addition, as vehicle trips represent the majority of the greenhouse gas emissions generally associated

with urban development, climate change impacts would be more significant under this alternative than the proposed project.

As previously mentioned, operation of this alternative would generate an additional 860 net new daily trips over the proposed project, and a different traffic pattern, which would result in potentially significant transportation impacts during both the AM and PM peak time periods at the Harbor Street/Garcia Avenue intersection. Per the California MUTCD, a signal warrant analysis was conducted to determine the feasibility of signalization of the Harbor Street/Garcia Avenue intersection. The criteria for signal warrants were satisfied. Therefore, the use of signalization to improve intersection operations would significantly reduce delay for future conditions under the Relocated Residential Density alternative. In addition, under future conditions, two of the 16 intersections studied would not satisfy the Traffic Service Objectives in the East County Action Plan for the proposed project. However, future traffic operations improve under the Relocated Residential Density alternative compared to the No Project alternative

The cumulative development impacts would generally be expected to be the same for the Relocated Residential Density alternative and for the proposed project, including significant and unavoidable project-related and cumulative operational air quality impacts.

It should be noted that the Relocated Residential Density alternative could displace existing industrial uses and lead to the loss of thousands of jobs that exist in the area. Loss of employment in the Transit Village sub-area could have negative economic repercussions for the City of Pittsburg by exacerbating the jobs/housing imbalance in the City. In addition, it could lead to an increase in VMT as people who would otherwise have taken the eBART or other form of transit to work would not be able to under this alternative. Economic impacts are not subject to analysis under CEQA. These economic impacts could, however, indirectly cause environmental impacts to occur. For example, if the City addressed these economic impacts by allowing for a rezoning so that the displaced industries could move to another part of Pittsburg, this relocation could affect habitats, residential air quality, transportation patterns, and a variety of other environmental factors. These potential indirect impacts are currently only speculative: they cannot be properly considered and have not been addressed in this EIR. However, to the extent that these indirect impacts can be reasonably predicted at this time, they should be considered by decision makers as part of any decision to support the Relocated Residential Density alternative.

5.5 ENVIRONMENTALLY SUPERIOR ALTERNATIVE

The No Project alternative would avoid the significant and unavoidable environmental air quality impacts (project-related and cumulative) associated with implementation of the proposed project by eliminating the new mobile and area source emissions. Under CEQA, if the Environmentally Superior Alternative is the No Project alternative, then at least one of the other alternatives must be designated as the "Environmentally Superior Alternative." In this EIR, in addition to the No Project Alternative, other alternatives examined included a 75 Percent Residential Development alternative and Relocated Residential Density alternative. While neither of these alternatives brings the project-related or

cumulative impacts to air quality to a less-than-significant level, fewer project-specific and cumulative air emissions would arise as a result of implementation of the 75 Percent Residential Development alternative, compared to the Relocated Residential Density alternative.

The Relocated Residential Density alternative would avoid placing residential development adjacent to SR 4; however, this air quality impact could be reduced to a less-than-significant level through mitigation. The Relocated Residential Density alternative would still result in all of the other impacts identified for the proposed project. Therefore, the Relocated Residential Density alternative would not accomplish any beneficial environmental goals, meaningfully reduce other environmental impacts, or otherwise allow for better environmental performance than the proposed project.

The 75 Percent Residential Density alternative would generate a reduced number of daily vehicle trips, compared to the Relocated Density alternative. In so doing, the 75 Percent Residential Density alternative would reduce vehicle emissions, as noted above, and would also lessen the transportation/traffic impacts associated with the proposed project and Relocated Residential Density alternative. For these reasons, the 75 Percent Residential Density alternative is deemed the Environmentally Superior Alternative. However, the 75 Percent Residential Density alternative would not achieve maximum residential densities within the Specific Plan Area. The 75 Percent Residential Density alternative may not fulfill the project's fundamental goal and purpose to direct growth around the eBART Station, and to take advantage of the proximity to a planned eBART Station. Under the 75 Percent Residential Density alternative, the City would meet BART and MTC's requirements for a minimum of 2,200 residential within ½-mile of the planned eBART Station; however, this alternative would not maximize the opportunity of placing high density housing near the planned transit station. Based on MTC's research into travel patterns and as discussed in Chapter 2, Project Description, people are four times more likely to take transit if they live within ¼-mile of a transit station. While reduced alternatives will achieve the minimum ridership and unit count required by BART and MTC, respectively, such alternatives will not maximize ridership, and maximize the utilization of resources, land and energy to the extent that would otherwise be possible under the proposed project.

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APPENDICES

Appendix A

Initial Study

INITIAL STUDY

Railroad Avenue Station Area Specific Plan

City of Pittsburg

October 1, 2008

TABLE OF CONTENTS

I. Introduction and Purpose 1

II. Project Information 1
- A. Project Title 1
- B. Lead Agency Name and Address 1
- C. Contact Person and Telephone Number 1
- D. Project Sponsor's Name and Address 1
- E. Other Public Agencies Whose Approval Is Required 1
- F. Project Location 1
- G. Surrounding Land Uses and Setting 4

Environmental Factors Potentially Affected 5
Determination 5

III. Project Description 6
- A. Project Background 6
- B. Proposed Project 8

IV. Environmental Checklist and Discussion of Potential Effects 21
- A. Aesthetics 21
- B. Agricultural Resources 24
- C. Air Quality 25
- D. Biological Resources 28
- E. Cultural Resources 36
- F. Geology and Soils 38
- G. Hazards and Hazardous Materials 42
- H. Hydrology and Water Quality 47
- I. Land Use 52
- J. Mineral Resources 54
- K. Noise 55
- L. Population and Housing 57
- M. Public Services 58
- N. Recreation 59
- O. Traffic 60
- P. Utilities and Service Systems 61
- Q. Mandatory Findings of Significance 63

V. List of Authors and Participants 64

FIGURES

Figure 1 Project Location 2
Figure 2 Specific Plan Area 3
Figure 3 Proposed eBART Alignment 7
Figure 4 Proposed Land Use Plan 10
Figure 5 Existing Land Uses 16
Figure 6a Visual Character of the Project Area 22
Figure 6b Visual Character of the Project Area 23
Figure 7 Potential Habitat for Sensitive Species 31

TABLES

Table 1 Railroad Avenue Specific Plan - Development Potential 12
Table 2 Net Development Potential Increase 14
Table 3 Development Standards by Land Use Classification 17
Table 4 Federal and State Air Quality Standards 27

I. INTRODUCTION AND PURPOSE

This Initial Study was prepared pursuant to California Environmental Quality Act (CEQA) requirements and the State CEQA Guidelines (California Code of Regulations §15000 *et. seq.*) and in accordance with the regulations and policies of the City of Pittsburg (City). This Initial Study addresses the potential environmental impacts of the Railroad Avenue Station Area Specific Plan (Specific Plan or proposed project) in order to determine if either a Negative Declaration or Environmental Impact Report is warranted to satisfy CEQA requirements for environmental review of the proposed project.

II. PROJECT INFORMATION

A. PROJECT TITLE

Railroad Avenue Station Area Specific Plan

B. LEAD AGENCY NAME AND ADDRESS

City of Pittsburg
Planning Department
65 Civic Avenue
Pittsburg, CA 94565

C. CONTACT PERSON AND TELEPHONE NUMBER

Leigha Schmidt, Project Planner
(925) 252-4015

D. PROJECT SPONSOR'S NAME AND ADDRESS

City of Pittsburg
Planning Department
65 Civic Avenue
Pittsburg, CA 94565

E. OTHER PUBLIC AGENCIES WHOSE APPROVAL IS REQUIRED

Approval from other public agencies is not required for implementation of the Specific Plan.

F. PROJECT LOCATION

Figure 1 shows the project location within the City of Pittsburg in eastern Contra Costa County. The Specific Plan boundaries roughly encompass the area within ½-mile of the future Railroad Avenue Station (Figure 2). The proposed Railroad Avenue Station would be in the median of State Route 4 (SR 4) beneath the Railroad Avenue overcrossing and would be accessible from both sides of the overcrossing. The Specific Plan boundary is not precisely a ½-mile radius from the eBART station but has been adjusted outward from the ½-mile radius to reflect logistically meaningful borders defined by railroads, subdivision boundaries, and Contra Costa County's Transportation Analysis Zones (TAZs). In total, the Specific Plan Area encompasses approximately 1,075 acres.

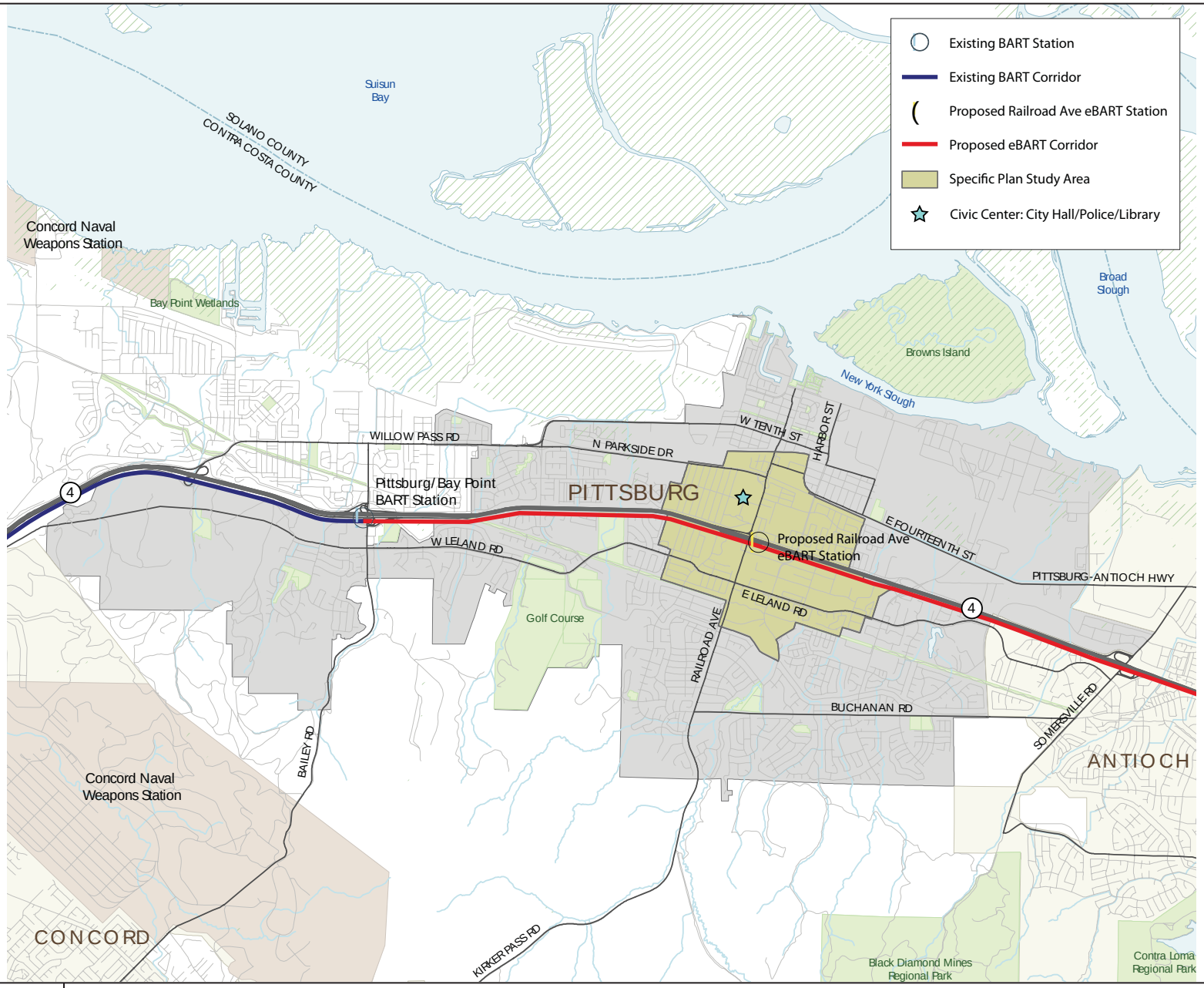


FIGURE 1
Project Location

***Source*:** MIG, 2008.

FIGURE 2
Specific Plan Area

***Source*:** MIG, 2008.

As indicated on Figure 2, within the Specific Plan boundaries, the project area has been divided into 11 planning sub-areas: Old Town Gateway, Parkside Manor Neighborhood, Civic Center, High School Village, Los Medanos Neighborhood, Transit Village, Industrial/Mixed-Use Center, Los Medanos Industrial Center, Railroad Avenue Retail Corridor, Atlantic Avenue Corridor, and East Leland Corridor.

G. SURROUNDING LAND USES AND SETTING

The project area is located in Pittsburg in eastern Contra Costa County. Pittsburg is approximately 17 square miles (7,700 acres). The City is generally an urbanized area, with residential, commercial, public, and light industrial uses in the eastern and central parts of the City, and heavy industrial uses in the northeastern portion of the City. The middle of the Specific Plan Area is generally located at the intersection of Railroad Avenue and SR 4 in central Pittsburg. Downtown Pittsburg, the Pittsburg Marina, and Suisun Bay are located just north of the Specific Plan Area.

The Delta de Anza trail, a 25-mile-long, paved, multi-use regional trail that follows the East Bay Municipal Utility District's corridor and the Contra Costa

Canal runs along the southern boundary of the Specific Plan Area. Other uses to the south of the Specific Plan Area include Buchanan Park, public schools, and extensive residential neighborhoods. Residential neighborhoods and schools also abut the west side of the Specific Plan Area and portions of the east side. Access between the Specific Plan Area and the western and eastern portions of the City is primarily via SR 4 and Leland Road. Railroad Avenue and Harbor Streets are the only north-south roadways in the Planning Area to span SR 4.

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

☐ Aesthetics	☐ Agriculture Resources	☒ Air Quality
☐ Biological Resources	☒ Cultural Resources	☐ Geology/Soils
☒ Hazards & Hazardous Materials	☐ Hydrology/Water Quality	☐ Land Use/Planning
☐ Mineral Resources	☒ Noise	☐ Population/Housing
☒ Public Services	☒ Recreation	☒ Transportation/Traffic
☒ Utilities/Services Systems	☒ Mandatory Findings of Significance	

DETERMINATION

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION has been prepared.

☒ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a significant effect(s) on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on the attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

_____ _____

Signature Date

For:

Leigha Schmidt, Project Manager City of Pittsburg

III. PROJECT DESCRIPTION

A. PROJECT BACKGROUND

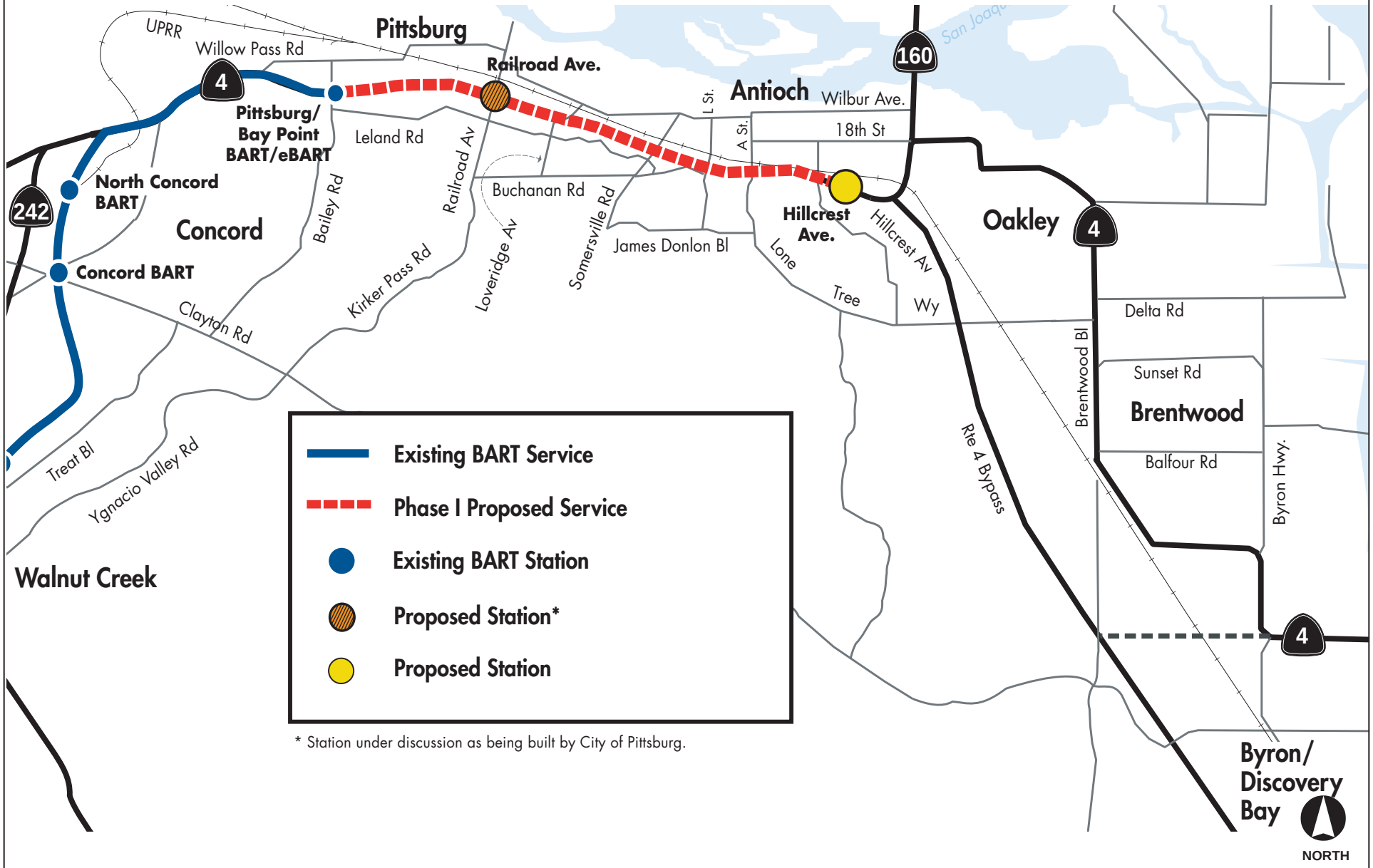
The City of Pittsburg is located in the eastern portion of Contra Costa County in the San Francisco Bay Area. Pittsburg is the westernmost city in eastern Contra Costa County which is composed of the incorporated cities of Antioch, Brentwood, and Oakley and the unincorporated communities of Bay Point, Bethel Island, Discovery Bay, and Byron. Eastern Contra Costa County is characterized by sprawling urban development surrounded by expansive open spaces, rural lands, and rolling hills, as well as proximity to the San Francisco Bay and Delta. Despite its long history as an agricultural area, the East County has experienced a large increase in residential development in the past three decades. As housing prices and the cost of living increased in the western part of the Bay Area region, people began to move east to Pittsburg and other communities in Contra Costa County for the suburban lifestyle and affordable housing prices. Businesses are also locating in and re-locating to the East County in order to take advantage of land availability, large portions of land zoned to allow industrial development, and the growing workforce population.

According to the Association of Bay Area Governments, the inflow of new residents and businesses has made East Contra Costa County one of the fastest growing portions of the Bay Area. Between 2005 and 2030, the cities of Pittsburg and Antioch alone are projected to add 17,650 households and 35,800 jobs, a 30 percent and 90 percent increase, respectively.[1] This growth has been somewhat tempered by the housing mortgage crisis; however, the factors that contributed to the area's development boom over the past two decades are still present, including available land, lower housing and development costs, attractive weather, and desirable suburban lifestyle.

Increasingly, Pittsburg and other communities in East County are feeling the impacts of this growth in the form of traffic and congestion along major roadways and local streets. While many parts of the Bay Area have an array of transportation options, public transportation choices in the East County are limited. Currently, BART service ends at the Pittsburg/Bay Point BART Station at the western end of Pittsburg and bus service by Tri Delta Transit from the station to Pittsburg and surrounding communities is limited in frequency forcing the majority of commuters to rely on their cars to get them to and from their destinations.

The proposed East Contra Costa BART Extension (eBART) project would provide East County communities with an alternative to using their cars by connecting residents and businesses to the larger Bay Area Rapid Transit District (BART) network. As shown in Figure 3, Phase I of the proposed eBART project would extend from the Pittsburg/Bay Point Station eastward via the median of SR4 for a distance of about 10 miles to its terminus just east of Hillcrest Avenue in the City of Antioch. Two stations are proposed as part of the eBART project: at Railroad Avenue and at Hillcrest Avenue.

[1] Association of Bay Area Governments, *Projections 2007*, December 2006.



PBS&J

FIGURE 3
Proposed eBART Alignment

***Source*:** Wilber Smith, 2008.

As part of BART's 1999 System Expansion Policy, jurisdictions seeking to connect to the BART system via an extension of the system are required to prepare Ridership Development Plans (RDPs) to ensure that development or access improvements along the proposed corridor would attract enough riders to make the new extension financially viable. The RDPs must also demonstrate that each local jurisdiction has satisfied the Metropolitan Transportation Commission (MTC) policy regarding extension of transit, which requires certain thresholds of development be achieved within ½ mile of each proposed station.[2] The City of Pittsburg has embraced this opportunity to develop a vision and plan for the area surrounding the future Railroad Avenue Station Area by becoming the first jurisdiction to commence the RDP process in East Contra Costa County.

B. PROPOSED PROJECT

The Railroad Avenue Station Area Specific Plan (proposed project) includes new land use classifications, development policies and guidelines, urban design guidelines, planned community resources, transportation and circulation improvements, utility and infrastructure improvements, implementation strategies, and phasing recommendations. Once adopted, the Specific Plan would guide all new development in the Specific Plan Area. Existing developments would not be directly affected unless the occupants or owners choose to expand or change their structures, grounds, or uses in accordance with Pittsburg Municipal Code (PMC) Chapter 18.76, Nonconforming Uses and Structures.

The following actions may be required in order to implement the Specific Plan:

- General Plan amendment to change the land use designations in the Transit Village, Civic Center, High School Village, Industrial/Mixed Use and Railraod Avenue Retail Corridor sub-areas to Mixed Use, and to revise other chapters to maintain internal consistency in the General Plan and consistency between the Specific Plan and General Plan.
- Zoning text and map amendments to maintain internal consistency and consistency between the Specific Plan, General Plan, and zoning ordinance.
- Rezoning portions of the Specific Plan Area to Planned Development (PD) pursuant to PMC Chapter 18.62, Planned Development District.
- Amending PMC Chapter 17.32, Dedication and Reservations, in regards to parkland and other dedication requirements.
- Updating capital facilities plans including but not limited to utility master plans and capital improvement programs.

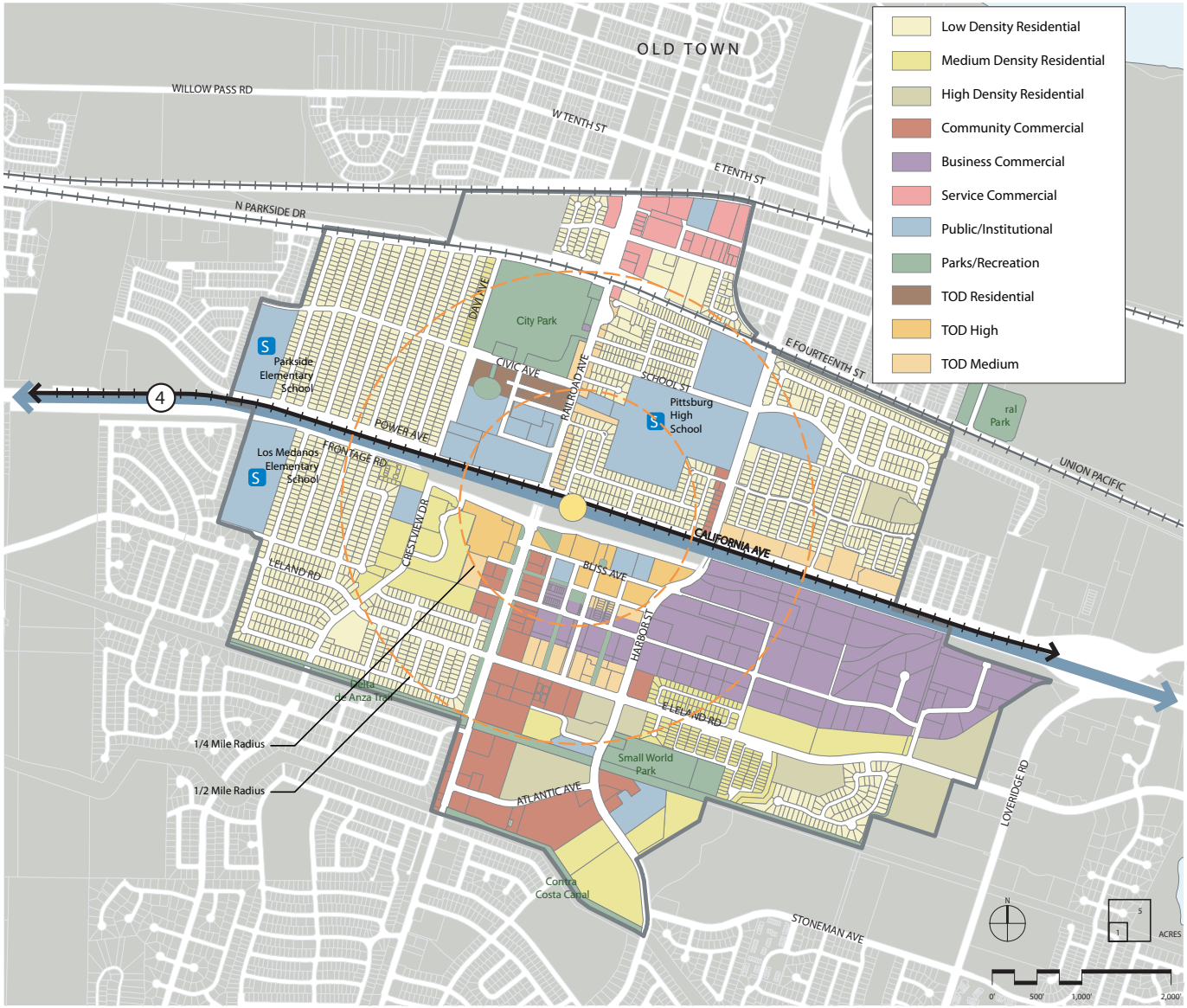
Land Use Classifications

The existing General Plan land use classifications that would be retained and applied within the Specific Plan Area include Low Density Residential, Medium Density Residential, High Density Residential, Community Commercial, Business Commercial, Service Commercial, Public/Institutional, and Parks/Recreation. The

[2] Metropolitan Transportation Commission, MTC Resolution 3434 Transit-Oriented Development for Regional Transit Extension Projects.

proposed new land use classifications in the Specific Plan include Transit Oriented Development – TOD Residential, TOD High, and TOD Medium. Figure 4 illustrates the proposed land use plan. Each land use classification is defined below:

- **Low Density Residential (1 to 7 units/gross acre):** The Low Density Residential classification allows for single-family residential units built at a density of one to seven units per gross acre. The classification is intended to promote and protect single-family neighborhoods. It is mainly intended for detached single-family dwellings, but attached single-family units may be permitted in select areas provided that each unit has ground-floor living and private or common outdoor open space. A 25 percent density bonus is available for projects within one-quarter mile of the eBART Station.
- **Medium Density Residential (7 to 14 units/gross acre):** The Medium Density Residential classification allows for single and multi-family residential units built at a density of seven to 14 units per gross acre. The classification accommodates more intensive forms of residential development, such as one or two story garden apartments, townhouses, and attached and detached single-family residences.
- **High Density Residential (14 to 25 units/gross acre):** The High Density Residential classification allows for a mix of housing types built at a density of 14 to 25 units per gross acre. The classification permits products ranging from single-family attached units to multi-family complexes. As part of the design review process, the Planning Commission can approve discretionary density increases up to 40 units per gross acre for projects that meet community objectives. An additional 25 percent density bonus is available for projects within one-quarter mile of the proposed eBART Station.
- **Community Commercial:** The Community Commercial classification allows for a variety of commercial uses and service-oriented businesses at scales ranging from large retail stores serving the community and region to smaller businesses oriented towards neighborhood activity. Permitted uses include retail stores, eating and drinking establishments, commercial recreation, service stations, auto sales and service, financial, educational and social services. The maximum permitted floor area ratio (FAR) in this land use designation is 0.5 with a maximum bonus of 0.25 FAR to accommodate a residential component. For commercial projects located on properties along Railroad Avenue between SR 4 and Leland Road, a maximum 2.0 FAR is permitted. For mixed use projects located on properties along Railroad Avenue between State Route 4 and Leland Road, a maximum 1.0 FAR is permitted for the non-residential portion of the project with additional residential development at a maximum density of 25 dwelling units per acre.
- **Business Commercial:** The Business Commercial classification focuses on providing sites for administrative, financial, business, research and development and public offices, as well as custom manufacturing, limited assembly, light manufacturing, warehousing and distribution, and support commercial uses. The maximum permitted FAR in this land use designation is 1.0. Subject to the discretion of the Planning Commission, mixed use projects in commercial land use designations may receive a 0.25 additional FAR over the maximum permitted FAR in order to accommodate a residential component.



NORTH

FIGURE 4
Proposed Land Use Plan

***Source*:** MIG, 2008.

- **Service Commercial:** The Service Commercial classification provides sites for commercial businesses that are not appropriate in other commercial areas because they generate high volumes of vehicle traffic or other potential adverse impacts on adjacent uses. Allowable uses in Service Commercial areas include contractors, automotive repair, equipment rental, and wholesaling and storage. The maximum permitted FAR in this land use designation is 0.5. Subject to the discretion of the Planning Commission, mixed use projects in commercial land use designations may receive a 0.25 additional FAR over the maximum permitted FAR in order to accommodate a residential component.
- **Public/Institutional:** The Public/Institutional classification allows schools, government offices, transit sites, public utilities, and other facilities with a unique public character.
- **Parks/Recreation:** The Parks/Recreation classification provides for parks, recreation complexes, community fields, greenways, and trails.
- **TOD Residential (20 to 50 dwelling units/gross acre and 0.25 FAR):** The TOD Residential land use classification is intended to provide opportunities for multi-family residential development in a well-designed walkable environment within ½-mile of local and regional transportation facilities. TOD Residential land uses are intended to provide sites for multi-family apartments, condos, row houses, apartments, townhouses, court homes, and cluster housing. Neighborhood commercial uses are also appropriate in this land use designation provided that the commercial use is integrated into the development and limited to properties fronting Railroad Avenue.
- **TOD High (30 to 65 dwelling units/gross acre and 1.0 floor area ratio maximum):** The TOD High classification is intended to promote a vertical combination of ground-floor retail uses and residential uses on upper stories in the areas closest to proposed regional transit facilities. Special attention should be given to pedestrian circulation within the area to provide access to adjacent facilities and uses. The designation is intended to encourage ground floor, pedestrian friendly, retail sales and service uses with upper floors of residential uses or offices. Ground-floor commercial activity would be required along Bliss Avenue between Railroad Avenue and Harbor Street.
- **TOD Medium (15 to 30 dwelling units/gross acre and 1.0 floor area ratio maximum):** The TOD Medium classification is intended to allow primarily multi-family residential development. Secondarily, ground-floor commercial uses are permitted below residential uses within ½-mile of regional transit facilities.

Development Program for Civic Center, Transit Village, and High School Village Sub-areas

As described above, the Specific Plan Area was divided into 11 sub-areas: Old Town Gateway, Parkside Manor Neighborhood, Civic Center, High School Village, Los Medanos Neighborhood, Transit Village, Industrial/Mixed-Use Center, Los Medanos Industrial Center, Railroad Avenue Retail Corridor, Atlantic Avenue Corridor, and East Leland Corridor. The land use mix within the majority of these districts would not change with implementation of the Specific Plan. Rather, the land use concept is designed to maximize development potential of land within ¼ mile of the proposed Railroad Avenue Station and to preserve the

character of established residential neighborhoods located within the Specific Plan Area. High-intensity mixed-use development would be allowed in former light industrial areas southeast of the proposed station in the proposed Transit Village sub-area, and a mix of office, general commercial, public, and residential uses would be allowed in the Civic Center sub-area surrounding City Hall. The specific land use changes in the Civic Center, Transit Village, and High School Village sub-areas are described in more detail below and quantified in Table 1.

Table 1
Railroad Avenue Specific Plan - Development Potential

		Development		Parking (spaces)	
Land Use Designation	**Gross Area (acres)**	**Residential Units**	**Commercial (sf)**	**Residential**	**Commercial**
Civic Center					
TOD Residential	6.58	230	-	345	-
TOD Medium	0.88	17	22,550	26	67
Public/Institutional	19.81	-	304,400*	-	1,020
Parks/Recreation	2.22	-	-	-	-
Subtotal	29.49	247	326,950	371	1,087
Transit Village					
TOD High	16.59	830	52,500	1,245	158
TOD Medium	12.36	247	36,354	371	109
Business Commercial	8.53	-	223,046	-	446
Community Commercial	10.37	259*	270,949*	389	814
Structured Public Parking	3.77	-	-	-	1,407
Parks/Recreation	2.75	-	-	-	-
Subtotal	54.37	1,336	582,849	2,004	2,934
High School Village					
TOD Medium	13.13	262	78,650	393	236
Total	**96.99**	**1,845**	**988,449**	**2,768**	**4,305**

Source: City of Pittsburg, 2008.
Note: ** Currently permitted.*

Civic Center. In the Civic Center sub-area, the Specific Plan assumes an average development density of 35 dwelling units per acre within the TOD Residential area where a range of 20-50 dwelling units per acre is permitted. Given 6.58 acres of potentially available land, development at this density would result in the development of 230 dwelling units. Pursuant to the Specific Plan, a maximum number of 1.5 parking spaces per residential unit would be permitted on-site, creating the need for 345 residential parking spaces under this designation. The Specific Plan does allow for reductions in on-site parking for residential developments located within ¼ mile of the proposed eBART Station.

The Civic Center sub-area also includes an additional 0.88 acres of privately owned land at the southeastern corner of City Park that could be developed under the TOD Medium land use designation. The Specific Plan

assumes that the TOD Medium land use designation would develop at 20 dwelling units per acre (range of 15-30 dwelling units per acre permitted) resulting in a total of 17 dwelling units. In addition, the Specific Plan assumes that commercial development on the ground floor of buildings would extend 50 feet back from the front property line along Railroad Avenue resulting in potential commercial development of 22,550 sf of commercial space. Using the same residential parking assumptions described above for the TOD Residential designation, and assuming no more than one parking space for every 333 square feet of commercial space as outlined in the Specific Plan, a total of 67 parking spaces would be required to serve residential and commercial uses under the development assumptions for this land use designation.

The Public/Institutional uses in the sub-area are designated to preserve the 71,000-square-foot City Hall and parking for employees and visitors. The anticipated land uses include expansion of the Pittsburg Library (from approximately 7,100 square feet to approximately 11,900 square feet) and construction of a new 73,500-square-foot County courthouse which would be expanded from four courtrooms to seven courtrooms (and eventually ten courtrooms at full buildout). Parking for the new and expanded uses on the Civic Center block would be accommodated through surface parking until the TOD Residential portion at the northern part of the block develops at which time it would be necessary to construct a parking structure to provide adequate parking for all uses. Additional uses in the sub-area include the existing National Guard Armory building on a 135,000-square-foot site, over which the City has no jurisdiction. Should the Armory re-locate and the land become available, new uses should be considered on the site. Pursuant to the PMC, future uses could include commercial recreation, housing, office space, and parking depending on market conditions when the land becomes available. A total of 400 existing and proposed parking spaces would be provided to serve the proposed Public/Institutional uses.

Commercial uses permitted in the Public/Institutional land use classification in the sub-area would include an approximately 134,000-square-foot, six-story office building and 6,500 square foot restaurant pad that have already been approved by the Planning Commission. In addition, another restaurant totaling 6,500 square feet and other small-scale retail uses totaling approximately 1,000 square feet would be permitted within the TOD Residential land use classification on the Civic Center block along Railroad Avenue. A total of 620 existing and proposed parking spaces would be provided to serve the commercial uses.

Transit Village. In the Transit Village sub-area, the Specific Plan assumes an average development density of 50 dwelling units per acre and retail development on the ground floor of buildings would be set back 50 feet from the property line on Bliss Avenue within the TOD High land use classification. Given 16.59 acres of land designated with this use classification, redevelopment at this density creates the potential for 830 new residential units and 52,500 square feet of retail or office space. Pursuant to the Specific Plan, a maximum number of 1.5 parking spaces per residential unit and one space per 333 square feet of retail or office space would be permitted on-site, allowing the development of 1,403 parking spaces for the combined residential and commercial uses. The Specific Plan does allow for reductions in on-site parking for residential developments located within ¼ mile of the proposed eBART Station.

Within the TOD Medium areas, the plan assumes an average development density of 20 dwelling units per acre and retail development on the ground floor of buildings would be set back 50 feet from the property line along Leland Road. This designation would create the opportunity to redevelop the area with 247 residential units

and 36,354 square feet of retail or office space. Using the same parking assumptions described above for the TOD High areas, 480 parking spaces would be provided for the combined commercial and residential uses.

The Business Commercial classification in this sub-area would allow light industrial development. With an assumed intensity of 0.6 FAR, the area could accommodate 223,046 square feet of industrial development. Assuming one parking space per 500 square feet of industrial development, 446 parking spaces would be provided on-site.

The Community Commercial designation in the Transit Village would promote retail-focused development along Railroad Avenue, but it would also allow for additional, limited auto-oriented uses. Assuming an average intensity of a 0.6 FAR for commercial uses and 25 dwelling units per acre of residential, the area (approximately 10.37 acres) would accommodate 270,949 square feet of retail redevelopment and 259 new residential units. Using the same parking assumptions as described for the TOD High and TOD Medium land use classifications, 1,203 parking spaces would be required.

High School Village. The vast majority of the land located within the High School Village sub-area is currently designated for single family residential and public uses (including Pittsburg High School). Land use classification for the sub area would remain the same, except for the areas along Railroad Avenue and the northern side of California, east of Harbor Street, which would maintain the existing development potential, but provide enhanced design requirements.

Table 2
Net Development Potential Increase

Specific Plan Sub-Area	Area (Acres)	Land Use Designation	New Residential Units	New Commercial (sf)
Transit Village	16.60	TOD High	830	0
	12.36	TOD Medium	247	0
Civic Center	6.58	TOD Residential	230	0
	0.88	TOD Medium	17	22,550
Total New Development Potential			**1,324**	**22,550**

Source: City of Pittsburg, 2008

Combined Impacts. Within the Civic Center, Transit Village, and portions of the High School Village sub-areas, the Specific Plan would provide a land use and policy framework to allow approximately 1,845 residential units and approximately 1 million square feet of commercial and civic space under the assumptions set forth above. Compared to the existing land use designations in the City General Plan, the Specific Plan would result in increased development potential to allow for 1,077 *new* dwelling units in the Transit Village sub-area and 247 *new* dwelling units within the Civic Center sub-area. The Specific Plan would also allow for an increase in 22,550 sq. ft. of commercial development within the Civic Center sub-area. All other land use classifications in the Specific Plan would remain consistent with the development potential currently allowed for the base land use classification set forth in the General Plan.

To support these uses, the Specific Plan identifies two parking structures in the Transit Village, providing approximately 1,400 spaces. New plazas and open space are also provided, and the Specific Plan would designate nearly five acres of land for recreational purposes.

Land Use, Design, and Development Standards

The Specific Plan sets forth new land use classifications and retains existing land use classifications from the General Plan. The land use classifications located within the Specific Plan Area would include the following:

New Land Use Classifications

- Transit-Oriented Development – High
- Transit Oriented Development – Medium
- Transit Oriented Development – Residential

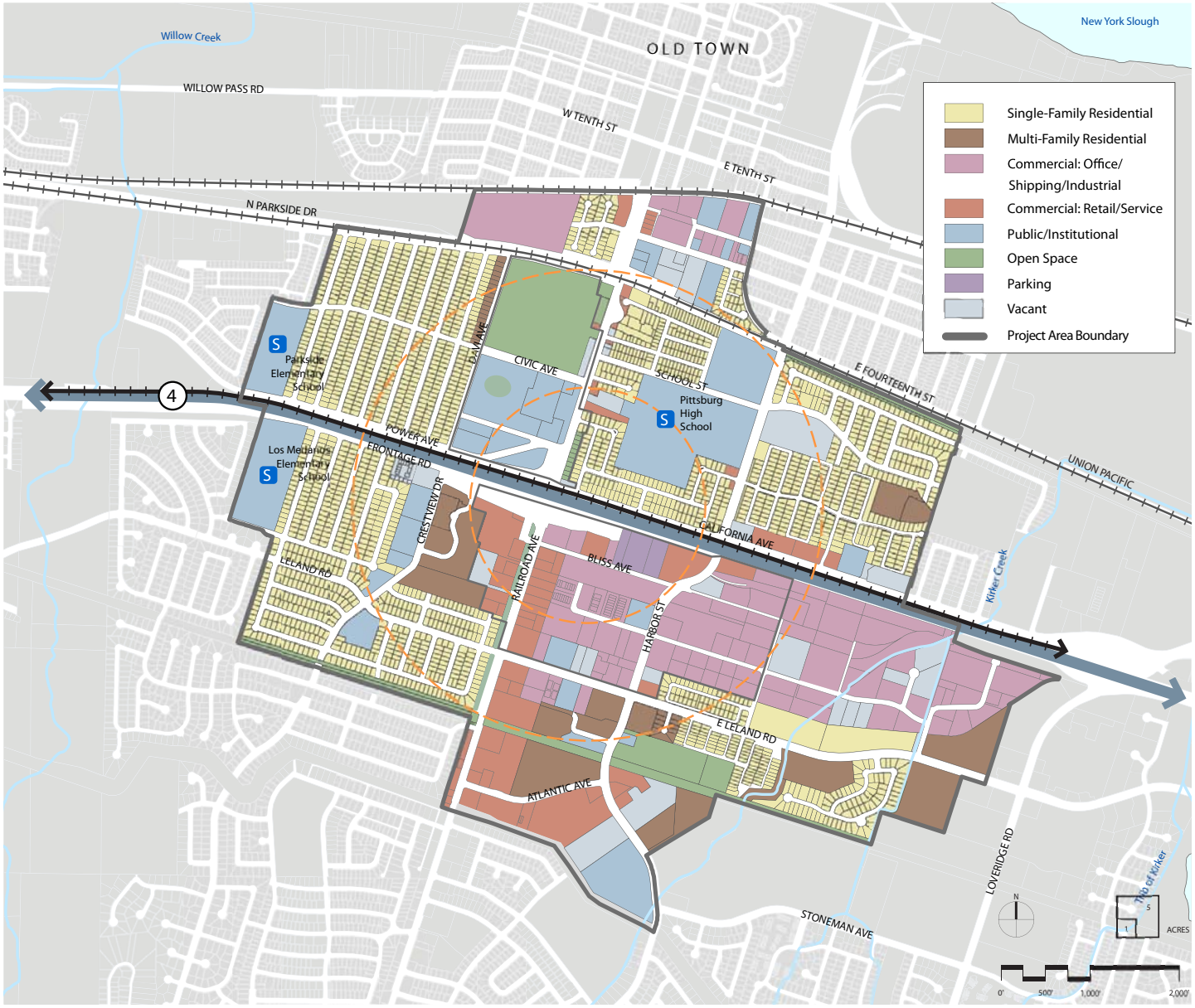
Existing Land Use Classifications

- Low Density Residential
- Medium Density Residential
- High Density Residential
- Business Commercial
- Community Commercial
- Service Commercial
- Public/Institutional

Figure 5 illustrates the existing land uses within the Specific Plan Area, and Figure 4 above presents the proposed land use classifications within the project area.

The Specific Plan provides specific land use standards, development standards, parking and landscaping requirements as well as architectural form and design criteria for the new zoning land use classifications; for the properties designated Community Commercial and located within the Transit Village, Railroad Avenue Retail Corridor, and High School Village sub-areas; and, for the properties designated Business Commercial and located within the Transit Village and Industrial/Mixed Use Center sub-areas.. In the case of mixed use development, the applicant may calculate maximum allowable commercial FAR and density based on gross acreage of the site.

Property development standards and allowable uses for properties designated Community Commercial and Business Commercial that are not located within one of the sub-areas specified above will be required to follow the General Plan and applicable base district zoning standards set forth in Title 18 of the PMC. In addition, standards for the Single Family Residential, Medium Density Residential, High Density Residential, Service Commercial and Public/Institutional land use designations shall be the same as those specified for the base land use designations in the General Plan and applicable base zoning districts set forth in Title 18 of the PMC.



PBS&J®

FIGURE 5
Existing Land Use

***Source*:** MIG, 2008.

Table 3
Development Standards by Land Use Classification

Zoning District	Development Intensity	Height	Setback	Parking Maximum
TOD High	30 to 65 du/ac 0.25 to 1.0 FAR	25' to 65'	Front: 0' (up to 15') Side: 0' Rear: 0'	1.5 spaces per unit 1 space/333 sf
TOD Medium	15 to 30 du/ac up to 1.0 FAR	25' to 40'	Front: 0' (up to 15') Side: 0' Rear: 0'	1.5 spaces per unit 1 space/333 sf
TOD Residential	20 to 50 du/ac	25' to 45'	Front: 0' (up to 15') Side: 0' (up to 5') Rear: 0' (up to 10')	1.5 spaces per unit 1 space/333 sf
Business Commercial	up to 1.0 FAR*	up to 50'	Front: 0' (up to 10') Side/Rear: 0' (up to 10')	1 space/500 sf
TOD-CC	For commercial projects on RR Ave between State Route 4 and Leland Road allow up to 2.0 FAR For mixed use projects on RR Ave between State Route 4 and Leland Road allow 1.0 FAR and up to 25 du/ac For all other commercial and mixed use development along Railroad Avenue south of Leland Road allow up to 0.5 FAR*	up to 60'	Front: 0' (up to 15') Side/Rear: 0' (up to 10')	1.5 spaces per unit 1 space/333 sf
Governmental/Quasipublic	-	-	-	-

Source: City of Pittsburg, 2008

Note: *Subject to the discretion of the Planning Commission, mixed use projects in commercial districts may receive a 0.25 additional FAR over the maximum permitted base district FAR in order to accommodate the residential component. Pursuant to PMC Section 18.52.010, the residential portion of a mixed use project is permitted above, or adjacent to ground floor office, restaurant, or retail use on the same site, and the residential floor area must comprise no less than 25% and no more than 75% of the total square footage of the building developed on-site.

The Specific Plan also includes urban design goals, policies, and improvements. The planning goals and policies are intended to ensure that future decision-making remains relevant to larger aspirations for the area. The goals prioritize the pedestrian experience; preserve each sub-area's character; define the area as a gateway to the community; and support a high quality environment that is clean and safe, as well as socially and environmentally responsible. Building design would enhance the pedestrian experience with transparency of storefronts, maximum setbacks, minimum building heights, minimum commercial intensities and residential densities, well-articulated business facades, recessed entry vestibules, and outdoor seating areas. In addition, the Specific Plan contains a policy requiring site and building design incorporate sustainable elements such as improved insulation, operable windows, energy efficient appliances and lighting, natural ventilation and permeable paving materials, among others.

Community Resources

The Specific Plan contains goals and policies related to parks, opens spaces, and recreational and public facilities that serve the community in addition to natural resources located within the Specific Plan Area. The plan recommends specific goals and policies to expand open space and facilities in the area, to improve existing parks and facilities, and to provide an enjoyable transit experience for riders. The land use plan for the Specific Plan Area features pocket parks, transit plazas, city parks, playfields, school grounds, and community facilities. These open space and community resources would be linked via a network of dedicated pedestrian greenways, trails, and pedestrian-friendly corridors both within the Specific Plan Area and to the rest of the City through existing and planned bicycle routes, sidewalks, and trails. Four specific improvements to facilities and services are identified in the Specific Plan:

- Develop and expand library services in the City by including space for a new library facility in the proposed Civic Tower development at the corner of Railroad Avenue and Center Drive.
- Relocate the Teen Center from Railroad Avenue and Power Avenue to a new facility at City Park or other appropriate location.
- Continue to provide resources for and operate the Senior Center in its current location.
- Coordinate with Pittsburg Unified School District to use fields and other school facilities at Parkside Elementary School, Los Medanos Elementary School, and Pittsburg High School as amenities available to the entire community during school off-hours.

The design recommendations described in the Specific Plan are intended to help define an integrated system of open spaces that are attractive, engaging, and accessible. Key improvements include:

- A large plaza near the intersection of Railroad Avenue and Bliss Avenue;
- A secondary plaza on the north side of Bliss Avenue, midway between Railroad Avenue and Harbor Street with a connection to the multi-use path that runs parallel to Highway 4;
- A 1.5-acre neighborhood park between Bliss Avenue and Garcia Avenue, with potential program elements such as a basketball court, benches and tables, interactive water features, and both hardscape and landscape;
- Two greenways that run north to south from Garcia Avenue to East Leland Road that provide Transit Village residents and visitors with pedestrian-friendly connections to commercial businesses along East Leland Road;
- A multi-use pathway along the north side of SR 4 from Davi Avenue to Railroad Avenue;
- A 12-foot-wide multi-use pathway along the south side of SR 4 between Railroad Avenue and Harbor Street;
- A 12-foot-wide multi-use pathway within the existing greenbelt along the west side of Railroad Avenue between SR 4 and the Delta De Anza Trail; and
- An east-west greenway from the western terminus of Clark Avenue that provides pedestrian-friendly connections for Transit Village residents to commercial services along Railroad Avenue.

This chapter of the Specific Plan briefly discusses natural resources located within the project area. Kirker Creek passes through the southeast corner of the area providing limited riparian woodland vegetation. In addition, vacant areas in the Specific Plan Area are identified as covered in ruderal land cover type according to the East Contra Costa County Habitat Conservation Plan (HCP), and those undeveloped areas are subject to HCP development fees. An additional policy related to potential noise and air quality impacts would require that all residential development located within a certain number of feet of SR 4 incorporate site and building specific measures such as triple-paned windows and internal ventilation systems to alleviate noise and air quality issues related to the proximity of proposed high density residential development to the highway.

Transportation and Circulation

The Specific Plan also contains transportation and circulation-related goals, policies, and a series of recommended improvements to support a seamless multi-modal circulation network in the Specific Plan Area. The transportation and circulation system is designed to improve the existing roadway system by enhancing key roadways, transit connections, and greenway networks and constructing new roadways and pedestrian pathways within the Specific Plan Area. The proposed circulation system would link the eBART Station and the Specific Plan Area to the entire City and the surrounding region. This integrated network would promote transit, pedestrian, and bicycle modes above private vehicle travel through policies supporting traffic calming strategies, reduced parking standards, improved sidewalks, and transit amenities such as a bus-only lane within the Transit Village. Specifically, the Specific Plan seeks to accomplish its circulation goals by minimizing walking distances to key transit-oriented retail, employment, and residential destinations; accommodating safe, direct, and efficient automobile, bus, bicycle, and pedestrian routes; designating truck routes to circumvent major pedestrian, bicycle, and local traffic corridors; strategically locating parking facilities; and improving streetscapes to create a pleasant and inviting pedestrian experience.

Specific roadway improvements in the Civic Center sub-area include improvements in conjunction with the Civic Tower and Davi Avenue Roadway Improvement Projects and internal roadways located north of Center Drive that will be constructed with future residential development on the northern part of the Civic Center block.

Specific roadway improvements in the Transit Village would include:

- Conversion of the existing private roadway along Bliss Avenue into a public roadway with two travel lanes, diagonal parking on both sides of the street, curbs, gutters, sidewalks, and crosswalks. This street is envisioned as a major pedestrian oriented street;
- Conversion of the existing private roadway along Clark Avenue into a public roadway with two travel lanes, curbs, gutters, sidewalks, and crosswalks;
- Extension of Garcia Avenue from its western terminus to Railroad Avenue including improved sidewalks and crosswalks. Garcia Avenue would be designed to accommodate spill-over vehicular traffic from Bliss Avenue;
- Construction of roadway improvements (road, sidewalk, curb, gutter, and crosswalks) for two new north-south streets extending from Bliss Avenue to Garcia Avenue; and

- Construction of roadway improvements (road, sidewalk, curb, gutter, and bike lane) for one new north-south street extending from Bliss Avenue to Leland Road.

Bicycle improvements in the Specific Plan Area would include:

- Class I trails on the north and south sides of SR 4 as described above;
- Extension of Class III bicycle lane south of SR 4 along Railroad Avenue;
- New Class III bicycle lanes on both sides of the new north-south roadway running from Leland Road to the Bliss Avenue in the middle of the Transit Village sub-area; and
- A new bicycle lane along School Street from Railroad Avenue to Harbor Street.

Parking facilities for vehicles would be accommodated through a combination of on-site parking, on-street parking, and construction of two public parking structures on both sides of Bliss Avenue to accommodate 350 parking spaces for use by BART patrons as well as patrons of the commercial uses located in the Transit Village sub-area. A large parking structure is also planned for the Civic Center sub-area; however, the location is yet to be determined. Bicycle parking would be accommodated with the installation of bicycle racks in front of businesses and along designated bicycle routes in the Specific Plan Area. Enclosed bicycle parking would likely be located on the ground floor of public parking garages in the Transit Village and Civic Center sub-areas.

Improvements related to public transportation would include a new, north-south bus-only roadway between Garcia Avenue and Bliss Avenue to provide a dedicated area for bus pick-up and drop-off near the proposed eBART Station. The 80- to 90-foot-wide right-of-way (depending on the bus parking configuration) would accommodate two-way bus lanes, extra wide sidewalks for passenger circulation, shelters, wayfinding signage, and schedule information. The bus throughway would be located adjacent to a proposed public parking garage which could contain bicycle parking and public bathrooms. Coordination with Tri Delta Transit would ensure minimum 10-15 minute bus headways during peak hours with longer headways during non-peak hours. In addition, a dedicated shuttle is planned to run between the Specific Plan Area and Old Town Pittsburg during peak commute times.

Utilities and Infrastructure

The Utilities and Infrastructure chapter of the Specific Plan provides an overview of the existing utilities and contains goals and policies related to environmental sustainability that cover site and building design, stormwater control and treatment, water conservation measures, and appropriately sized trash enclosures with areas for recycling and green waste storage, among others. Specific utility improvements and upgrades necessary to implement the Specific Plan include installation of and expansion of existing water, wastewater, and stormdrain pipes in the Transit Village and Civic Center sub-areas as well as the installation of water booster pumps for structures larger than two stories in the sub-areas to compensate for low water pressure levels. With regards to stormwater management, adjacent development projects are encouraged to meet C.3 requirements jointly through construction of swales and other treatment and flow control measures along public green paths and other open spaces in the Transit Village and Civic Center sub-areas.

IV. ENVIRONMENTAL CHECKLIST AND DISCUSSION OF POTENTIAL EFFECTS

This Initial Study evaluates the potential environmental effects of the Railroad Avenue Station Area Specific Plan (proposed project) as required by the California Environmental Quality Act (CEQA).

A. AESTHETICS

1. Setting

The Specific Plan Area is a developed area, and is defined visually by a predominantly built character (see Figure 6a and b). Much of the retail and service commercial buildings in the Specific Plan Area are low intensity, auto-oriented, single-level structures. Large-scale parking lots are typically located in front of the buildings, abutting the street. Residential development in the Specific Plan Area is primarily characterized by post World War II, single-story and split-level suburban homes. These homes generally have small front and rear yards, a front driveway, and a garage prominently located on the façade. Office, retail, and industrial buildings in the Transit Village sub-area are largely tilt-up warehouse-style structures organized in an "office park" layout. One of the newest and most modern-styled buildings in Specific Plan Area is Pittsburg's City Hall. This building is a large, steel-framed structure with varying heights and generous glazing. City Hall serves as a landmark for both the Specific Plan Area and the entire City.

From some locations within the Specific Plan Area, views of the southern hills and the Black Diamond Mines Regional Preserve to the south may be visible. The City's General Plan includes goals and policies to protect views of these ridgelines. Within the Specific Plan Area, Railroad Avenue and SR 4 are designated as key corridors affecting the City's sense of character. The City's General Plan identifies goals and policies for each of these corridors.

2. Environmental Checklist and Discussion

Would the project:	Significant or Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
1) Have a substantial adverse effect on a scenic vista?	❑	❑	■	❑
2) Substantially damage scenic resources, including but not limited to trees, rock outcroppings, and historic buildings within a state scenic highway?	❑	❑	❑	■
3) Substantially degrade the existing visual character or quality of the site and its surroundings?	❑	❑	■	❑
4) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	❑	❑	■	❑

a. Existing character of single-family homes

b. Pittsburg's City Hall

FIGURE 6a
Visual Character of the Project Area

***Source*:** PBS&J, Railroad Avenue eBART Specific Plan, March 2008.

c. Auto-oriented buildings typify the character along Railroad Avenue

PBS&J

FIGURE 6b
Visual Character of the Project Area

***Source*:** PBS&J, Railroad Avenue eBART Specific Plan, March 2008.

Discussion:

A.1. The project area is not part of a scenic vista. However, some areas within the project area feature partial views of the southern hills. Sensitive viewers within the project area would primarily include users of public spaces, such as the City Park and Small World Park. However, views of the southern hills would primarily be available to viewers at an elevation, such as within the City Hall structure, as opposed to viewers at ground level. The Specific Plan does not propose substantial land use changes that would alter existing views of the southern hills from public areas. In addition, the Specific Plan includes Policy SP4-P-2.1, to preserve views to and from City Hall. Consequently, the proposed Specific Plan would have a less-than-significant effect on a scenic vista.

A.2. The project area is not located in the vicinity of a State scenic highway. Therefore, the proposed project would not affect scenic resources within a State scenic highway, and there would be no impact on scenic resources, including but not limited to trees, rock outcroppings, and historic buildings.

A.3. The existing visual character of the Specific Plan Area is defined by urban and suburban development with little in terms of open space resources. The Specific Plan is intended to maintain and enhance the character of existing, well-defined neighborhoods. Within the Transit Village and Civic Center sub-areas, where the greatest change in the land use and visual environment is proposed, the Specific Plan would result in increased density, height, and massing, compared to current development patterns. The more dense and urban visual character that would result, however, would comply with the detailed design guidelines included in the Specific Plan, which would increase the visual experience of pedestrians, residents, and visitors to the area. As described previously, the Specific Plan includes design guidelines and development standards to shape the character of future projects and achieve its vision of a vibrant, walkable, mixed-use transit oriented-area. As a result, the Specific Plan would have a less-than-significant impact related to degradation of the existing visual character in the area.

A.4. Implementation of the Specific Plan would permit more dense development, including residential, commercial, and mixed-use structures, primarily concentrated in the two sub-areas closest to the proposed eBART Station (the Civic Center and Transit Village). The entire Specific Plan Area is currently developed with uses similar to those that are proposed, which generate light and glare from a variety of sources, including windows, safety lighting, home lighting, illuminated signs, etc. Projects constructed pursuant to the proposed Specific Plan would increase sources of lights and glare in the Specific Plan Area, but all projects would be required to comply with PMC Section 18.82.030, which limits the use of mirrored or reflective surfaces and requires that all light sources be directed away from residential districts. Further, the Standard Conditions of Development require that all light sources be shielded to prevent glare and spillover lighting. Therefore, the proposed project would have a less-than-significant impact related to light and glare.

B. AGRICULTURAL RESOURCES

1. Setting

The proposed project is located in an urbanized, developed area. There are no agricultural resources located on or near the project area.

2. Environmental Checklist and Discussion

Would the project:	Significant or Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
1) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	❑	❑	❑	■
2) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	❑	❑	❑	■
3) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use?	❑	❑	❑	■

Discussion:

B.1-3. The Specific Plan Area does not include land designated as "farmland" by the Farmland Mapping and Monitoring Program of the California Resources Agency (2000). Additionally, there are no parcels within the project area that are zoned for agricultural use or under a Williamson Act contract. Because the Specific Plan Area is currently developed with urban uses, the project would not result in the conversion of farmland to non-agricultural use. There would be no impact to agricultural uses.

C. AIR QUALITY

1. Setting

Federal, state, and local laws and regulations are the basis for controlling air pollution. The Bay Area Air Quality Management District (BAAQMD) has planning responsibilities and permitting authority over stationary sources of pollutants and for achieving ambient air quality standards. The California Air Resources Board (CARB) regulates vehicular sources of pollutants. The City of Pittsburg is directly involved in regulating odors and nuisances (PMC Section 18.82.045 prohibits offensive odors), and the release of particulate matter at construction sites.

The BAAQMD monitors ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter (PM_{10}), and lead in the Pittsburg area at the local air quality monitoring station (583 West Tenth Street). Between 2000 and 2004, the Pittsburg area met federal and state ambient air quality standards for all criteria pollutants except ozone and PM_{10}. Ozone exceedances of both the state one-hour and national eight-hour standard occurred each year between 2000 and 2002, but no exceedances were recorded in 2003 or 2004. The state standard for PM_{10}

was exceeded in 2000, 2002, 2003, and 2004. PM_{10} data were not available for 2001. In 2004, the BAAQMD recorded one exceedance of the state PM_{10} standard.[3]

In addition to the criteria air pollutants, another group of airborne substances, called Toxic Air Contaminants (TACs), are known to be highly hazardous to public health, even in small quantities. TACs can be emitted from a variety of common sources, including gasoline stations, automobiles, dry cleaners, industrial operations, and painting operations. Natural source emissions include windblown dust and wildfires. Farms, construction sites, and residential areas can also contribute to toxic air emissions. CARB also identifies diesel particulate matter as a TAC. While TACs are produced by many different sources, the largest contributor to inhalation cancer risk in California is diesel particulates. Diesel particulate matter is emitted into the air via heavy-duty diesel trucks, construction equipment, and passenger cars.

CARB's *Air Quality and Land Use Handbook: A Community Health Perspective* references numerous studies indicating a correlation between proximity to a freeway and an increase in health impacts, such as reduced lung function, asthma, and bronchitis. In recognition of these potential health concerns, CARB provides advisory recommendations on siting new land uses whose occupants are particularly sensitive to air quality. CARB recommends that local authorities avoid siting new sensitive land uses within 500 feet of a freeway carrying 100,000 vehicles per day, or rural roads carrying 50,000 vehicles per day. SR 4 carries an estimated 122,000 vehicles per day in the vicinity of the Specific Plan Area,[4] resulting in a potential for elevated TAC concentrations. CARB also references several studies that conclude that particulate pollution levels show about a 70 percent reduction at 500 feet from a freeway.[5] While CARB has proposed these guidelines to assist local governments in their planning, CARB did not establish a standard of significance for mobile TAC against which a development project could be evaluated. Notably, CARB explicitly notes that land use decisions are a local government responsibility to be balanced with other state and local policies and the recommendations do not establish regulatory standards of any kind. Additionally, the benefits to be gained by TOD derive from locating housing in close proximity to transit services. With eBART proposed to operate in the median of SR 4 and the Railroad Avenue Station located within the freeway right-of-way, higher density housing in the Civic Center and Transit Village sub-areas affords the City, BART, and the region the best opportunity to increase transit ridership, reduce automobile travel, and achieve supportive and vibrant new land use patterns.

Air quality is monitored, evaluated, and regulated by federal, state, regional, and local regulatory agencies and jurisdictions, including the United States Environmental Protection Agency (EPA), CARB, and the BAAQMD. The EPA, CARB, and BAAQMD develop rules and/or regulations to attain the goals or directives imposed by legislation. Both state and regional regulations may be more, but not less, stringent than federal regulations. The CARB establishes state ambient air quality standards and motor vehicle emission standards, conducts research, and oversees the activities of regional Air Pollution Control Districts and Air Quality Management Districts. The San Francisco Bay Area is designated as non-attainment for ozone under both state and federal standards, and non-attainment for particulate matter under 10 microns (PM_{10}) under state standards. Existing

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[3] Bay Area Air Quality Management District, *Bay Area Air Pollution Summaries 2000-2004, Pittsburg Monitoring Station,* www.baaqmd.gov/pio/aq_summaries/pollusm04.pdf, accessed June 13, 2006.

[4] State of California, Business, Transportation and Housing Agency, Department of Transportation, *2004 Average Daily Truck Traffic on the California State Highway System,* August 2005.

[5] California Air Resources Board, Air Quality and Land Use Handbook: A Community Health Perspective, April 2005.

state and federal air quality standards are depicted in Table 4. Reactive Organic Gases (ROG) and nitrogen oxides (NO_x) are considered ozone precursors.

Table 4
Federal and State Air Quality Standards

Pollutant	Averaging Time	California Standard[a]	Federal Standard[b]
Ozone	1-hour	0.09 ppm	0.12 ppm
	8-hour	—	0.08 ppm
Carbon Monoxide (CO)	1-hour	20.00 ppm	35.00 ppm
	8-hour	9.00 ppm	9.00 ppm
Nitrogen Dioxide (NO_2)	1-hour	0.25 ppm	—
	Annual Average	—	0.053 ppm
Sulfur Dioxide (SO_2)	1-hour	0.25 ppm	—
	3-hour	—	0.5 ppm
	24-hour	0.04 ppm	0.14 ppm
	Annual Average	—	0.03 ppm
Particulate Matter (PM_{10})	24-hour	50 $\mu g/m^3$	150 $\mu g/m^3$
	Annual Geometric Mean	20 $\mu g/m^3$	—
	Annual Arithmetic Mean	—	50 $\mu g/m^3$
Fine Particulate Matter ($PM_{2.5}$)	24-hour	—	65 $\mu g/m^3$
	Annual Arithmetic Mean	12 $\mu g/m^3$	15 $\mu g/m^3$
Lead (Pb)	30-day Average	1.5 $\mu g/m^3$	—
	Calendar Quarter	—	1.5 $\mu g/m^3$

Source: Summarized by PBS&J from *BAAQMD CEQA Guidelines*, 1996, revised 1999.

Notes:

ppm = *parts per million by volume*

$\mu g/m^3$ = micrograms per cubic meter

— = *No standard exists for this category*

a. California standards for ozone, CO, NO_2, SO_2, and particulate matter (PM_{10}) are values that are not to be exceeded.

b. Federal standards other than for ozone, particulates, and those based on annual averages are not to be exceeded more than once a year. The 1-hour ozone standard is attained if, during the most recent three-year period, the average number of days per year with maximum hourly concentrations above the standard is equal to or less than one. The 8-hour ozone standard is attained when the 3-year average of the 4th highest daily concentrations is 0.08 ppm or less. The 24-hour PM_{10} standard is attained when the 3-year average of the 99th percentile of the monitored concentrations is less than 150 $\mu g/m^3$. The 24-hour $PM_{2.5}$ standard is attained when the 3-year average of 98th percentile is less than 65 $\mu g/m^3$.

2. Environmental Checklist and Discussion

Would the project:	Significant or Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
1) Conflict with or obstruct implementation of the applicable air quality plan?	■	❑	❑	❑
2) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	■	❑	❑	❑

Would the project:	Significant or Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
3) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is classified as non-attainment under an applicable federal or state ambient air quality standard including releasing emissions which exceed quantitative thresholds for ozone precursors?	■	❑	❑	❑
4) Expose sensitive receptors to substantial pollutant concentrations?	■	❑	❑	❑
5) Create objectionable odors affecting a substantial number of people?	❑	❑	■	❑

Discussion:

C.1-4. The proposed Specific Plan would increase development in the Specific Plan Area. Although the development would support the proposed eBART Station and encourage the use of transit, the proposed project could alter traffic patterns in the area. Construction activities from development pursuant to the Specific Plan could also generate air pollutants. An EIR for the Specific Plan should analyze the project's potential air quality impacts, during both the construction and operational phases of the project. The EIR should also examine the potential impacts of siting housing in proximity to SR 4, which could include exposing sensitive receptors (i.e., residents) to substantial pollutant concentrations (i.e., diesel particulate matter) that are associated with heavily trafficked roadways.

C.5. Development under the Specific Plan would result in construction activities adjacent to existing uses. Residents, schools, and businesses in proximity to these construction areas may experience occasional odors from equipment exhaust during construction. This effect would be intermittent, would be contingent on prevailing wind conditions, and would occur only during construction activities. The types of uses proposed in the Specific Plan Area are similar to those already in the area, and similar odors would be generated. The mix of uses proposed in the Specific Plan would not generate unusual or intense odors that would be distinguishable from existing odors. In addition, PMC Section 18.82.045 prohibits the emission of unreasonable, disturbing, or unnecessary odors. Therefore, the impact from the creation of objectionable odors would be less than significant.

D. BIOLOGICAL RESOURCES

1. Setting

The Specific Plan Area was surveyed by foot and car by PBS&J biologists in July and August 2006. The Specific Plan Area is primarily urban in nature, with non-native landscaping comprising much of the vegetative cover. Vegetation in the urban habitat consists primarily of horticultural cultivars and specimen plantings around residential, municipal, and commercial properties, and is sparse in industrial areas. Wildlife species observed are those best adapted to urban environments and do not include sensitive-status species.

Two tributaries of Kirker Creek pass through the southeast corner of the Specific Plan Area, and exhibit riparian woodland vegetation. One tributary passes through the Specific Plan Area in a northeastern direction for approximately 3,100 feet. The other tributary passes through the Specific Plan Area in a northern direction for approximately 2,600 feet. Use of the riparian vegetation in and around Kirker Creek by local wildlife populations is limited due to the fragmented nature of available habitat within the Specific Plan Area.

Vegetation. Vegetation in the undeveloped lots within the Specific Plan Area consists of ruderal (weedy) habitats. Ruderal habitats often contain a high percentage of introduced, non-native annual and biennial grasses and broad-leaved plants (forbs) that undergo frequent disturbance (e.g., mowing, spraying, grading, discing). Native species are not frequently encountered within ruderal habitats due to their inability to compete with the more aggressive short-lived annual and biennial species. Ruderal habitats are found in association with undeveloped lots within the Specific Plan Area. The more commonly encountered non-native plant species include wild oat (*Avena fatua*), rip-gut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), hare barley (*Hordeum murinum ssp. leporinum*), Italian ryegrass (*Lolium multiflorum*), sweet fennel (*Foeniculum vulgare*), wild radish (*Raphanus sativus*), prickly sow-thistle (*Sonchus asper*), Italian thistle (*Carduus pycnocephalus*), black mustard (*Brassica nigra*), yellow star-thistle (*Centaurea solstitialis*), California bur-clover (*Medicago polymorpha*), red-stem filaree (*Erodium cicutarium*), filaree (*Erodium botrys*), prickly lettuce (*Lactuca serriola*), hairy vetch (*Vicia sativa*), milk thistle (*Silybum marianum*), and field bindweed (*Convolvulus arvensis*). The only native vascular plant species likely to occur in common association with ruderal habitats are fiddleneck (*Amsinckia menziesii var. intermedia*) and annual fireweed (*Epilobium brachycarpum*). Scattered tree and shrub species (primarily within urbanized landscape corridors) include flowering almond (*Prunus dulcis*), blackwood acacia (*Acacia melanoxylon*), eucalyptus (*Eucalyptus spp.*), toyon (*Heteromeles arbutifolia*), Peruvian peppertree (*Schinus molle*), and coyote brush (*Baccharis pilularis*).

Wildlife. Species observed in ruderal habitats include monarch butterfly (*Danaus plexippus*), western fence lizard (*Sceloporus occidentalis*), gopher snake (*Pituophis catenifer*), black phoebe (*Saynoris nigricans*), Brewer's blackbird (*Euphagus cyanocephalus*), killdeer (*Charadrius vociferus*), meadowlark (*Sturnella neglecta*), western kingbird (*Tyrannus verticalis*), mourning dove (*Zenaida macroura*), house finch (*Carpodacus mexicanus*), goldfinch (*Carduelis psaltria*), house sparrow (*Passer domesticus*), tree swallow (*Tachycineta bicolor*), northern mockingbird (*Mimus polyglottos*), western scrub jay (*Aphelocoma coerulescens*), loggerhead shrike (*Lanius ludovician*), western tanager (*Piranga ludoviciana*), American robin (*Turdis migratorius*), American crow (*Corvus brachyrhynchos*), black-tailed hare (*Lepus californicus*), Botta's pocket gopher (*Thomomys bottae*), and California ground squirrel (*Spermophilus beecheyi*). Red-tailed hawk (*Buteo jamaicensis*), red-shouldered hawk (*Buteo lineatus*), white-tailed kite (*Elanus leucurus*), and turkey vulture (*Cathartes aura*) commonly forage over ruderal habitat.

Riparian Habitat. Riparian woodland is the predominant vegetation community found within Kirker Creek. Most of the existing riparian habitat has been heavily degraded by human activity. Vegetation likely to occur along the riparian area includes Fremont's cottonwood (*Populus fremontii*), valley oak (*Quercus lobata*), arroyo willow (*Salix lasiolepis*), and California black walnut (*Juglans californica*). The herbaceous understory is likely to include wild oats, wild pea (*Lathyrus jepsonii ssp. californicus*), field bindweed, white sweetclover (*Melilotus alba*), and Himalayan blackberry (*Rubus discolor*).

Sensitive Species. Review of the California Department of Fish and Game's California Natural Diversity Database (CNDDB) for the Specific Plan Area occurred prior to conducting fieldwork. The Specific Plan Area is within the Honker Bay USGS 7.5-minute quadrangle. The surrounding quadrangles are Antioch North, Antioch South, and Clayton. A query of all four maps results in a list of 43 sensitive species of plants, 37 sensitive animal species, and two sensitive habitat types.[6] The only sensitive species within the CNDDB list that was observed on site is the white-tailed kite. Based on the CNDDB query, two special-status sensitive species, the Suisun song sparrow (*Melospiza melodia maxillaries*) and the big tarplant (*Blepharizonia plumose*), may occur within the Specific Plan Area (Figure 7).

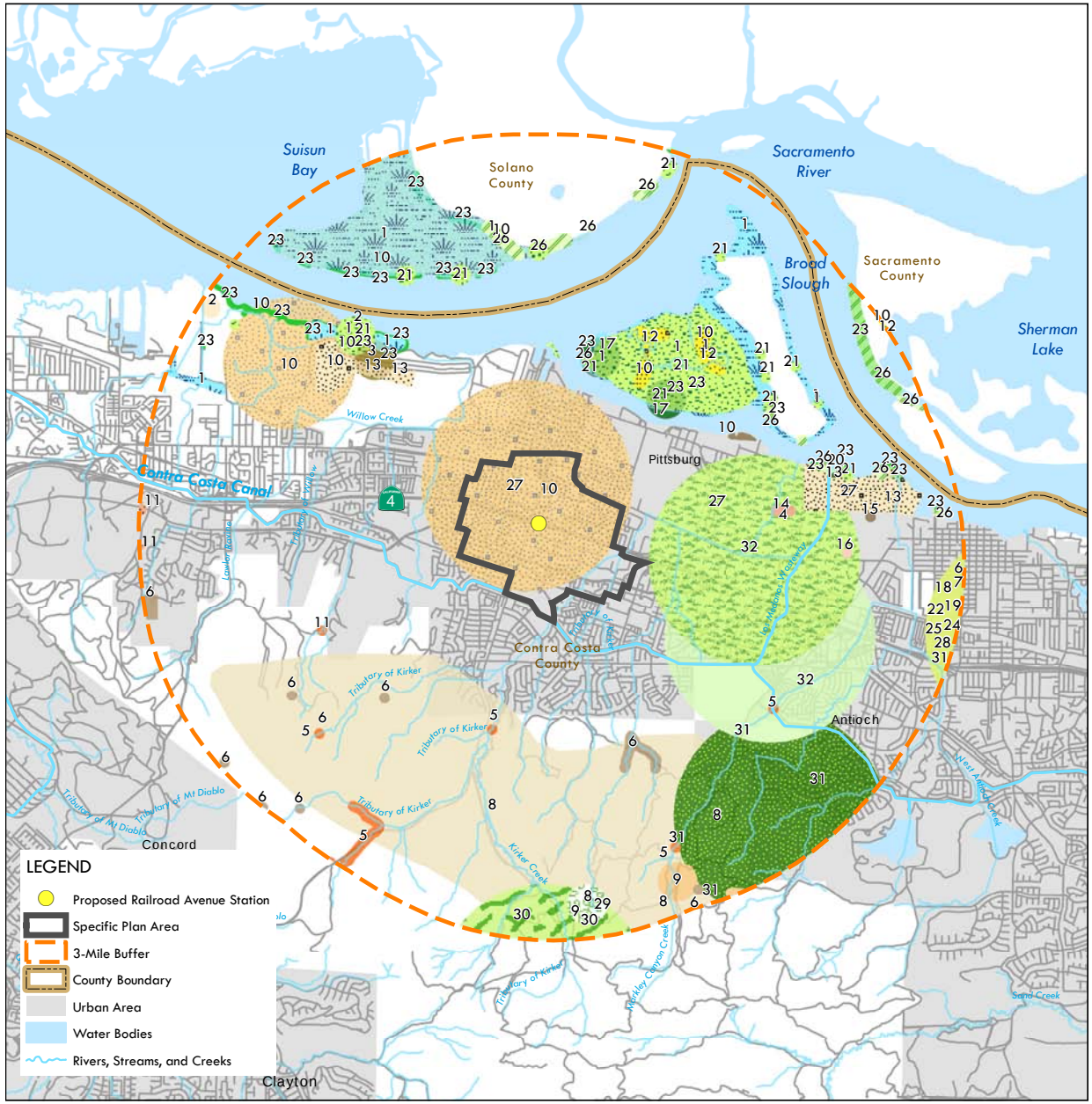
Suisun Song Sparrow. The Suisun song sparrow typically inhabits the brackish-water marshes surrounding Suisun Bay. The CNDDB includes numerous historical sightings of the Suisun song sparrow in the vicinity of the Specific Plan Area, primarily on the north side of the City adjacent to and on islands in New York Slough. The Suisun song sparrow is currently a federal species of concern and is also listed as a Species of Special Concern by the California Department of Fish and Game (CDFG). The Suisun song sparrow was considered by the California Fish and Game Commission for possible state listing as threatened, but no action was taken. The Suisun song sparrow ideal habitat consists of intermixed stands of bulrush (*Scirpus spp*.), cattail (*Typha spp*.), and other emergent vegetation. Because habitat for the Suisun song sparrow does not occur within the Specific Plan Area, the species is not likely to occur.

Big Tarplant. The big tarplant occurs in valley and foothill grassland habitats. The flowering period for this species is July to October, and occurs at elevations ranging from 30 to 505 meters. No big tarplant species were observed during the floristic surveys conducted in August 2006. In addition, due to the urbanized nature of the Specific Plan Area, it is unlikely that the habitat necessary to support this species is still intact, and thus it is unlikely that big tarplant occurs in the Specific Plan Area.

White-tailed Kite. The white-tailed kite is a state "fully protected" raptor. It breeds between February and October and feeds on rodents, small reptiles, and large insects in fresh emergent wetlands, annual grasslands, pastures, and ruderal vegetation. Unlike other raptors, kites often roost and occasionally nest communally; therefore, disturbance of a relatively small roost or nesting area could affect a large number of birds. Although the white-tailed kite was not identified in the CNDDB search for the project area, suitable foraging habitat could occur along the riparian area of Kirker Creek.

California Red-legged Frog. The California red-legged frog (CRLF) is a large brown to reddish-brown frog that historically occurred over much of California from the Sierra Nevada foothills to the coast. The CRLF is described here because although it was not identified in the CNDDB for the project area, the East Contra Costa County Habitat Conservation Plan (HCP) identifies Kirker Creek as potential CRLF breeding habitat. CRLF typically inhabit ponds, slow moving creeks, and streams with deep pools that are lined with dense emergent marsh or shrubby riparian vegetation. Submerged root masses and undercut banks are important habitat features for this species. However, this frog is capable of inhabiting a variety of perennial aquatic habitats with sufficient cover, and without bullfrogs or non-native predatory fish. CRLF are known to survive in ephemeral streams, if deep pools with vegetative cover persist through the dry season. The CRLF is listed as

[6] CNDDB 2007, California natural diversity database v3.1.0, information dated December 30, 2006.



CITY OF PITTSBURG
RAILROAD AVENUE STATION AREA
SPECIFIC PLAN

CNDDB Occurences

Terrestrial

1, Coastal Brackish Marsh

Animal

2, California black rail
3, California least tern
4, California linderiella
5, California red-legged frog
6, California tiger salamander
7, Hurd's metapogon robberfly
8, San Joaquin kit fox
9, San Joaquin pocket mouse
10, Suisun song sparrow
11, burrowing owl
12, saltmarsh common yellowthroat
13, salt-marsh harvest mouse
14, vernal pool fairy shrimp
15, western pond turtle
16, white-tailed kite

Plant

17, Antioch Dunes evening-primrose
18, Brewer's western flax
19, Contra Costa goldfields
20, Delta mudwort
21, Delta tule pea
22, Hoover's cryptantha
23, Mason's lilaeopsis
24, Mt. Diablo buckwheat
25, Mt. Diablo manzanita
26, Suisun Marsh aster
27, big tarplant
28, diamond-petaled California poppy
29, large-flowered fiddleneck
30, rayless ragwort
31, round-leaved filaree
32, showy madia

0 2,500 5,000 Feet

NORTH

PBS&J

FIGURE 7
Potential Habitat for Sensitive Species

Source: MIG, 2008.

Threatened by the U.S. Fish and Wildlife Service (USFWS), and is designated as a California Species of Special Concern.

East Contra Costa County Habitat Conservation Plan. The purpose of East Contra Costa County HCP is to protect and enhance ecological diversity and function within the rapidly urbanizing region of eastern Contra Costa County. To that end, the HCP describes how to avoid, minimize, and mitigate, to the maximum extent practicable, impacts on protected species and their habitats and wetlands while allowing for the growth of selected regions of the County and the cities of Pittsburg, Clayton, Oakley, and Brentwood. The Specific Plan Area falls entirely within the East Contra Costa HCP Inventory Area and Impact of Urban Covered Activities. While the majority of the properties within the project area are identified and mapped as containing urban, turf or aqueduct landcover types, some sites within the project area are identified as containing ruderal landcover and are therefore subject to the requirements of Pittsburg Municipal Code Section 15.108. For project sites larger than one acre and identified as containing ruderal landcover types, the HCP requirements include the submittal of an HCP application and payment of all applicable HCP fees prior to the issuance of a grading or building permit.

City of Pittsburg General Plan – Open Space, Youth, and Recreation Element: Policy 8-P-20. Kirker Creek is one of three areas (including the Contra Costa Canal and PG&E Utility Right-of-Way) identified by the City in its General Plan for possible development of local and/or regional trails within the City. The General Plan states that the Kirker Creek easement could be developed as a creekside trail, connecting to other trails and open space within the City. Kirker Creek passes through the southeast corner of the Specific Plan Area.

2. Environmental Checklist and Discussion

Would the project:	Significant or Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
1) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	❑	■	❑	❑
2) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	❑	❑	❑	■

Would the project:	Significant or Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
3) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	❑	❑	❑	■
4) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	❑	❑	■	❑
5) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	❑	❑	❑	■
6) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	❑	❑	■	❑

Discussion:

D.1. As mentioned above, the Specific Plan Area is generally developed and therefore supports little to no sensitive and/or native biological resources. The only sensitive resource within the Specific Plan Area is Kirker Creek. The East Contra Costa County HCP designated Kirker Creek as potential breeding habitat for the CRLF. The nearest CRLF occurrence in the CNDDB was recorded in July 2002 on Kirker Creek approximately 1.96 miles south of the Specific Plan Area. The west fork of Kirker Creek, from Harbor Street until it leaves the Specific Plan Area, is composed of mud bottom. The east fork of Kirker Creek, from Stoneman Avenue until it leaves the Specific Plan Area (near SR 4) has a concrete bottom. The mud bottom section of Kirker Creek could support breeding habitat for the CRLF. Therefore, construction adjacent or within the Kirker Creek channel could affect the CRLF. However, the Specific Plan would not alter the existing land use designation in the area surrounding Kirker Creek nor propose circulation or utility improvements along the creek. As such, the Specific Plan would have no potential to impact Kirker Creek or the potential CRLF breeding habitat.

The riparian vegetation along Kirker Creek would provide the most likely nesting habitat for a number of protected avian species, such as white-tailed kite, tree swallows, western blue bird, and American robin. Although unlikely, trees within the urban and industrial zone of the Specific Plan Area could also provide suitable habitat for nesting birds. The white-tailed kite is a California fully protected species; the tree swallow, western blue bird, and other avian species are protected under the Migratory Bird Treaty Act (MBTA). While nesting activities were not observed during the surveys in the Specific Plan Area, existing trees could support

nesting birds in the future. Construction activities associated with future projects could result in the disturbance to nesting birds. This would be considered a potentially significant impact.

MITIGATION MEASURES. Mitigation Measure BIO-1, below, would minimize the potential effects from the implementation of the Specific Plan on nesting birds and reduce impacts to a less-than-significant level. Future project applicants within the Specific Plan Area would comply with the following measures.

BIO-1. Conduct a Nesting Bird Survey within the Specific Plan Area. Project applicants shall be required to comply with the following activities prior to construction during the nesting season, March 1st to August 1st. Outside the specified time period, no mitigation would be required.

(a) Between March 1st and August 1st, the applicant shall have a qualified biologist conduct nest surveys 30 days prior to any demolition/construction activities that are within 500 feet of potential nest trees. A pre-construction survey report shall be submitted to CDFG and the City of Pittsburg that includes, at a minimum: (1) a description of the methodology including dates of field visits, the names of survey personnel with resumes, and a list of references cited and persons contacted; and (2) a map showing the location(s) of any bird nests observed on the project site. This report shall be consistent with the requirements from the East Contra Costa County HCP. If no active nests of MBTA, CDFG, or USFWS protected species are identified then no further mitigation is required.

(b) Should active bird nests be located in the survey area, the applicant, in consultation with the City of Pittsburg and CDFG, shall delay construction in the vicinity of active nest sites during the breeding season (March 1st through August 1st) while the nest is occupied with adults and/or young. A qualified biologist shall monitor any occupied nest to determine when the nest is no longer used. If the construction cannot be delayed, avoidance shall include the establishment of a non-disturbance buffer zone around the nest site. The size of the buffer zone will be determined in consultation with the CDFG, but will be a minimum of 100 feet. The buffer zone shall be delineated by highly visible temporary construction fencing.

(c) No intensive disturbance (e.g., heavy equipment operation associated with construction or use of cranes) or other project-related activities that could cause nest abandonment or forced fledging, shall be initiated within the established buffer zone of an active nest between March 1st and August 1st.

(d) If demolition/construction activities are unavoidable within the buffer zone, the project applicant shall retain a qualified biologist to monitor the nest site to determine if construction activities are disturbing the adult or young birds. If abandonment occurs the biologist shall consult with CDFG or USFWS for the appropriate salvage measures. This could include taking any nestlings to a local wildlife rehabilitation center.

(e) Trees that support active nests which are to be removed shall only be removed during the non-breeding, non-nesting season.

D.2. Sensitive habitats reported in the CNDDB query include coastal brackish marsh and stabilized interior dunes,[7] neither of which occurs in the Specific Plan Area. Kirker Creek passes through the southeast corner of the project area, providing riparian woodland vegetation. Construction along Kirker Creek could result in the disturbance or removal or riparian vegetation. However, the Specific Plan would not alter existing land use designations or otherwise result in development around Kirker Creek. Because no construction would occur in the vicinity of Kirker Creek, the project would have no impact on riparian vegetation.

D.3. The U.S. Army Corps of Engineers (Corps) has jurisdiction over a variety of water features including wetlands (i.e., vernal pools, marshes, seasonal wetlands) and "other waters of the United States" (i.e., drainages, creeks, streams, navigable waters, tidal area). Kirker Creek would fall under the jurisdiction of the Corps as a water of the U.S. No other waters of the U.S. are present within the Specific Plan Area. Implementation of the Specific Plan would not result in fill or construction within the channel of Kirker Creek. The Specific Plan would therefore have no impact on waters of the U.S.

D.4. Due to the urbanization within the Specific Plan Area, the use of Kirker Creek as a migratory route by the CRLF or other species is highly unlikely. In addition, the Specific Plan would not result in any changes in the area surrounding Kirker Creek. The remainder of the Specific Plan Area does not provide suitable habitat for a migratory route. Consequently, the Specific Plan would have a less-than-significant impact on wildlife corridors and wildlife nursery sites.

D.5. Future projects within the Specific Plan Area would have to comply with all applicable local, State, and federal regulations. PMC Section 12.32.070 (A) requires that a street tree permit be obtained before a person plants, cuts, trims, removes, prunes, shapes, injures, interferes with, or does maintenance work on a street tree. PMC Section 12.32.070 (B) states that if a person obtains a building permit or other permit from the City's Public Works Department under PMC Section 12.32.100 or 12.32.120 and street tree work is required or authorized under that permit, the person need not obtain a separate street tree permit. Implementation of subsequent projects developed under the Specific Plan would be required to obtain the necessary permits consistent with local policies and ordinances protecting biological resources, resulting in no impact.

D.6. As noted above, the Specific Plan Area falls entirely within the East Contra Costa County HCP Inventory Area and Impact of Urban Covered Activities. The City of Pittsburg, as a signatory of the HCP, would implement all conditions and requirements of the plan. Future development activities under the Specific Plan would be required by the City to be consistent with the HCP policies, conservation measures, and fees. As required by Pittsburg Municipal Code Section 15.108, development sites identified as containing ruderal landcover types and larger than one acre will be required to submit an HCP application and pay all applicable HCP fees prior to any ground disturbing activities. As a result, impacts related to consistency with the HCP would be less than significant.

[7] CNDDB 2007, California Natural Diversity Database v3.1.0, information dated December 30, 2006.

E. CULTURAL RESOURCES

1. Setting

For the purposes of this analysis, cultural resources are divided into historic resources, archaeological resources, and paleontological resources. Although only one-third of Pittsburg has been studied for cultural resources, five archaeological sites have been identified. Pittsburg's waterfront location and industrial history make the existence of additional archaeological resources in the region likely.

Historic Resources. There are no historic buildings listed on the National Register of Historic Places or California Register of Historical Resources within the Specific Plan Area. These inventories contain lists of properties and buildings that meet specific federal or state criteria as historic resources. However, the Camp Stoneman Military Chapel, on the south side of East Leland Road between Railroad Avenue and Harbor Street, is eligible for local listing or designation. The Camp Stoneman Military Chapel was constructed in 1942, as part of the Camp Stoneman military base, and continues to operate as the Community Presbyterian Church. Camp Stoneman served as a staging and embarkation facility for troops during World War II and the Korean conflict from 1942 to its deactivation in 1954.

Prehistoric Archaeological Resources. The Pittsburg area contains a number of Native American and archaeological and historic archaeological areas that may be considered sensitive. Indications of potential archaeological resources typically include chert or obsidian flakes, projectile points, mortars and pestles, and dark friable soil containing shell and bone, dietary debris, heat-affected rock, and/or human burials. These sites are most likely to occur on alluvial flats and along historic bay margins, as well as near sources of water. The General Plan lists five archaeological sites and eight recorded historic archaeological sites in the City's planning area (see General Plan EIR Figure 4.10-2), although none of the identified sites are within the Specific Plan Area. The presence of other sites nearby and the Specific Plan Area's setting near the water suggest Native American artifacts, including buried remains and non-recorded artifacts, may be present within the Specific Plan Area. Senate Bill (SB) 18 requires the City of Pittsburg to contact and consult with California Native American tribes prior to amending or adopting a specific plan. The intent of SB 18 is to provide Native American tribes an opportunity to participate in local land use decisions at an early planning stage in order to protect, or mitigate impacts to, cultural places. This process will further define any sensitive locations within the Specific Plan Area.

Paleontological Resources. Paleontological resources are the fossilized remains and/or traces of prehistoric plant and animal life exclusive of human remains or artifacts. Fossil remains, such as bones, teeth, shells, and wood, are found in geologic deposits (rock formations). Although Pleistocene epoch mammal and fish fossils have been found in Pittsburg (along the Mokelumne Aqueduct), because of the ground disturbance that has occurred in the Specific Plan Area to create the existing urban land uses and infrastructure, shallow subsurface paleontological resources are not anticipated to be recovered intact.

2. Environmental Checklist and Discussion

Would the project:	Significant or Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
1) Cause a substantial adverse change in the significance of an historical resource as defined in §15064.5?	■	❑	❑	❑
2) Cause a substantial adverse change in the significance of an archaeological resource as defined in §15064.5?	■	❑	❑	❑
3) Directly or indirectly destroy a unique paleontological resource or site, or unique geologic feature?	❑	■	❑	❑
4) Disturb any human remains, including those interred outside of formal cemeteries?	■	❑	❑	❑

Discussion:

E.1. The proposed Specific Plan would increase development in the Specific Plan Area, which could result in adverse impacts on historical resources as defined by CEQA. Adverse impacts on historical resources, including historic-period buildings, structures, or other built features, could result from demolition, alteration, or changes in the setting of the resources. Therefore, an EIR-level analysis should be performed to determine whether the proposed project would result in impacts on historical resources.

E.2. The proposed Specific Plan would increase development in the Specific Plan Area, which could result in adverse impacts on archaeological resources as defined by CEQA. Adverse impacts on known or previously undiscovered archaeological resources, including prehistoric, ethnographic, and historic-period subsurface sites or features, could result from ground-disturbing activity associated with implementation of the Specific Plan. Therefore, an EIR-level analysis should be performed to determine whether the proposed project would result in impacts on historical resources.

E.3. Paleontological resources include fossil remains, as well as fossil localities and rock or soil formations that have produced fossil material. Fossils are the remains or traces of prehistoric animals and plants. Fossils are important scientific and educational resources because of their use in: (1) documenting the presence and evolutionary history of particular groups of now extinct organisms, (2) reconstructing the environments in which these organisms lived, and (3) determining the relative ages of the strata in which they occur and of the geologic events that resulted in the deposition of the sediments that formed these strata and in their subsequent deformation. Although Pleistocene epoch mammal and fish fossils have been found in Pittsburg (along the Mokelumne Aqueduct), because of the ground disturbance that has occurred in the Specific Plan area to create the existing urban land uses and infrastructure, shallow subsurface paleontological resources are not anticipated to be recovered intact. Nonetheless, it is possible that intact paleontological resources could be adversely

affected by the earth-moving development of the Specific Plan area. Impacts on paleontological resources are therefore considered potentially significant.

MITIGATION MEASURES. Mitigation Measure CR-1 would ensure that any previously undiscovered paleontological resources would be treated by a qualified professional, who would reduce impacts to a less-than-significant level via avoidance, data recovery, or other appropriate measures. The impact, therefore, is considered less than significant with mitigation incorporated.

CR-1 *Treatment of Unexpected Paleontological Resources*. Should paleontological resources be identified at project construction sites during any phase of construction, the construction contractor/supervisor shall cease operation at the site of the discovery and immediately notify the City of Pittsburg Planning Department. The project applicant shall retain a qualified paleontologist to provide an evaluation of the find and to prescribe mitigation measures to reduce impacts to a less-than-significant level. In considering any suggested mitigation proposed by the consulting paleontologist, the City of Pittsburg Planning Department shall determine whether avoidance is necessary and feasible in light of factors such as the nature of the find, project design, costs, specific plan policies and land use assumptions, and other considerations. If avoidance is unnecessary or infeasible, other appropriate measures (e.g., data recovery) shall be instituted. Work may proceed on other parts of the project site while mitigation for paleontological resources is carried out.

E.4. The proposed Specific Plan would increase development in the Specific Plan Area, which could disturb human remains, including those interred outside of formal cemeteries. Disturbance of human remains could result from ground-disturbing activity associated with implementation the Specific Plan. Therefore, an EIR-level analysis should be performed to determine whether the proposed project would disturb human remains.

F. GEOLOGY AND SOILS

1. Setting

The Specific Plan Area is in the Lowland (coastal) zone of the City of Pittsburg. The Specific Plan Area is composed of Flatland Soils, which have 0-20 percent slopes and minimum slump/slide potential. The Specific Plan Area is relatively flat, and is not subject to landslides. Antioch loam, Brentwood clay loam, Capay and Omni clay loam comprise the Flatland Soils; these soil types have a high shrink-swell/subsidence potential, but do not have a high risk of liquefaction. The lowland soils typically consist of heterogeneous material such as unconsolidated silt and clay with abundant organic material.

Historically active faults in Contra Costa County include the Concord, Hayward, and Clayton-Marsh Creek-Greenville faults. The historically active Calaveras and Green Valley faults are within 15 miles of Pittsburg. The largest regional active fault, the San Andreas, is about 40 miles west of Pittsburg. Groundshaking intensity is described using the Modified Mercalli Scale, which ranges from I (not felt) to XII (wide-spread devastation). During an earthquake, the majority of Pittsburg is projected to experience groundshaking of intensity VII, which is associated with non-structural damage. Portions of the Specific Plan Area adjacent to Kirker Creek could experience strong groundshaking of intensity VIII. The Specific Plan Area is not in or

adjacent to an Alquist-Priolo Earthquake Fault Zone. The Alquist-Priolo Act requires the designation of Earthquake Fault Zones around active faults and subjects those areas to land use restrictions.

2. Environmental Checklist and Discussion

Would the project:	Significant or Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
1) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
a) Rupture of a known earthquake fault, as described on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? (Refer to Division of Mines and Geology Special Publication 42.)	❑	❑	■	❑
b) Strong seismic ground shaking?	❑	❑	■	❑
c) Seismic-related ground failure, including liquefaction?	❑	❑	■	❑
d) Landslides?	❑	❑	❑	■
2) Result in substantial soil erosion or the loss of topsoil?	❑	❑	■	❑
3) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	❑	❑	■	❑
4) Be located on expansive soil, as defined in Table 18-1-A of the California Building Code (2001), creating substantial risks to life or property?	❑	❑	■	❑
5) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	❑	❑	❑	■

Discussion:

F.1. The Specific Plan Area is not in a designated Alquist-Priolo Earthquake Fault Zone. The General Plan does not identify any faults within the Specific Plan Area.[8] Major faults in the area include the historically active Calaveras and Green Valley faults, which are both within 15 miles of Pittsburg, as described above. The largest regional active fault, the San Andreas, is about 40 miles west of the Pittsburg.

The future development in the Specific Plan Area would be required to comply with the City's Building Code. The code requires an extensive design and review process; compliance with this process would ensure that seismic hazards would not present a constraint to the proposed development. In addition, hazards that could accompany potentially expansive or compressive soils would be addressed through the existing Building Code regulations. Because compliance with the existing Building Code and other safety regulations is mandatory, all potentially hazardous geological conditions (including seismicity and soil strength issues) would be reduced to an acceptable level of risk during the planning and design phases of any project proposed in the Specific Plan Area. As such, the proposed project is not expected to expose people to potential adverse effects caused by the rupture of a known fault.

The City of Pittsburg and the San Francisco Bay Area are in a seismically active region. Recent studies by the United States Geological Survey (USGS) indicate that there is a 63-percent probability of a Moment Magnitude (M_w) 6.7 or higher earthquake occurring in the Bay Area in the next 30 years. The project area would experience a range of groundshaking effects during an earthquake on a Bay Area fault, particularly the San Andreas Fault. A characteristic earthquake on the San Andreas fault (M_w 7.2 on the Peninsula segment; M_w 7.9 on the entire Bay Area trace) would cause very strong to violent groundshaking intensities (Modified Mercalli Intensity VIII to IX).[9,10] Seismic groundshaking could cause damage to new structures and developments proposed in the Specific Plan Area.

Although the potential for seismic groundshaking to occur in the proposed Specific Plan Area is unavoidable, the risk of excessive, permanent damage to the new development is anticipated to be relatively minor. Per the Building Code, all new development would be designed and constructed to modern engineering standards for seismically active areas to withstand damage from groundshaking. Compliance with these standards would reduce damage caused by groundshaking as much as practicable. Therefore, ground shaking hazards are considered less than significant.

The Specific Plan Area is composed of Flatland Soils, which have 0-20 percent slopes and minimum slump/slide potential. Antioch loam, Brentwood clay loam, Capay, and Omni clay loam comprise the Flatland Soils; these soil types have a high shrink-swell/subsidence potential, but do not have a high risk of liquefaction.

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8 City of Pittsburg General Plan (2004) Health and Safety Element Figure 10-2, and City Council Resolution No. 07-10779.

9 Shaking intensity is a measure of groundshaking effects at a particular location, and can vary depending on the overall magnitude of the earthquake, distance to the fault, focus of earthquake energy, and type of underlying geologic material. The Modified Mercalli (MM) intensity scale is commonly used to measure earthquake effects caused by groundshaking. The MM values for intensity range from I (earthquake not felt) to XII (damage nearly total).

10 ABAG, Earthquake Shaking Potential Map, www.abag.ca.gov/bayarea/eqmaps/mapsba.html, accessed March 6, 2008.

According to the ABAG Earthquake Liquefaction Hazard Map,[11] the potential for liquefaction in most of the Specific Plan Area is primarily low. The proposed project would be designed and constructed to modern engineering standards for seismically active areas, as set forth by the Building Code. As such, the impacts of ground failure and liquefaction on the proposed project would be reduced as much as practicable. Impacts associated with liquefaction would be considered less than significant.

Many of the natural factors that promote landsliding, such as steep slopes, poorly consolidated bedrock, heavy rainfall, and seismic groundshaking are known to affect certain areas of the southern foothills. These areas are not within the Specific Plan Area. Due to the relatively flat topography of the Specific Plan Area, the proposed project is not expected to alter the current exposure of people to landslide hazards. As such, no impact would occur.

F.2. The proposed project is not expected to create substantial erosion or loss of topsoil because the majority of the Specific Plan Area is already developed with paving or landscaping. Subsequent projects implemented under the Specific Plan would be required to obtain a grading permit from the City and to comply with the grading standards contained in PMC Section 15.88.030.[12]

In addition, future projects would be required to comply with the National Pollutant Discharge Elimination System (NPDES) permit (described under Checklist Item H, Hydrology and Water Quality). Conformance with PMC Section 15.88.030 and the NPDES permit would ensure that any erosion resulting from construction and implementation of future projects would be controlled and minimized. Therefore, impacts related to soil erosion would be less than significant.

F.3 and F.4. The Specific Plan Area is composed of Flatland Soils, which have a high shrink-swell/subsidence potential, but do not have a high risk of liquefaction. The lowland soils typically consist of heterogeneous material such as unconsolidated silt and clay with abundant organic material. The Specific Plan Area is not in an area of expansive soils as defined in Table 18-1-A of the Building Code (2001).

During construction of the new structures, any unstable soil would be excavated and replaced with engineered fill as needed. The fill material would be non-expansive. In addition, the City requires new developments to comply with an extensive design and review process, set forth by the Building Code. The design and review process would address potentially expansive or compressive soils. Because compliance with the existing Building Code and other safety regulations is mandatory, all potentially hazardous geological conditions related to geologic instability or expansive soils would be reduced to an acceptable level of risk during the planning and design phases of any project proposed in the Specific Plan Area. Based on the relatively stable soil types present within the Specific Plan Area and the existing regulations, no risk to life or property is anticipated. Impacts due to unstable or expansive soils are therefore considered less than significant.

F.5. All new development within the Specific Plan Area would connect to the City's wastewater system. As such, the proposed project would not need a wastewater disposal system, and would not include the installation

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[11] ABAG, Liquefaction Susceptibility Map, www.abag.ca.gov/bayarea/eqmaps/liquefac/liquefac.html, accessed March 6 008.

[12] City of Pittsburg Municipal Code, http://www.codepublishing.com/ca/pittsburg/, accessed March 5, 2008.

of septic tanks or leach fields. Therefore, there is no potential impact related to the capability of the soil to support septic tanks or alternative disposal systems.

G. HAZARDS AND HAZARDOUS MATERIALS

1. Setting

Currently operating industrial or commercial businesses may use or generate varying amounts of hazardous materials within the Specific Plan Area. The Specific Plan Area contains residential, industrial, and commercial buildings that were constructed prior to 1978, when asbestos-containing building materials (ACBM) were banned from use by the U.S. Environmental Protection Agency (EPA). In addition, because of the age of the existing building stock, it is likely that buildings in the Specific Plan area contain lead-based paint and associated electrical transformers containing polychlorinated biphenyls (PCBs), both of which were banned from use for human health reasons.

Two facilities within the Specific Plan Area are of particular note: Fontaine Cleaners and Ramar Foods. Fontaine Cleaners at 168 Atlantic Avenue, in the southern portion of the Specific Plan Area, within the Atlantic Avenue Corridor, is classified as a state Spills, Leaks, Investigation, and Cleanup site. The site contained soil and groundwater contaminated with perchloroethylene (PCE) and trichloroethylene (TCE) of limited extent and low concentration. The leak was reported after a site assessment in 2001. Cleanup verification monitoring was conducted in 2002, and the case was closed by the RWQCB in 2003.

The California Accidental Release Prevention Program (CalARP) merges state and federal programs for the prevention of accidental release of regulated toxic and flammable substances. Any company that handles, manufactures, uses, or stores one of the regulated substances above the adopted threshold quantities is subject to the CalARP requirements. Ramar Foods, at 1101 Railroad Avenue, operates an ice cream plant and refrigerated storage space; anhydrous ammonia is used as a refrigerant at the plant. CalARP requires the preparation of a Risk Management Plan (RMP), which summarizes the facility's accidental release prevention program implementation activities.

The light industrial areas east of Railroad Avenue and north of East Leland Road are currently being used for industrial and automotive uses and were previously occupied with buildings and facilities associated with Camp Stoneman.[13] During the Camp Stoneman era, the Transit Village, Industrial/Mixed Use Center and Los Medanos Industrial Center areas contained warehouses, barracks, administration buildings, prisoner barracks, recreation buildings, mess halls, storehouses, motor repair shops and gas stations.[14] The Los Medanos Neighborhood, Civic Center and Parkside Manor Neighborhood areas contained buildings associated with the West Garrison, consisting primarily of barracks, mess halls, recreation buildings, administration buildings, officers clubs and quarters and a drill field. The Railroad Avenue Corridor and Atlantic Avenue Corridor

[13] Camp Stoneman functioned primarily as a troop staging area from 1942 to 1954, serving as an embarkation point for the Pacific Theater during World War II and the Korean War, and as a separation center at the end of these respective conflicts. At it's peak capacity, Camp Stoneman had the capacity to house 20,000 troops, while providing medical and dental examinations prior to embarkation. For additional information, see www.militarymuseum.org/CpStoneman.html.

[14] Camp Stoneman Layout Map (1944), Post Engineer Office, Camp Stoneman, California. 3/31/1944.

areas contained the hospital buildings, including nurse's quarters, mess halls, patient wards, and medical clinics. An obstacle course, bayonet course, rifle range and ammunitions storage buildings were located southeast (and outside) of the Specific Plan Area, on the eastern side of Kirker Creek, north of the Contra Costa Canal and south of the current location of Stoneman Avenue.[15] The Old Town Gateway and High School Village areas were also located outside of the Camp Stoneman boundaries.[16]

For many decades, industrial uses within the Specific Plan area have primarily located in the areas east of Railroad Avenue and north of East Leland Road, in the areas currently zoned IP (Industrial Park). Past industrial uses within this area include Merit USA, Pacific Heating and Sheet Metal, and Tennessee Chemical Company.[17] These areas may contain underground storage tanks associated with the former industrial uses; however, the sites are not listed or known to contain hazardous waste spills or leaks as reported by the state Spills, Leaks, Investigation, and Cleanup site lists or Hazardous Waste and Substances site list (prepared by the Department of Toxic Substances Control).[18]

2. Environmental Checklist and Discussion

Would the project:	Significant or Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
1) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	❑	❑	■	❑
2) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	❑	■	❑	❑
3) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	❑	❑	■	❑
4) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	❑	❑	❑	■

[15] Ibid.

[16] Ibid.

[17] City of Pittsburg (1998), Pittsburg General Plan Update, Existing Conditions and Planning Issues, page 309.

[18] Department of Toxic Substances Control, 2007. Envirostor Database: Pittsburg.

Would the project:	Significant or Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
5) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	❑	❑	❑	■
6) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	❑	❑	❑	■
7) Impair implementation of, or physically interfere with, an adopted emergency response plan or emergency evacuation plan?	❑	❑	❑	■
8) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	❑	❑	■	❑

Discussion:

G.1. The proposed Specific Plan is intended to guide and direct growth around the new Railroad Avenue Station. No component of the Specific Plan would deal directly with routine transport, use, or disposal of hazardous materials.

Construction and operation of future development under the Specific Plan would require minor amounts of hazardous materials typical of urban and suburban development, which would require some transport, and/or disposal of products containing hazardous materials. Typical products include vehicle fuels and lubricants, welding compounds, and various items such as solvents, cements, and paint. In accordance with General Plan policy 10-P-31, any spilled products would be properly characterized, removed, and transported to an approved disposal site according to state and Contra Costa County Environmental Health Division regulations.

The City's Goals for Hazardous Materials Safety, as set forth in the General Plan,[19] would ensure potential impacts related to the routine transport, use, or disposal of hazardous materials are less than significant. The relevant goal and policy are:

> 10-G-9: Minimize the risk to life and property from generations, storage, and transportation of hazardous materials and waste by complying with all applicable state regulations.

[19] City of Pittsburg, General Plan, Health and Safety Element, 2004.

10-P-31: Cooperate with other public agencies in the formation of a hazardous-materials team, consisting of specially-trained personnel from all East County public safety agencies, to address the reduction, safe transport, and clean-up of hazardous materials.

Complying with state and local regulations and the relevant goals and policies would reduce impacts related to the routine transport, use, or disposal of hazardous materials to less-than-significant levels.

G.2. The Transit Village, Industrial/Mixed Use Center and Los Medanos Industrial Center areas contained motor repair shops and gas stations during the Camp Stoneman era.[20] The Specific Plan includes land use changes from industrial to transit oriented mixed use (including residential, public parks, and ground-floor retail and commercial uses) within the Transit Village and Industrial/Mixed Use Center. Land use designations within the Los Medanos Industrial Center will remain for industrial type uses and will not result in the conversion of previous industrial sites for use as residential, mixed use, or public parks. Buildings within the Los Medanos Industrial Center sub area have been redeveloped since the Camp Stoneman era, and remnant buildings have been replaced with modern industrial type buildings. However, some of the remnant facilities associated with Camp Stoneman may remain within the Transit Village and Industrial/Mixed Use Center sub-areas. The Specific Plan would include changes in land use regulations that would allow sites containing these buildings to be redeveloped with residential, mixed use and recreation and park uses. The redevelopment of land within the Transit Village and Industrial Mixed Use Center sub-areas to include residential, mixed use and public park space creates a potentially significant hazard to the public or environment through the accidental release of hazardous materials associated with any potential underground storage tanks and potential contamination from previous industrial and military uses of the site.

The demolition of any structures within the City that may have asbestos containing building materials (ACBM) must be conducted in accordance with all applicable laws regarding ACBM abatement, including, but not limited to, Bay Area Air Quality Management District (BAAQMD) regulation 11, rule 2,[21] requiring that a licensed asbestos abatement contractor (acting under the supervision of a certified asbestos consultant) perform the demolition, transportation and disposal of the ACBMs. Prior to the issuance of a demolition permit, the City of Pittsburg Building Division ensures that the contractor has obtained approval from the BAAQMD, affirming the BAAQMD's understanding that there are no ACBMs present on the property, or that ACBMs will be handled in accordance with all BAAQMD requirements.[22] Compliance with the required BAAQMD asbestos demolition regulations, as enforced through the City's demolition permit issuance process, will ensure that potential hazardous materials impacts related to the demolition of ACBMs containing buildings will be reduced to less than significant levels without additional mitigation.

MITIGATION MEASURES. Mitigation Measure HAZ-1, below, would ensure that any potentially significant hazard to the public or environment involving the release of hazardous materials would be mitigated to a less than significant level. The impact, therefore, is considered less than significant with the mitigation incorporated.

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[20] Specific Plan and Camp Stoneman Layout Map (1944), Post Engineer Office, Camp Stoneman, California. 3/31/1944

[21] Bay Area Air Quality Management District, Regulation 11, rule 2, asbestos demoltion, website: www.baaqmd.gov/dst/regulations/rg1102.pdf

[22] Curt Smith, Chief Building Official (2008). Staff communication, July 17, 2008.

HAZ-1. *Underground storage tank and hazardous materials remediation*: The proposed Specific Plan shall include the following policy:

Policy SP7-P-2.9 Require phase I environmental site assessments (and phase II sampling where appropriate) for redevelopment of previous industrial sites within the sub-areas that have the potential to contain underground storage tanks or contamination from previous industrial uses. When remediation is required pursuant to the findings of the environmental site assessments, implement all required remediation and abatement work in accordance with the requirements of the Department of Toxic Substances Control (DTSC), Regional Water Quality Control Board (RWQCB) requirements or other applicable agency.

G.3. There are three schools within the Specific Plan Area:

- Pittsburg High School at 250 School Street in the High School Village District
- Parkside Elementary School at 989 West 17th Street in the Parkside Manor Neighborhood
- Los Medanos Elementary School at 610 Crowley Avenue in the Los Medanos Neighborhood

Implementation of the Specific Plan is expected to generate the most new development in the Civic Center and Transit Village sub-areas. Additional development could also occur on underutilized parcels in other districts. Thus, it is possible that new development under the Specific Plan could occur within 1/4 mile of a school. Construction equipment would use some small quantities of hazardous materials, including diesel, gasoline, lubrication oil, hydraulic fluid, antifreeze, transmission fluid, and lubricating grease. However, the amounts of hazardous materials used would be minimal. Additionally, all construction would comply with state regulations, including CalARP, and the Contra Costa County Environmental Health Division regulations. CalARP merges state and federal programs for the prevention of accidental release of regulated toxic and flammable substances. Any company that handles, manufactures, uses, or stores one of the regulated substances above the adopted threshold quantities is subject to the CalARP requirements.

In the event that a hazardous materials spill were to occur from construction and/or any other activities related to development in the Specific Plan Area, the construction personnel would follow state and local regulations to respond to the spill in a safe manner. By following state and local regulations, impacts related to the emission or handling of hazardous materials, substances, or wastes within ¼ mile of an existing or proposed school would be less than significant.

G.4. There are no locations and/or facilities within the Specific Plan Area listed in the State of California Hazardous Waste and Substances Sites List,[23] which is compiled by the Department of Toxic Substances Control pursuant to Government Code Section 65962.5. One contaminated site has been identified within the Specific Plan Area, but the Specific Plan would not change the land use designation at this site or otherwise influence its redevelopment. Thus, the proposed project would have no impact related to safety hazards from known hazardous materials sites.

[23] Department of Toxic Substances Control, Hazardous Waste and Substances Site List (Cortese List), www.dtsc.ca.gov/database/Calsites/Cortese_List.cfm, accessed March 5, 2008.

G.5 and G.6. The Specific Plan is not within an airport land use plan nor is it located in the vicinity of a private airstrip. The nearest airport to the Specific Plan Area is Buchannan Field, approximately 11 miles west. Therefore, the proposed project would have no impact on safety hazards related to airports.

G.7. In 1999, the City of Pittsburg updated its 1996 Emergency Response Plan, which addresses potential impacts from a major earthquake, hazardous materials incident, flood, national security emergency, wildfire, landslides, or dam failure. The proposed Specific Plan, by changing land use designations, would result in additional residents, employees, and visitors to the Specific Plan Area. However, the Specific Plan does not propose and would not create any physical barriers to the movement of emergency vehicles or evacuees in the case of an emergency. Therefore, the Specific Plan would have no impact related to implementation of the Emergency Response Plan.

G.8. According to the ABAG Wildfire Hazard Maps, the City of Pittsburg and portions of the Specific Plan Area would be subject to fire hazards. While the majority of the Specific Plan Area is located in a highly urbanized and developed area, the southern border of the Specific Plan does fall within a wildland-urban interface. Compliance with existing state and local fire safety regulations and standards during construction of any new structures would reduce the risk of fire hazard due to inadvertent releases of flammable or explosive materials. Therefore, the proposed project would not expose people or structures to a significant risk of loss, injury or death involving fires, resulting in a less-than-significant impact.

H. HYDROLOGY AND WATER QUALITY

1. Setting

The Specific Plan Area is in the Kirker Creek watershed, which encompasses the central and eastern portions of the Pittsburg area and drains to New York Slough. The southeastern corner of the Specific Plan Area, around Kirker Creek, is within the 100-year floodplain. The City is responsible for maintaining the local flood control system, including Kirker Creek. The City's Capital Improvement Program identified necessary improvements to the Kirker Creek watershed. The drainage channels require major cleaning due to years of siltation, as well as upgrades to the system.

Section 303(d) of the 1972 Clean Water Act requires states, territories, and authorized tribes to develop a list of water quality limited segments that do not meet water quality standards, even after point sources of pollution have installed the minimum required levels of pollution control technology. The law requires that these jurisdictions establish priority rankings for water on the lists and develop action plans, called Total Maximum Daily Loads (TMDL), to improve water quality. There are no rivers within City boundaries that are currently listed on the 303(d) list of impaired water bodies.[24]

[24] Regional Water Quality Control Board, 2006 CWA Section 303(d) List of Water Quality Limited Segments.

2. Environmental Checklist and Discussion

Would the project:	Significant or Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
1) Violate any water quality standards or waste discharge requirements?	❑	❑	■	❑
2) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	❑	❑	❑	■
3) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on-or off-site?	❑	❑	■	❑
4) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on-or off-site?	❑	❑	■	❑
5) Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?	❑	❑	■	❑
6) Otherwise substantially degrade water quality?	❑	❑	■	❑
7) Place housing within a 100-year flood hazard area as mapped on a Federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	❑	❑	■	❑
8) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	❑	❑	■	❑
9) Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam?	❑	❑	■	❑
10) Be subject to inundation by seiche, tsunami, or mudflow?	❑	❑	❑	■

Discussion:

H.1. As described in Section III, Project Description, the land use mix within the majority of the 11 sub-areas would not change with implementation of the Specific Plan. The land use concept is designed to maximize development potential of land adjacent to the proposed Railroad Avenue Station and to preserve the character of established residential neighborhoods. High-intensity mixed-use development would be allowed in former industrial areas south and east of the proposed station, and a mix of office, general commercial, public, and residential uses would be allowed in the area surrounding City Hall. Although the mix of land uses allowed in the entire Specific Plan Area could affect development potential throughout the area, the greatest changes are concentrated in the Civic Center and Transit Village sub-areas.

The San Francisco Bay Regional Water Quality Control Board (SFRWQCB) would require that future development obtain an individual NPDES permit from the RWQCB. Each project applicant/contractor would be required under its NPDES permit to file a Notice of Intent and to prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) to prevent polluted runoff from flowing into public drainage facilities during construction of the proposed structures. The SWPPP would contain Best Management Practices (BMPs) that include schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution in stormwater runoff during construction. The SWPPP would be reviewed and approved by the City and other appropriate agencies, such as the RWQCB, prior to issuance of a grading or building permit. In addition, each individual development project would need to comply with the Contra Costa County Clean Water Program requirements and would be subject to review by the City to ensure compliance with the applicable NPDES permit requirements. Because new proposed development and projects would be subject to compliance with the permit conditions set forth by the NPDES permit and the County, the Specific Plan would not be expected to violate water quality standards or discharge requirements. Compliance with NPDES requirements would ensure potential water quality impacts would be less than significant.

H.2. The Specific Plan Area currently draws water from the Contra Costa Water District (CCWD) through the Central Valley Project and two wells, located at City Park and at the intersection of Dover Way and Frontage Road. The City operates its own water treatment plant and the associated infrastructure facilities, including more than 122 miles of pipeline, to distribute treated water throughout the City. These facilities are built for a hydraulic design capacity of 32 million gallons per day (mgd).

The projected water demand associated with the new development anticipated under the Specific Plan is primarily associated with population growth. Average demand per day (measured in gallons per capita per day, or gpcd) is based on a consumption rate of 180 gpcd, per the standard set by the 2000 Pittsburg Water System Master Plan. Following construction of nearly 1,600 new residential units, demand for water would increase to an average of 0.7 mgd with a 1.47 mgd maximum demand per day.[25] This projected increase in demand can be accommodated using the existing water systems in place and the increased demand is not considered substantial in light of city-wide water demand. Furthermore, the Specific Plan envisions intensified development in areas that are already developed. As a result, the Specific Plan would not be expected to

[25] MIG, Railroad Avenue Specific Plan, Public Review Draft, page 154, April 2008.

adversely affect groundwater recharge. In summary, no impact on groundwater supplies or recharge is anticipated from development under the Specific Plan.

H.3. In addition to potential new developments around the Civic Center and Transit Village sub-areas, underutilized parcels have been identified adjacent to Kirker Creek, within the Kirker Creek Watershed. An approximately 7-acre opportunity site has been identified in the Los Medanos Industrial Center.

However, the opportunity site (parcel numbers 088-540-004, 088-540-005, 088-540-006, 088-540-009, and 088-540-014) is in an industrial area that is already paved. Potential development occurring with implementation of the Specific Plan could increase the impervious surface area of the site as well as other development locations; however, the City Building Code and grading permit, the NPDES permit described under Checklist Item F, Geology and Soils, the Flatland Soils in the Specific Plan Area would reduce the potential of soil and sediment erosion.

Additionally, all new development projects throughout the City of Pittsburg are subject to Provision C.3[26] of the City's joint NPDES municipal permit. Provision C.3 requires projects to incorporate treatment and source control measures to treat stormwater runoff. Treatment and source control measures and best management practices (BMPs) would be required, and projects that exceed the impervious surface threshold established in the applicable NPDES permit[27] would be required to include runoff flow control so that post-project runoff would not exceed estimated pre-project rates or durations.

If construction were to occur during the winter months, implementation of BMPs would account for potential construction activities in wet weather conditions, and would minimize potential erosion and enhance sediment control. Thus, conformance with the NPDES permit and the companion SWPPP and BMPs would ensure that substantial erosion would not result from the proposed project, and erosion-related impacts would be less than significant.

H.4. The development under the Specific Plan could result in substantial grading and redesign of the sites that are projected for growth, especially within the Civic Center and Transit Village sub-areas. As mentioned under item H.3 above, all new development would need to comply with NPDES and C.3 requirements. The NPDES permit would include BMP measures that would control and minimize surface runoff to prevent flooding and other potential impact related to surface water runoff.

Furthermore, all new development within the Specific Plan Area would follow the policies set forth in the Specific Plan. Specifically, Policy SP7-P-2.3 encourages developers to use low-impact development (LID) measures. LID measures address stormwater treatment through small, cost-effective landscape features located at the site. These landscape features, known as Integrated Management Practices, would help absorb surface

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[26] City of Pittsburg, Stormwater C.3 Updated, http://www.ci.pittsburg.ca.us/NR/rdonlyres/1DB3849B-4DD6-4291-8843-50813BBE4A28/0/C3UpdatesMay2006d2.pdf, accessed March 4, 2008.

[27] The City of Pittsburg is a member of the Contra Costa Clean Water Program, and is subject to the oversight and regulations of the San Francisco RWQCB. The San Francisco RWQCB is currently drafting a new municipal regional permit, which could include specific thresholds and increased requirements for inclusion of flow control in new development projects. These new thresholds and requirements would apply to all new development projects within the City of Pittsburg.

runoff on site, reducing the potential increase of surface runoff off-site and the potential for flooding. As such, impacts on potential flooding due to increased surface runoff are less than significant.

H.5. The potential new development under the Specific Plan is not expected to substantially increase the impervious surface area of the Specific Plan Area, such that significant upgrades to the drainage infrastructure are needed. Overall runoff from the Specific Plan Area is not projected to increase substantially because of the C.3 provisions that require projects to control runoff flow so that post-project runoff would not exceed estimated pre-project rates or durations. Additionally, the Specific Plan area is largely developed, so that new development could increase the amount of impervious surface area but relative to the entire plan area, this increment would be small. New drainage infrastructure would be required in certain areas to avoid concentrating runoff or increasing runoff volumes and to properly convey the runoff to existing drainage facilities. By adhering to Provision C.3 of the City's joint NPDES permit, and with the inclusion of Specific Plan policy SP7-P-2.3, the proposed project would not exceed the capacity of existing or planned storm water drainage systems. As a result, impacts to the area drainage systems and impacts from polluted runoff would be less than significant.

H.6. It is possible that during the construction phases of future development under the Specific Plan, polluted runoff would flow into City drainage facilities and eventually reach San Francisco Bay. As mentioned above under item H.3, all new development projects throughout the City are subject to Provision C.3 of the City's joint NPDES municipal permit. Thus, conformance with the NPDES permit would ensure that water quality is not impaired and/or degraded as result of the Specific Plan. As such, impacts to water quality are considered to be less than significant.

H.7-9. A portion of the Specific Plan Area is adjacent to Kirker Creek. This area, in the southeast corner of the Specific Plan Area, falls within the 100-year floodplain. Future development of the site could place new structures in the floodplain. However, the Pittsburg General Plan Policy 10-P-22 requires pad elevations on newly constructed residential buildings to be one foot above the 100-year flood elevation, as required by the Department of Housing and Urban Development for participation in the National Flood Insurance Program. Any development within the floodplain would comply with this requirement. As such, the proposed project would have a less-than-significant impact on potential flooding of residents and/or structures. The dam failure inundation map for the area created by the ABAG shows that the project area is not in a dam failure inundation zone.[28] As a result, the Specific Plan would have no impact on flooding risks from the failure of a levee or dam.

H.10. Earthquakes could cause tsunami ("tidal waves") and seiches (oscillating waves in enclosed water bodies) in the Bay. Portions of the City adjacent to Suisun Bay are susceptible to potential tsunami or seiche inundation. However, the Specific Plan Area, which does not extend further north than the BNSF tracks, is not adjacent to Suisun Bay. In addition, projected wave height and tsunami run-up is expected to be small in the interior portions of the San Francisco Bay, such as at Pittsburg. As such, no impact would result from potential tsunami or seiches.[29]

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[28] ABAG, Dam Failure Inundation Hazard Map, www.abag.ca.gov/bayarea/eqmaps/damfailure/damfail.html, accessed March 5, 2008.

[29] City of Pittsburg, General Plan: Health and Safety Element, 2004.

The strong ground motions that occur during earthquakes are capable of inducing landslides where unstable soil conditions already exist. Within the City, the hill areas that are underlain by weak bedrock units on slopes greater than 15 percent have the greatest susceptibility to landsliding. The majority of the Specific Plan Area is in a developed area with commercial and residential uses with slopes less than 15 percent. The surrounding area has been paved or landscaped. Because the project area is either paved or vegetated, the potential for rain to encounter and saturate exposed soil and other loose material is low. Thus, the proposed project is not expected to result in or be exposed to significant impacts from mudflow and/or landslides. There would be no impact.

I. LAND USE

1. Setting

The Specific Plan Area is a mix of civic, residential, commercial (retail and office), and industrial uses. The City Hall, Contra Costa County Courts, County library, and Pittsburg Unified School District offices are between SR 4 and the East 14 Street/old Southern Pacific right of way. In the Civic Center sub-area, low-rise buildings and adjacent underutilized surface parking predominate. City Park also provides substantial public open space.

Established residential neighborhoods (in the Parkside Manor, Los Medanos, High School Village, East Leland Corridor, and Atlantic Avenue Corridor sub-areas) encircle the proposed eBART Station. These neighborhoods are predominantly low density. Some medium-density residential areas are present primarily in the southeastern part of the area, including duplexes, apartment buildings, and several senior housing facilities.

Railroad Avenue is the retail corridor serving the nearby industrial workforce, government offices, other professionals, and residents of the surrounding neighborhoods. The retail center includes office, strip commercial uses, freeway-oriented commercial, restaurants, small family-owned businesses, and larger franchises. The corridor is characterized by a low intensity style of development. However, policies in the General Plan do envision an increase in the development density/intensity along the Railroad Avenue Corridor. For example, General Plan Policy 2-P-57 would allow development at an intensity of up to 2.0 FAR along Railroad Avenue from SR 4 to East Leland Road, and General Plan Policy 2-P-58 would allow mixed-use development at an intensity of up to 1.0 FAR for nonresidential uses, and additional residential development at a maximum density of 25 units per acre, on designated community commercial sites along Railroad Avenue, south of Bliss Avenue. In addition, General Plan Policy 4-P-72 encourages the amendment of the PMC to allow the reuse and redevelopment of aging industrial/warehouse structures currently located within the proposed Railroad Avenue Station Area, between Garcia Avenue and SR 4 at commercial intensities of up to 2.5 FAR.

Industrial uses are concentrated in the southeast portion of the Specific Plan Area. The nature of industrial uses transitions from shipping, storage, and military-based uses around Railroad Avenue to more active industrial and light manufacturing uses between Harbor Street and Loveridge Road.

2. Environmental Checklist and Discussion

Would the project:	Significant or Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
1) Physically divide an established community?	❑	❑	❑	■
2) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	❑	❑	❑	■
3) Conflict with any applicable habitat conservation plan or natural community conservation plan?	❑	❑	❑	■

Discussion:

I.1. The Specific Plan would intensify development in the Specific Plan Area, primarily within the Civic Center and Transit Village sub-areas. The Specific Plan proposes a variety of uses in these areas, including residential, commercial, and mixed use and new development would occur on parcels that are currently underutilized. The Specific Plan contains urban design policies and guidelines that seek to create more community cohesion. For example, urban design policies and guidelines would ensure that uses and activities within the 11 planning districts are compatible and supportive of each district's intended character. Moreover, the Specific Plan would not propose or include any physical barriers to divide a community. For example, the Specific Plan seeks to maintain and, if possible, enhance the existing community cohesion in existing residential neighborhoods. In addition, existing and proposed businesses and residences within the Specific Plan Area would benefit from a more efficient use of underutilized industrial space that is now occupied by adjacent industrial businesses as well as improved roads, access points, sidewalks, etc. Finally, implementation of the proposed project would improve connectivity south of Bliss Street through the introduction of a grid street pattern, thus eliminating the existing super block located between Railroad Avenue and Harbor Street. In light of these policies, the Specific Plan would have no impact related to dividing an established community.

I.2. The Specific Plan proposes a mix of existing land use designations and new land use designations. In the majority of the Specific Plan Area, land use designations would remain unchanged. Substantial changes would occur only in the Civic Center and Transit Village sub-areas. Specific plans are intended to implement a city's general plan through the development of more detailed policies, programs, and regulations for the subject plan area. In the case of the area around the Railroad Avenue Station, the proposed Specific Plan would implement several land use goals and policies specific to the Railroad Avenue Corridor. In particular, the proposed project would further General Plan Policy 2-G-20 which seeks to support the extension of BART to Railroad Avenue by developing a mixed-use, pedestrian-oriented village surrounding the proposed station area. Furthermore, implementation of the Specific Plan would increase the development density/intensity along Railroad Avenue between SR 4 and East Leland Avenue (consistent with General Plan Policy 2-P-57) and

promote mixed uses along Railroad Avenue in the vicinity of Bliss Avenue (consistent with General Plan Policy 2-P-58). Implementation of a specific plan for the Railroad Avenue Station area, featuring mixed-use Business Commercial activities with extensive pedestrian amenities, would also further General Plan Policy 2-P-56.

State law requires that specific plans can only be adopted or amended if they are consistent with the area's adopted general plan. The Railroad Avenue Station Area Specific Plan is consistent with and implements the city-wide General Plan (see discussion above). Future developments within the Specific Plan Area would be subject to all policies of the General Plan and Specific Plan, including those adopted to mitigate an environmental effect. Where the Specific Plan proposes to modify the City's General Plan, a general plan amendment has been identified (e.g., changing the land use designations in the Transit Village and Civic Center sub-areas to Mixed Use). Approval of the Specific Plan and the companion general plan amendment would ensure continued internal consistency between the two plan documents. Therefore, the Specific Plan would have no impact related to a conflict with the applicable land use plan.

In the interim, as industrial uses concentrated in the southeast portion of the Specific Plan Area transition to mixed-use residential and commercial uses in accordance with the Specific Plan, potential land use conflicts could occur between the older industrial uses and the newer residential and commercial uses. However, potential conflicts would be short-term in nature and would decrease over time as land uses transition toward a mix of residential and commercial uses. In addition, no new industrial uses would be permitted. As a result, the Specific Plan would have no impact related to a conflict between existing and future land uses.

I.3. As described in Biology, under item D.6, the Specific Plan Area is subject to the East Contra Costa County HCP. Projects developed subsequent to the Specific Plan would be required by the City to participate and comply with the policies, conservation measures, standards, and fees of the HCP. As such, the project would have no impact related to consistency with the HCP.

J. MINERAL RESOURCES

1. Setting

Mining activities in California are regulated by the Surface Mining and Reclamation Act (SMARA) of 1975. This Act provides for the reclamation of mined lands and directs the State Geologist to classify (identify and map) the non-fuel mineral resources of the state to show where economically significant mineral deposits occur and where they are likely to occur based upon the best available scientific data. Based on guidelines adopted by the California Geological Survey (CGS), areas known as Mineral Resource Zones (MRZs) are classified according to the presence or absence of significant deposits, as defined below. These classifications indicate the potential for a specific area to contain significant mineral resources.

- **MRZ-1:** Areas where available geologic information indicates there is little or no likelihood for presence of significant mineral resources.
- **MRZ-2:** Areas where adequate information indicates that significant mineral resources are present or where it is judged that it is a high likelihood for their presence exists. The zone shall be applied to known mineral deposits or where well developed lines of reasoning, based upon economic

geologic principles and adequate data, demonstrate that the likelihood for occurrence of significant mineral deposits is high.

- **MRZ-3:** Areas containing known mineral occurrences of undetermined mineral resource significance.
- **MRZ-4:** Areas of no known mineral occurrences where geologic information does not rule out the presence or absence of significant mineral resources.

The nearest MRZ-2 area is approximately 6.5 miles southeast of the Specific Plan Area.[30]

2. Environmental Checklist and Discussion

Would the project:	Significant or Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
1) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	❑	❑	❑	■
2) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	❑	❑	❑	■

Discussion:

J.1-2. The Specific Plan Area does not include and is not near any known mineral resource sites. The General Plan does not identify any mineral resources in the City. The proposed project would therefore have no impact on significant mineral resources.

K. NOISE

The primary source of noise in the City is vehicular traffic along SR 4, which bisects the Specific Plan Area. Sensitive receptors (i.e., populations that are particularly susceptible to noise, such as residential uses and schools) are found in the Specific Plan Area. As defined by the General Plan EIR, exposing residents to roadway noise in excess of 60 decibels (dB) is considered a potentially significant impact.[31] Commercial uses along Railroad Avenue, East Leland Road, and West Tenth Street are generally more tolerant than sensitive uses to higher ambient noise levels. According to noise contours included in the General Plan, traffic on SR 4

[30] Stinson, M.C., M.W. Manson, and J.J. Plappert, Mineral Land Classification: Aggregate Materials in the San Francisco Monterey Bay Area, Part II: Classification of Aggregate Resource Areas, South San Francisco Bay Production Consumption Region, California Division of Mines and Geology, Special Report 146, Part II, 1983, Plate 2.2, Mineral Resource Zones and Resource Sectors, Contra Costa County, scale 1:125,000.

[31] Per the General Plan, maximum noise levels up to 60 dB are considered "normally acceptable" for unshielded residential development. Noise levels from 60 to 70 dB are "conditionally acceptable," and those in the 70 to 75 range are "normally unacceptable".

generates noise levels in excess of 60 dB approximately 2,000 feet north and south of the highway. This estimate, however, does not account for reductions in noise from intervening structures, including soundwalls or other buildings. Within the Specific Plan Area, SR 4 has intermittent soundwalls, which can reduce noise levels by 5 to 15 dB. Railroad Avenue and Leland Road are also identified as roadways producing noise levels in excess of 60 dB beyond the road right-of-way.

2. Environmental Checklist and Discussion

Would the project:	Significant or Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
1) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	■	❑	❑	❑
2) Exposure of persons to, or generation of, excessive groundborne vibration or groundborne noise levels?	■	❑	❑	❑
3) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	■	❑	❑	❑
4) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	■	❑	❑	❑
5) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	❑	❑	❑	■
6) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	❑	❑	❑	■

Discussion:

K.1-4. The proposed Specific Plan would increase development in the Specific Plan Area. Potential sources of noise could include construction activities, revised traffic patterns, or the introduction of more intensive uses near residential uses, schools, and other sensitive receptors. Additionally, the Specific Plan proposes residential uses near a heavily-travelled freeway, which could expose future residents to noise impacts from vehicular traffic. An EIR for the Specific Plan should analyze the project's potential noise impacts.

K.5-6. The Specific Plan is not within an airport land use plan nor is it located in the vicinity of a private airstrip. The nearest airport to the Specific Plan Area is Buchannan Field, approximately 11 miles west. Therefore, the proposed project would have no impact related to noise from aviation traffic.

L. POPULATION AND HOUSING

1. Setting

According to ABAG, the City of Pittsburg had a 2005 population of approximately 62,400 residents, in 19,440 households[32,] Residential areas within the Specific Plan Area consist of predominantly low-density, single-family units. In addition, there are some medium-density residential areas primarily in the southeastern part of the Specific Plan Area (the Atlantic Avenue Corridor) with duplexes, apartment buildings, and several senior housing facilities. ABAG's current projections anticipate the City of Pittsburg's population will increase to 78,100 residents by the year 2030, an increase of approximately 15,700 residents. Households would likewise increase from 19,440 units in 2005 to 25,470 units in 2030.

2. Environmental Checklist and Discussion

Would the project:	Significant or Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
1) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	❑	❑	■	❑
2) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	❑	❑	❑	■
3) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	❑	❑	❑	■

Discussion:

L.1. Implementation of the Specific Plan is expected to create the potential for approximately 1,845 new residential units. Based on the ABAG's persons per household (pph) ratio for the City of Pittsburg for 2005 of 3.21,[33] the proposed project is anticipated to increase City population by an additional 5,922 residents. This estimate of future population is conservative (a greater number than is likely to occur) since the housing types that are encouraged by the Specific Plan land use classifications tend to be smaller units accommodating smaller household sizes.

As a result of the proposed project, overall population within the City would increase to 68,300 residents, an increase of approximately nine percent. As stated above, growth projections for the City currently estimate a 2030 population of 78,100 people. The new residents, as a result of the proposed project, are a component of the growth expected in the City over the next 25 years. Consistent with transit-oriented developments and the

[32] Association of Bay Area Governments, *Projections 2007*, December 2006.

[33] Calculated using ABAG's household population and number of households for the City of Pittsburg.

City's General Plan policies, the Specific Plan would concentrate growth around station areas to encourage transit ridership. Furthermore, greater population levels are desired in mixed use environments to create a "critical mass" for vibrant centers that can support daytime and nighttime activities. Accordingly, the proposed project would induce substantial population into designated areas for sound land use and transportation planning reasons. The environmental effects of this growth, which would be higher than would occur in the absence of the Specific Plan, are addressed in other topic discussions in this Initial Study. Nevertheless, in terms of strictly population and housing, this growth inducement is appropriate and consistent with the City's transit-oriented development policies. As such, the proposed project would have a less-than-significant impact on population growth.

L.2. Although there are existing residential uses within the Specific Plan Area, the proposed project would not displace any of these uses and would therefore not necessitate the need to create additional housing elsewhere. In fact, the proposed project would increase the potential housing stock within the Specific Plan Area.

L.3. No existing housing or people would be displaced by the proposed project, and no replacement housing would need to be constructed elsewhere.

M. PUBLIC SERVICES

1. Setting

Public services in the Specific Plan Area are provided by both the City of Pittsburg and Contra Costa County. Police services within the City are provided by the Pittsburg Police Department (PPD). The PPD is divided into beats for deployment purposes and maintains patrol officers within each beat 24 hours a day, 7 days a week. The Contra Costa Fire Protection District's (CCCFPD) Battalion 8 provides fire protection and suppression services for the cities of Pittsburg and Antioch, and surrounding unincorporated areas such as Bay Point. There are a total of eight stations within Battalion 8 with four stations specifically serving the Pittsburg and Bay Point areas. The Pittsburg Unified School District (PUSD) is in charge of schools within the City and operates seven elementary schools, two middle schools, and two high schools. PUSD schools within the Specific Plan Area are Parkside Elementary, Los Medanos Elementary, and Pittsburg High School.

2. Environmental Checklist and Discussion

Would the project:	Significant or Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
1) Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				

Fire Protection?	■	❑	❑	❑
Police Protection?	■	❑	❑	❑
Schools?	■	❑	❑	❑
Parks?	■	❑	❑	❑
Other Public Facilities?	■	❑	❑	❑

Discussion:

M.1. Implementation of the Specific Plan would support future projects that would increase residents, employees, and visitors to the Specific Plan Area over current conditions. This change may necessitate the acquisition of new or additional equipment and hiring of additional personnel in order to adequately maintain acceptable standards of fire and police protection. In addition, the increase in population may result in the need for more school facilities to accommodate new students or public facilities. The greater demand associated with the proposed project may result in the need for new or expanded facilities, the construction of which, in turn, could result in a potentially significant impact. Therefore, an EIR-level analysis should be performed to determine whether the proposed project would result in public services impacts.

Impacts with regards to parks are discussed below, under Checklist Item N of this document.

N. RECREATION

1. Setting

The Pittsburg Recreation Department (PRD) provides recreation services within the City while the City's Public Works Department manages the maintenance of City park facilities. Pittsburg has approximately 312 acres of parkland, ranging in size from quarter-acre mini parks to the 190-acre Stoneman Park. Neighborhood parks within the City are located near collector streets in residential neighborhoods, while community parks lie along arterial roadways to serve the larger City population. Parks included within the Specific Plan Area are City Park and Small World Park. City Park is a 28-acre park located at Civic Avenue and Railroad Avenue and includes a picnic/passive areas, play areas, and sports facilities. Small World Park is an 8-acre park located at Harbor Street and Delta DeAnza Trail and features small replicas of a fort, mission, railroad ride, lagoon, riverboat, and full-scale carousel.

2. Environmental Checklist and Discussion

Would the project:	Significant or Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
1) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	■	❑	❑	❑

Would the project:	Significant or Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
2) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	■	❑	❑	❑

Discussion:

N.1-2. Because the proposed project would result in greater employment and population in the Specific Plan Area, it is expected that demand for parks and recreational facilities could increase. Depending on the existing use and condition of local parks and related recreational facilities, the proposed project could necessitate the expansion or construction of park-related resources which could result in a potentially significant impact. Therefore, an EIR should be prepared to discuss potential project impacts to parks and recreational facilities in the project area and its vicinity.

O. TRAFFIC

1. Setting

State Route 4 provides the primary regional access to the Specific Plan Area. Significant local routes include Railroad Avenue and Harbor Street, running north-south, and East Leland Road and Tenth Street, providing east-west access. As noted below, an EIR should be prepared to fully document potential transportation impacts of the Specific Plan. The EIR will also provide a detailed description of existing conditions for transportation and circulation.

2. Environmental Checklist and Discussion

Would the project:	Significant or Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
1) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio of roads, or congestion at intersections)?	■	❑	❑	❑
2) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?	■	❑	❑	❑

Would the project:	Significant or Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
3) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	❑	❑	❑	■
4) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible land uses (e.g., farm equipment)?	❑	❑	❑	■
5) Result in inadequate emergency access?	■	❑	❑	❑
6) Result in inadequate parking capacity?	■	❑	❑	❑
7) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	■	❑	❑	❑

Discussion:

O.1-2, 5-7. The Specific Plan would increase the intensity of uses in the area, which would generate additional parking demand, additional vehicle trips and alter existing traffic patterns. Potential impacts of the Specific Plan to the transportation network should be addressed in an EIR.

O.3. The Specific Plan contains land use designations, policies, and guidelines to shape land use development in the area. The proposed project is not near an airport and future development as a result of the Specific Plan would not affect air traffic patterns. As such, the project would have no impact related to safety risks associated with air traffic patterns.

O.4. The Specific Plan would create a mix of uses around the existing roadway network. Although the plan encourages pedestrian activity, there are no components that would crease substantial hazards related to a design feature or incompatible land uses. During the routine planning and design review process of the City, features that could pose safety hazards, such as poor visibility, circulation design that results in vehicular conflicts, parking layouts that impede pedestrian and vehicular circulation, would typically be identified and corrected. During this process, projects would also be reviewed to ensure compliance with City standards regarding the design and layout of transportation and circulation systems. Accordingly, it is not expected that the proposed project would substantially increase hazards due to a design feature.

P. UTILITIES AND SERVICE SYSTEMS

1. Setting

Pittsburg receives raw water from CCWD, through the Central Valley Project, which it processes at its own water treatment plant. The City also supplements its CCWD water supply with two wells. The existing water

pressure levels in the Specific Plan Area are insufficient to ensure adequate water pressure in new development.

Wastewater is collected and treated by the City and Delta Diablo Sanitation District. The sewer main that crosses west to east through the Specific Plan Area is adequately sized to meet currently planned development.

Solid waste pickup and disposal for Pittsburg is provided by Pittsburg Disposal Services. Residential and commercial solid waste is disposed at Portrero Hills Landfill located east of Suisun City. Portrero Hills Landfill, a Class III facility, has a projected life of 17 to 20 years. Non-recyclable industrial waste is transported to Keller Canyon Landfill, southeast of the City limits. Keller Landfill, a Class II facility, has a projected lifespan of 40 years.

2. Environmental Checklist and Discussion

Would the project:	Significant or Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
1) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	■	❑	❑	❑
2) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	■	❑	❑	❑
3) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	■	❑	❑	❑
4) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	■	❑	❑	❑
5) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	■	❑	❑	❑
6) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	■	❑	❑	❑
7) Comply with federal, state, and local statutes and regulations related to solid waste?	■	❑	❑	❑

Discussion:

P.1-7. The Specific Plan would increase residents, employees, and visitors to the Specific Plan Area. As such, additional demand would be placed on the utilities currently serving the area. The project's potential impacts on utilities should be analyzed in an EIR.

Q. MANDATORY FINDINGS OF SIGNIFICANCE

Would the project:	Significant or Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
1) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	■	❑	❑	❑
2) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	■	❑	❑	❑
3) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	■	❑	❑	❑

Discussion:

Q.1-3. As discussed in preceding sections of this document, the proposed project could degrade the quality of the environment by generating air pollutants and by increasing noise levels during construction and operation of the project. Air quality and noise impacts from construction would potentially cause substantial adverse effects on human beings, particularly those at sensitive locations such as nearby residences and schools. In addition, the project could result in cumulatively considerable impacts related to traffic, air quality, noise, or infrastructure. To discuss the severity of these impacts and the necessary mitigation measures, these topics should be addressed in an EIR.

V. LIST OF AUTHORS AND PARTICIPANTS

Lead Agency

Leigha Schmidt, Project Manager, Planning Department, City of Pittsburg

Consultants

Rod Jeung, Project Director, PBS&J

Lucy Armentrout, Project Manager, PBS&J

Melissa Duncan, Project Manager, PBS&J

Carolina Morgan, Associate Manager, PBS&J

Sarah Troub, Planner, PBS&J

Jackie Ha, Production Coordinator, PBS&J

Appendix B

Notice of Preparation and Public Comment Letters

NOTICE OF PREPARATION

To: _____

_____
(Address)

_____

From: City of Pittsburg Planning Department

65 Civic Avenue

Pittsburg, CA 94565

Subject: **Notice of Preparation of a Draft Environmental Impact Report (EIR)**

City of Pittsburg will be the Lead Agency and will prepare an environmental impact report for the project identified below. We need to know the views of your agency as to the scope and content of the environmental information which is germane to your agency's salutory responsibilities in connection with the proposed project. Your agency will need to use the EIR prepared by our agency when considering your permit or other approval for the project.

The project description, location, and the potential environmental effects are contained in the attached materials. A copy of the Initial Study (☒ is ☐ is not) attached.

Due to the time limits mandated by State law, your response must be sent at the earliest possible date but not later than 30 days after receipt of this notice.

Please send your response Leigha Schmidt to at the address shown above. We will need the name for a contact person in your **agency**.

Project Title: **Railroad Avenue Specific Plan EIR**

Project Applicant, if any: **N/A**

Date _____

Signature _____

Title Assistant Planner

Telephone (925) 252-4015

Reference: California Code of Regulations, Title 14, (CEQA Guidelines) Sections 15082(a), 15103, 15375.

PROJECT DESCRIPTION: The City of Pittsburg Planning Department is preparing a Specific Plan which, if adopted, would amend provisions of the City's General Plan. This Railroad Avenue Specific Plan would provide for the creation of new land use classifications, development policies and guidelines, urban design guidelines, planned community resources, transportation and circulation improvements, utility and infrastructure improvements, implementation strategies, and phasing recommendations. If adopted, the Specific Plan would guide all new development in key sub-areas located within the Specific Plan Area. Existing developments would not be directly affected unless the occupants or owners choose to expand or change their structures, grounds, or uses in accordance with Pittsburg Municipal Code (PMC) Chapter 18.76, Nonconforming Uses and Structures.

Currently, Pittsburg and other communities in East County are feeling the impacts of growth in the form of traffic and congestion along major roadways and local streets. The City of Pittsburg seeks to address these impacts by securing a new BART Extension (eBART) to a proposed Railroad Avenue Station, which would be located in the median of State Route 4 (SR 4). In order to participate in BART's 1999 System Expansion Policy, and secure this station, Pittsburg is required to prepare Ridership Development Plans (RDPs) to ensure that development and access improvements along the proposed corridor would attract enough riders to make the new extension financially viable. The RDPs must demonstrate that each local jurisdiction has satisfied BART and Metropolitan Transportation Commission (MTC) policies regarding extension of transit, which requires certain thresholds of development and ridership potential be achieved within ½ mile of each proposed station. The City of Pittsburg's Railroad Avenue Specific Plan has been prepared to serve as Pittsburg's RDP, and support their application for eBART service to the City.

The Specific Plan boundaries roughly encompass the area within ½-mile of the proposed Railroad Avenue Station, on Railroad Avenue and SR 4. The Specific Plan boundary is not precisely a ½-mile radius from the eBART station, but has been adjusted outward from the ½-mile radius to reflect logistically meaningful borders defined by railroads, subdivision boundaries, and Contra Costa County's Transportation Analysis Zones (TAZs). In total, the Specific Plan Area encompasses approximately 1,075 acres. The Specific Plan proposes allowing construction of approximately 1,845 new residential units and up to 1,004,221 square feet of commercial floor area in key sub-areas within the Specific Plan Area that are located in close proximity to the future eBART Station.

The Specific Plan Area has been divided into 11 subareas, for study purposes. The land use mix within the majority of these districts would not change with implementation of the Specific Plan, but would maximize development potential of land within ¼ mile of the proposed Railroad Avenue Station, and preserve the character of established residential neighborhoods located within the Specific Plan Area. High-intensity mixed-use development would be allowed in former light industrial areas southeast of the proposed station in the proposed Transit Village subarea, and a mix of office, general commercial, public, and residential uses would be allowed in the Civic Center subarea surrounding City Hall. The specific land use changes in the Civic Center, Transit Village, and High School Village subareas would result in an increase of density and intensity of development from the existing General Plan land use designations and are described in more detail, and quantified, in the attached Initial Study document.

Through the Initial Study process, the Planning Department has determined that an Environmental Impact Report (EIR) must be prepared for the proposed project, prior to any final decision regarding whether or not to approve the project. As determined through the Initial Study process, the EIR will be focused on areas of identified d potential significant impact:

- Transportation
- Noise
- Air Quality
- Cultural Resources
- Community Services
- Utilities

The purpose of the EIR is to provide information about potential significant physical environmental impacts of the proposed project, to identify possible ways to minimize the significant impacts, and to describe and analyze possible alternatives to the proposed project if potential significant impacts are identified. Preparation of an NOP or EIR does not indicate a decision by the City to approve or disapprove the project. However, prior to making any such decision, the decision makers must review and consider the information contained in the EIR.

Please note that, while the project considered is related to the proposed development of a new eBART Station in the City of Pittsburg, potential environmental impacts of the eBART project will not be considered under the current Specific Plan EIR because the eBART project is subject to separate environmental review. BART is in the process of issuing a separate EIR with specific analysis of potential impacts caused by the new eBART line and station. The Draft EIR was provided for public comment on September 19, 2008. A copy of this document may be obtained by contacting BART.

Written comments on the scope of the Railroad Avenue Specific Plan Initial Study and EIR are welcome. Please submit comments by 5:00 p.m. on November 7, 2008. Written comments should be sent to Leigha Schmidt at 65 Civic Avenue, Pittsburg, CA 94565 or via email at lschmidt@ci.pittsburg.ca.us or via fax at 925-252-4814.

A public meeting will also be held at 5:30 p.m. on October 14, 2008, to discuss the Initial Study and EIR scope. The meeting will be held in the City Council Chambers at City Hall, 65 Civic Avenue, Pittsburg. At this meeting, City staff and PBS&J (an environmental consulting services firm) will give a presentation of the EIR process, and will take public comment on the Initial Study and EIR.

If you have any questions concerning the environmental review of the proposed project, please contact Leigha Schmidt at (925) 252-4015. However, please note that verbal comments on the Initial Study/Draft EIR cannot be accepted over the phone.

Attachment: Initial Study

Comment Letters

Railroad Avenue Specific Plan Scoping Meeting
October 14, 2008

- Review population projections in Specific Plan versus projected population projections in the eBART EIR.
- Review impacts from increased residential development on school district and public services.
- One alternative should examine elimination of residential and commercial uses on the Civic Center block.
- Examine impacts of growth on City Hall, Police Department and other public uses that could be placed on the block.
- Natural Resources:
    - Examine impacts of project on Kirker Creek and Delta de Anza trail, especially by Central Junior High School
    - Can the creek be restored in the project area?
    - Examine impacts on monarch butterflies, white tailed kite and other biological resources
- Examine climate change as a result of increased traffic and greenhouse gas emissions
- Consider requiring shade giving trees to increase the tree canopy in the project area
- Examine connections to other modes of transportation such as ferry and Amtrak.

November 14, 2008

Leigha Schmidt
Assistant Planner
City of Pittsburg
65 Civic Avenue
Pittsburg, CA 94565

Dear Ms. Schmidt,

Thank you for this opportunity to comment on the scope of the Environmental Impact Report for the Pittsburg Railroad Avenue Specific Plan. We applaud the city's efforts to plan for a walkable community with jobs, homes, and shops near the future Railroad Avenue eBART station.

We generally support Pittsburg's efforts to create a vibrant station area, but we do have a few concerns that we believe should be addressed through the environmental review process. Our comments are intended to support development around this new eBART station where residents and workers of all income levels can easily access homes, jobs, shopping and local transportation.

Transportation impacts on Pedestrian and Bicyclists

Pedestrian and bicycle access are essential in creating a vibrant neighborhood where people can easily access jobs, shops, homes and services without the need for a car. More people walking and biking means a safer neighborhood, more viable retails, and healthier communities.

Please consider the following issues in the Transportation section of the EIR:

1. The EIR needs to pay particular attention to pedestrian and bicycle safety and comfort in accessing the eBART station by studying the sidewalks, crosswalks, and bicycle routes immediately adjacent to the eBART station entrance. The following intersections and sidewalk/bike route segments should be studied:
    - *The east and west sidewalks of the Railroad Avenue overcrossing of Highway 4.* Every eBART rider will have to use these sidewalks to access the station. The sidewalks are currently too narrow (5ft wide), poorly lit, and not designed to a pedestrian scale. These factors should lead to an EIR designation of Potentially Significant Impact on pedestrian safety. Mitigations should include expanding the sidewalks to 10 feet minimum, improved lighting, and pedestrian-scaled design (such as planters, artwork, signage, etc.) to increase the safety and comfort of people accessing the eBART station.
    - *The pedestrian and bicycle crossing of the four SR 4 on/off ramps with Railroad Avenue (on the NE, NW, SE, and SW corners of the Railroad Avenue overpass of Highway 4).* Freeway on/off ramps are particularly dangerous crossings for

pedestrians and crossings. These four intersections should be studied in the EIR with respect to how to ensure pedestrian and bicycle safety is prioritized through the following measures:

- Sidewalks and bicycle lanes should be emphasized through unique pavement coloring, use of brick, raised crossings, and/or other methods to draw drivers' attention to pedestrians;
- Signage and lighting should be used to increase pedestrian visibility to drivers; and
- Pedestrian and bicycle safety should be factors in determining the LOS of the intersections.

2. The EIR should study how the proposed widths and designs of the streets impact pedestrian and bicyclist safety and mobility within the plan area. In particular, the EIR should study how street LOS designations and any mitigations proposed in the EIR based on LOS designations will impact pedestrians and bicyclists.
3. In conducting the traffic modeling, use the URBEMIS model, with its ability to determine the affects of TDM strategies on traffic, to compare traffic generation predictions in the EIR.

Air Quality Impacts on Land Use

Air quality concerns are of particular importance in planning for development near freeways. It is vital that proper mitigations are put into place to protect the long term health of future residents. We applaud the city for including specific requirements on HVAC systems for housing built near freeways.

Equally important to the health of residents located near freeways is the health of residents throughout the city and the region. State legislation SB 375 has recently outlined the connection between greenhouse gas emissions and land use planning. When we build homes far from jobs and services, we create air quality impacts that affect us on a local, regional, and global level through worsened air quality and the negative impacts of global warming. However, if we plan walkable communities with responsibly-built homes near transit, shops, and services, we cut down on the amount of driving and therefore greenhouse gasses we create, thus preserving our regional air quality and preventing global climate change.

Please consider the following issues in the Air Quality section of the EIR:

1. *Study the air quality impacts of land use in all alternatives studied in the EIR.* Study levels of greenhouse gas emissions per capita that would be generated for each alternative. In particular, study the likely vehicle miles generated from each alternative and what the corresponding impact would be on greenhouse gas emissions.
2. *Ensure there are proper mitigations for construction impacts of development near preexisting residents.* Air quality during construction is a common major impact that local residents suffer, as we've seen in the construction of the Vidrio development in downtown Pittsburg. In order to prevent future negative air quality impacts due to construction, the EIR should study potential negative impacts and proper mitigations, including strong enforcement of existing regulations.

Again, we appreciate the city's efforts to increase transportation choices for Pittsburg residents through smart planning, and we look forward to seeing our questions addressed in the environmental review process.

Sincerely,

Chris Schildt, Program Associate
TransForm

Delta Diablo Sanitation District

OFFICE AND TREATMENT PLANT: 2500 PITTSBURG-ANTIOCH HIGHWAY, ANTIOCH, CA 94509-1373
TEL.: (925) 756-1900 ADMIN. FAX: (925) 756-1961 MAINT. FAX: (925) 756-1963 OPER. FAX: (925) 756-1962 TECH. SVCS. FAX: (925) 756-1960
www.ddsd.org

November 7, 2008

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PLANNING DIVISION
PLANNING AND BUILDING DEPT
CITY OF PITTSBURG

Ms. Leigha Schmidt, Project Planner
City of Pittsburg
Planning Department
65 Civic Avenue
Pittsburg, CA 94565

VIA FACSIMILE (925) 252-4814 & EMAIL: lschmidt@ci.pittsburg.ca.u

SUBJECT: NOTICE OF PREPARATION OF A DRAFT ENVIRONMENTAL IMPACT REPORT FOR THE RAILROAD AVENUE SPECIFIC PLAN

Dear Ms. Schmidt:

Thank you for sending the notice of preparation and initial study for the subject project.

WASTEWATER CONVEYANCE AND TREATMENT

The City of Pittsburg is responsible for the wastewater collection system from the planning area to the designated District regional conveyance improvements. Conveyance facilities that serve the planning area include the Pittsburg Pump Station located at Herb White Way, northwest of the plan area, and the Pittsburg Conveyance Improvements to the east. The regional conveyance facilities transport wastewater from City collection pipelines to the Delta Diablo Sanitation District Wastewater Treatment Plant located at 2500 Pittsburg-Antioch Highway, Antioch. After secondary treatment, the effluent is either discharged through a deep-water outfall to New York Slough, or further processed through the District's Recycled Water Facility to tertiary Title 22 recycled water standards and distributed for reuse.

The Delta Diablo Sanitation District Wastewater Treatment Plant NPDES Permit allows an average dry weather flow of 16.5 million gallons per day (mgd). An Environmental Impact Report (EIR) for the expansion of the Wastewater Treatment Plant capacity to an average dry weather flow of 22.7[1] mgd was completed in April 1988. During the most recent reporting period, 2007, the average dry weather flow influent to the treatment plant was 14.0 mgd. In 2000 and 2005, the average dry weather flow influent to the treatment plant was 13.5 mgd and 14.2 mgd, respectively.

[1] In Order No. R2-2003-0114 (Order), the San Francisco Bay Regional Water Quality Control Board cited the District's intent to increase permitted flows from 16.5 mgd to 22.7 mgd (Average Daily Dry Weather Flow). According to the text of the order, "To treat the additional wastewater, the Discharger indicates that it is considering expanding and/or upgrading the existing wastewater treatment plant in one or more phases by improving or adding preliminary, primary and/or secondary capacity as presented in the Discharger's Wastewater Treatment Plant Master Plan. The multimillion-dollar project should be completed by 2015. To support this request to increase permitted flow, the discharger completed an Environmental Impact Report in 1988."

Recycled Paper

The District has wastewater conveyance and treatment facilities planned and under construction to increase system capacity. The District collects Capital Facility Capacity Charges to build capacity as it is consumed by new connections. Capacity is provided through facilities constructed by the District as prescribed in its Conveyance and Treatment Plant Master Plans. These Master Plans use the planning data in the General Plans for the communities in the District service area. The District's current Conveyance and Treatment Plant Master Plans were published in 2004. The District is updating the Conveyance System Master Plan in 2008/09.

The City Wastewater Collection System Master Plan was prepared concurrent with the preparation of the District Conveyance Master Plan, 2004 and the City General Plan. The project EIR should address changes to flow projections which are contained in the City Collection System Master Plan so that the District may accurately assess impacts on existing and planned District facilities. The program EIR should identify the projected equivalent residential units for alternative development scenarios.

RECYCLED WATER

The District produces tertiary recycled water that meets or exceeds the California Department of Health Title 22 standards for unrestricted use. The recycled water is distributed through District owned and maintained facilities to the community of Pittsburg for industrial and landscape irrigation. The District is also engaged in discussions with Caltrans for providing recycled water to the State Route 4 corridor for landscape irrigation. The current and potential use of recycled water in the vicinity of the specific plan area should be discussed in the Environmental Impact Report.

Please contact me if you have any questions.

Sincerely,

Barbara J. Walday/por

Patricia Chapman
Associate Engineer

PEC:bjm

cc: Dean Eckerson, Principal Engineer, DDSD
Amanda Wong Roa, Environmental Compliance Engineer, DDSD
DEV.02-DEVDOC-624
Chron File

DEPARTMENT OF TRANSPORTATION
111 GRAND AVENUE
P. O. BOX 23660
OAKLAND, CA 94623-0660
PHONE (510) 622-5491
FAX (510) 286-5559
TTY 711

Flex your power!
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PLANNING DEPARTMENT
CITY OF PITTSBURG

October 30, 2008

CC004016
CC-4-23.05
SCH#2008102003

Ms. Leigha Schmidt
City of Pittsburg
65 Civic Avenue
Pittsburg, CA 94565

Dear Ms. Schmidt:

Railroad Avenue Specific Plan - Notice of Preparation

Thank you for including the California Department of Transportation (Department) in the environmental review process for the Railroad Avenue Specific Plan Notice of Preparation (NOP). The following comments are based on the NOP.

As lead agency, the City of Pittsburg is responsible for all project mitigation, including any needed improvements to State highways. The project's fair share contribution, financing, scheduling, and implementation responsibilities as well as lead agency monitoring should be fully discussed in the Traffic Impact Study (TIS), Draft Environmental Impact Review (DEIR), and Mitigation Monitoring and Reporting Plan (MMRP) for all proposed mitigation measures. The MMRP should be circulated along with the DEIR for review. The project's traffic mitigation fees should also be specifically identified in the future DEIR. The specific plan should detail financing measures needed to ensure improvements.

Any required roadway improvements should be completed prior to issuance of project occupancy permits. An encroachment permit is required when the project involves work in the State's right of way (ROW). The Department will not issue an encroachment permit until our concerns are adequately addressed. Therefore, we strongly recommend that the lead agency ensure resolution of the Department's CEQA concerns prior to submittal of the encroachment permit application; see the end of this letter for more information regarding the encroachment permit process.

TRAFFIC

Traffic Impact Study

The Department is primarily concerned with impacts to the State Highway System. Specifically, a detailed TIS should identify impacts to the State Highway System. The

Department strongly encourages close and constant coordination with other stakeholder agencies (such as BART, Contra Costa Transit Authority (CCTA), the Association of Bay Area Governments (ABAG), the Metropolitan Transportation Commission (MTC), Tri Delta Transit, Contra Costa County and the City of Antioch) when developing the TIS.

Forecasting assumptions should also be consistent between the BART extension (eBART) DEIR, the Railroad Ave Specific Plan and the ridership development plan (RDP) for the Railroad Avenue Station. The RDP and related environmental documents should be circulated to the Department for review. The TIS should include, but is not limited to the following:

1. Information on the project's traffic impacts in terms of trip generation, distribution, and assignment. The assumptions and methodologies used in compiling this information should be addressed.

2. Average Daily Traffic (ADT) and AM and PM peak hour volumes on all significantly affected streets and highways, including crossroads and controlling intersections.

3. Schematic illustration of the traffic conditions for: 1) existing, 2) existing plus project, and 3) cumulative for the intersections in the project area.

4. Calculation of cumulative traffic volumes should consider all traffic-generating developments, both existing and future, that would affect the State Highway facilities being evaluated.

5. Mitigation measures should consider highway and non-highway improvements and services. Special attention should be given to the development of alternate solutions to circulation problems that do not rely on increased highway construction.

6. All mitigation measures proposed should be fully discussed, including financing, scheduling, implementation responsibilities, and lead agency monitoring.

Additionally, in Section O of the NOP (Traffic), project related trip generation assumptions should be listed clearly in the TIS supporting documentation. These assumptions should also be consistent with the eBART environmental document and the proposed ridership development plan for the City of Antioch.

Please also note that the TIS should address all traffic generating developments, both existing and future, that would affect study area roadways and intersections for all project scenarios including existing, existing plus project, cumulative and cumulative plus project. The TIS should address levels of service (LOS) and the Department LOS thresholds should be applied to all State facilities. Also please clarify if the transportation/circulation element of the general plan will be updated to ensure consistency with the specific plan and the general plan.

We encourage the City of Pittsburg to coordinate preparation of the study with our office, and we would appreciate the opportunity to review the scope of work. Please see the Caltrans' *"Guide for the Preparation of Traffic Impact Studies"* at the following website for more information:
http://www.dot.ca.gov/hq/traffops/developserv/operationalsystems/reports/tisguide.pdf

We look forward to reviewing the TIS, including Technical Appendices, and environmental documents for this project. Please send two copies to the address at the top of this letterhead, marked ATTN: Lisa Courington, Mail Stop #10D.

Planned and Future Improvements
Please note that the lead agency for the specific plan is responsible for all project related mitigation, including improvements and assessing impacts to State Highways including mitigation for commercial, civic and residential developments that may increase vehicle miles traveled (VMTs) on Department ROW. VMTs should be mitigated to ensure reduced vehicle trips on State Routes (SR) 4 and 160. This information should be fully disclosed in the MMRPs and circulated with appropriate environmental documents.

Any improvements on the State Highway System should be consistent with plans and policies affecting respective jurisdictions such as the Department, CCTA, ABAG, MTC, Tri Delta Transit, Contra Costa County, and the City of Antioch.

The specific plan should be sufficiently detailed to ensure intermodal connectivity. Bike paths, pedestrian crossings, easy access to alternative transportation and neighborhood interconnectivity should be provided where demand is demonstrated. The plan should also include preferential parking for City CarShare riders and carpoolers at stations and express buses should be synchronized with local and feeder bus services and shuttle services.

Additionally, the specific plan should include potential programs and subsidies for commuters to use alternative transportation as viable incentives in reducing VMTs and enhancing transit orientated communities. With regard to the Community Commercial development (page 9) and ground floor retail fronts for the transit orientated developments TODs (page 11), the specific plan should create incentives and programs to encourage local business growth among potential community members. Potential economic benefits realized by the City of Pittsburg could benefit future City enhancements. This would also assist in reducing potential VMTs from the proposed developments.

Anticipated numbers for ridership should be projected and include potential users of eBART, local and regional transit to off-set any induced traffic impacts on SR 4 due to new developments. Information regarding incentives to use eBART and transit should be addressed to reduce potential VMTs. This information should be fully disclosed in MMRPs and circulated with appropriate environmental documents.

Parking Spaces for Transit Village and Civic Center
Because of the proximity of the potential TODs to SR 4, the number of parking spaces should

be limited to reduce the potential number of VMTs on SR 4.

Traffic Impact Fees
Any additional associated future infrastructure improvements due to vehicle traffic in the specific plan should be funded by traffic impact fees based on projected vehicle traffic, and/or based on associated cost estimates for public transportation facilities necessitated by development (the Governor's Office of Planning and Research General Plan (OPR-GP) Guidelines p. 163).

Scheduling and costs associated with planned improvements in the specific plan affecting Departmental ROW should be listed, in addition to identifying viable funding sources correlated to the pace of improvements for additional roadway improvements, if any (OPR-GP Guidelines, p. 106).

Community Planning
The Department commends you for including TOD in your plan, and also encourages you to locate any needed housing, jobs and neighborhood services near the Railroad Avenue BART station with streets configured to facilitate walking and biking, as a means of promoting mass transit use and reducing VMT and traffic impacts on the state highways.

Please consider developing and applying pedestrian, bicycling and transit performance or quality of service measures and modeling pedestrian, bicycle and transit trips that your project will generate so that impacts can be quantified. Mitigation measures resulting from this analysis could improve pedestrian and bicycle access to transit facilities, thereby reducing traffic impacts on state highways. In addition to urban design treatments, these measures could include Travel Demand Management (TDM) policies (for example, lower parking ratios, car-sharing programs, transit subsidies, etc.) to encourage usage of nearby public transit lines.

In addition, please analyze secondary impacts on pedestrians and bicyclists that may result from any traffic impact mitigation measures. Please describe any pedestrian and bicycle mitigation measures and safety countermeasures that would therefore be needed as a means of maintaining and improving access to transit facilities and reducing traffic impacts on state highways.

Cultural Resources
If construction activities are proposed within the State's ROW, the Department requires documented results of a current archaeological record search from the Northwest Information Center (NIC) of the California Historical Resources Information System before an encroachment permit can be issued. Current record searches must be no more than five years old.

The Department requires the records search, and if warranted, a cultural resource study by

action on the project), CEQA, Section 5024.5 of the California Public Resources Code (for state-owned historic resources) and Volume 2 of the Department's Environmental Handbook (Caltrans Standard Environmental Reference (SER), available at http://www.dot.ca.gov/hq/env/index.htm). Work subject to these requirements includes, but is not limited to: lane widening, channelization, auxiliary lanes, and/or modification of existing features such as slopes, drainage features, curbs, sidewalks and driveways within or adjacent to State ROW.

Encroachment Permit

Any work or traffic control within the State ROW requires an encroachment permit that is issued by the Department. Traffic-related mitigation measures will be incorporated into the construction plans during the encroachment permit process. See the following website link for more information: http://www.dot.ca.gov/hq/traffops/developserv/permits/

To apply for an encroachment permit, submit a completed encroachment permit application, environmental documentation, and five (5) sets of plans which clearly indicate State ROW to the address at the top of this letterhead, marked ATTN: Michael Condie, Mail Stop #5E.

Should you have any questions regarding this letter, please contact Lisa Courington of my staff at (510) 286-5505 or via email at lisa.ann.courington@dot.ca.gov.

Sincerely,

Lisa Carboni

LISA CARBONI
District Branch Chief
Local Development - Intergovernmental Review

c: State Clearinghouse

Contra Costa County Fire Protection District

Fire Chief
KEITH RICHTER

October 21, 2008

Ms. Leigha Schmidt
City of Pittsburg – Planning Department
65 Civic Avenue
Pittsburg, CA 94565

Subject: Railroad Avenue Specific Plan - EIR
Railroad Avenue and SR4
CCCFPD Project No.: 111914-EIR

Dear Ms. Schmidt:

We have reviewed the Notice of Preparation of an Environment Impact Report (EIR) to construct approximately 1,845 new residential units and up to 1,004,221 square feet of commercial floor area in key sub-areas within the Specific Plan Area, located in close proximity to the future e Bart Station. The Fire District at the current time cannot protect the proposed development without built-in fire protection. In order to maintain required service levels, the following is required for Fire District approval:

1. Three copies of a site plan are required to be submitted for the placement of fire hydrants, the determination of required fire flow and the review of access in order to assure compliance with minimum Fire District requirements. (501.3) CFC

2. Traffic signals, which are installed or modified as part of this development, shall have pre-emption devices (Opticom) installed. (21351) CVC

3. The developer shall submit three complete sets of construction drawings, including built-in fire protection systems for review and approval prior to construction. Plan review fees will be assessed at that time. (901.2) CFC, (108.4 1) CBC

4. Approved premise identification shall be provided. Such numbers shall be contrast with their background and be visible from the street. (505.1) CFC, (501.2) CBC

5. Approved roadways and fire hydrants shall be installed and in service prior to building construction. (501.4) CFC

2010 Geary Road • Pleasant Hill, California 94523-4619 • Telephone (925) 941-3300 • Fax (925) 941-3309
East County • Telephone (925) 757-1303 • Fax (925) 941-3329 West County • Telephone (510) 374-7070
www.cccfpd.org

Our preliminary review comments shall not be construed to encompass the complete project. Additional plans and specifications may be required after further review.

Please provide this office with a copy of the conditions of approval as set forth by your Planning Division for our files.

If you have any questions regarding this matter, please contact this office at 925.941.3300.

Sincerely,

Ted Leach
Fire Prevention Technician

TL/mm

File: 111914EIR.ltr

Pittsburg Unified School District
Building Tomorrow's Scholars and Leaders Today
2000 RAILROAD AVENUE · PITTSBURG · CALIFORNIA 94565
Barbara B. Wilson, Ph.D., Superintendent
PHONE: (925) 473-4231 FAX: (925) 473-4274
Est. 1933

RECEIVED
NOV 13 2008
PLANNING DIVISION
PLANNING AND BUILDING DE
CITY OF PITTSBURG

To: The City of Pittsburg

Subject: Response to the EIR issue for the Railroad Specific Plan

Date: November 11, 2008

The Pittsburg Unified School District has reviewed with great interest the adopted Railroad Specific Plan and had a representative in attendance for your informational meeting. Your plan presents an exciting picture for Pittsburg as a transportation hub. However, the District is greatly concerned that the plan fails to take remedial steps, nor has City staff consulted with the District, on the impact of the adopted plan and the number of new students that PUSD would be required to house and educate.

As you are aware many of our elementary facilities and one of our junior high schools are approaching 50 years of age, have failing infrastructure and have increased their capacity artificially by the addition of portable classrooms. Even with the addition of these portable classrooms these schools are reaching both their physical and educational maximums. Playfields and hard-court areas have been reduced to the bare minimum. Recently state budget cuts have forced us to release or re-assign every elementary vice principal leaving only a single administrator on campus to manage these extended educational facilities and the large number of students. Junior high schools have been forced to reduce vice principal staffing, as well, leaving only two administrators to manage and supervise over 1000 students at each school

Your plan calls for the addition of 1645 new housing units within a half mile radius of the EBart station on Bliss and Railroad. Our minimum demographic calculator indicates that this would bring .7 students per household or 1,151 new students while our maximum calculation for single family units is 1.32 students per household or 2,171 new students. Either calculation leaves PUSD in the position of needing to build at least another elementary school and another junior high school. PUSD currently owns an elementary site located next to Rancho Medanos Junior High School on Range Road although ideally, a new school would be built south and east of the freeway to accommodate growth. A new elementary site on Range Road would mean considerably expanded busing to that site and attendant costs that go with that increase.

Currently PUSD does not own or control a site in any area of Pittsburg for a new junior high school. The new Pittsburg High School will be built to accommodate the growth that the successful implementation of your Railroad Specific Plan would generate but the District, which is currently at its bonding capacity, would need an additional $80,000,000 to acquire the land and to build two new schools for elementary and junior high student houusing. This, of course, does not take into consideration the accelerated costs for staffing and maintaining these new sites.

It is the responsibility of the Pittsburg Unified School District to provide a high quality education for all of our students and to do this we must look first to the quality and number of our facilities. The District is disappointed that the City plan has initially failed to address the impact that adding this new housing would create. PUSD strongly believes that the City of Pittsburg should begin conversations and planning to mitigate these educational impacts with PUSD immediately. Please call me to schedule a meeting at your earliest convenience.

Respectfully Submitted:

Barbara B. Wilson

Barbara B. Wilson, Ph.D
Superintendent

cc: Board of Trustees
Mark Bonnett
Tim Galli

cc: Pittsburg City Council and staff
Matc, Dana, Leigha

223 Donner Avenue
Livermore, CA 94551-4240

29 September 2008

BART Planning Department
c/o Katie Balk Fax 510-464-7673

Re: eBART Draft EIR

BART's East Contra Costa Extension should be BART gauge (5' - 6"), not freight gauge (4' – 8 ½"). It should be regular BART and remain its entire length at grade in the freeway median. The maintenance facility, transfer station, and flyover should be deleted.

The trackway cost (ballasted double track, third rail traction power, train control, communications, ductwork, and barriers/fencing) should run about $131 million in today's dollars (based on BART historic costs escalated per Bay Area CPI-U). That cost does **not** include stations, rolling stock, land, special trackwork (crossovers, turnouts), environmental work, minor structures and earthwork, contingencies, or future escalation.

DPX (BART's Dublin-Pleasanton Extension) shows how well such a BART line can work, with car storage on tail tracks and maintenance performed elsewhere until the line is further extended.

I strongly urge two intermediate remotely-staffed stations: Pittsburg (Railroad Avenue) and Los Medanos (Century Blvd.). Los Medanos is in-direction for most Antioch patrons, while Hillcrest is not. It is near Los Medanos College as well.

Re track gauge: originally eBART presumed operation on UP's Mococo line. Any chance of that looks nil. Of UP's two lines between the San Joaquin Valley and the Bay area, only the Mococo line has a profile friendly to heavy freight service: nearly flat with minimal energy waste, diesel exhaust, and demand for motive power. Transit trackage parallel to the Mococo line would make potential industrial sites hard to serve with rail. Rail transit in the Mococo corridor is just not viable. By contrast, BART at grade in a wide Rt-4 Bypass median would need no new grade separation structures, and little earthwork or structure alignment.

There is no reason to make eBART freight gauge, set up a separate operating system, or put patrons to the inconvenience of a transfer. As noted in my attachment, this project could and should be part of an integrated regional rapid transit operation.

Robert S Allen

Robert S. Allen
(925) 449-1387
BART Director (1974-1988)

Attach: My Word: Merge BART and Caltrain, 29 September 2008
cc: eBART partners;
Governing Boards and interested parties

MTC: A better plan for regional passenger rail!

My Word: Merge BART and Caltrain

Robert S. Allen RSA 29 September 2008

Our legislators in 1957 formed the first five-county BART district. After San Mateo and Marin counties withdrew in 1961, 61.2% of Alameda, San Francisco, and Contra Costa County voters in 1962 approved $792 million in bonds. BART was born, and by 1999 the bonds were paid off. The time has come to consider a radical change: merge the Caltrain joint powers agency with BART in a single five-county rail rapid transit district.

Let the people vote on a new bond issue. (Adding San Mateo and Santa Clara counties and adjusting for inflation and population, a bond issue today like BART's in 1962 would yield about $16 billion.) Its main goal: widen, grade separate, and electrify the existing Caltrain peninsula line to allow at least four tracks: two BART gauge (south from Millbrae), two Muni to SFO, and at least two standard gauge for Bullet, freight, and other trains.

The enlarged district would bring BART around the Bay, in subway to the Golden Gate Bridge, and at grade in widened medians of East Bay freeways to Livermore, Antioch, and Crockett. Through new JEPA's (joint exercise of powers agreements) it would be poised to serve the North Bay and Central Valley.

Bullet trains would run into downtown San Francisco, serving people-mover stations at the San Francisco and San Jose airports. With Union Pacific permission, the new district would double track and grade separate their Mulford line to speed bullet trains from the San Jose depot to the San Jose and Oakland airports and a new BART intermodal station near Magnolia in Oakland. A new tube near Port Costa or Benicia could by-pass the Martinez drawbridge and speed the electrified bullet trains to Sacramento.

Except in San Jose, San Francisco, and Oakland, most of the BART trackway would be at grade, without the costly digging or structural work required by subway or aerial lines. **At grade** BART trackway (double track, traction power, train control, barriers, etc.) in a freeway median costs about $13.1 million per mile in today's dollars.

Frequent, reliable, safe, pollution-free, comfortable, and seamless BART service around the Bay - with automatic fare collection, one-operator trains of up to ten cars, and fenced right of way with no grade crossings - could ease many of the problems we face today. With the other rail improvements, we'd have a great transportation package.

The nearly six million people in our five counties would have the political and financial clout to support a bond issue for a unified rail rapid transit and bullet train system – just as voters in three counties pioneered BART a few decades ago.

Allen was a BART Director (1974-1988), and is retired from Southern Pacific's Western Division in Engineering and Operations. He is a Life member of American Railway Engineering and Maintenance of Way Association (AREMA), and serves on AREMA Committees 12 (Rail Transit) and 17 (High Speed Rail). He has also served on AREMA Committees 32 (Systems Engineering) and 16 (then Economics of Railway Location and Operations). He can be reached at 223 Donner Avenue, Livermore, CA 94551-4240 or (925) 449-1387.

Appendix C

Transportation Impact Analysis
prepared by Wilbur Smith Associates

Preliminary Draft Report

Railroad Avenue Specific Plan Transportation Impact Analysis (TIA)

Prepared for the
City of Pittsburg
Planning Department

December 2008

Railroad Avenue Specific Plan Transportation Impact Analysis (TIA)

Preliminary Draft Report

Prepared for the
City of Pittsburg
Planning Department
65 Civic Avenue
Pittsburg, CA 94565

Prepared by

WilburSmith ASSOCIATES

201 Mission Street, Suite 1450
San Francisco, CA 94105

December 2008

Table of Contents

1.0 Introduction 1-1
1.1 Project Description 1-1

2.0 Methodology 2-1
2.1 Intersection Level of Service Methodology 2-1
2.1.1 Standards of Significance 2-3
2.1.2 Travel Demand Model 2-7
2.1.2.1 Volume Development 2-7
2.1.2.2 Trip Generation Estimate 2-7
2.1.3 Roadway Network Changes 2-9
2.2 Multimodal Level of Service Methodology 2-10
2.2.1 Roadway Segment Level of Service Methodology 2-10
2.2.1.1 Auto Level of Service Methodology 2-11
2.2.1.2 Transit Level of Service Methology 2-11
2.2.1.3 Bicycle Level of Service Methodology 2-12
2.2.1.4 Pedestrian Level of Service Methology 2-12
2.2.2 Multimodal Level of Service Limitations 2-12
2.2.3 Railroad Specific Plan (Project) Corridors 2-13

3.0 Existing Conditions 3-1
3.1 Existing Transportation Network 3-1
3.1.1 Existing Roadway Network 3-1
3.1.1.1 Regional Access 3-1
3.1.1.2 Local Access 3-2
3.1.1.3 Methodology for Evaluating Intersection Traffic Operations 3-3
3.1.2 Existing Traffic Conditions 3-6
3.1.2.1 Existing Intersection Operating Conditions 3-6
3.1.3 Transit Network 3-10
3.1.3.1 BART Service 3-10
3.1.3.2 Tri Delta Transit Service 3-11
3.1.3.3 County Connection Transit Service 3-13
3.1.4 Pedestrian Conditions 3-15
3.1.5 Bicycle Conditions 3-15
3.1.6 Parking Conditions 3-17
3.1.6.1 Off-Street Parking 3-17
3.1.6.2 Park-and-Ride Lots 3-17
3.1.6.3 BART Station Parking 3-17
3.2 Multimodal Level of Service Analysis – Existing Conditions 3-18
3.2.1 Facility 1 3-18
3.2.2 Facility 2 3-19
3.2.3 Facility 3 3-20
3.2.4 Facility 4 3-20
3.2.5 Facility 5 3-21

4.0 Transportation Impact Analysis 4-1
4.1 Traffic Impact Analysis 4-1
4.1.1 Year 2015 No Project Scenario 4-1
4.1.2 Year 2030 No Project Scenario 4-2
4.1.3 Year 2015 plus Project Scenario 4-2
4.1.4 Year 2030 plus Project Scenario 4-3
4.1.5 Year 2015 plus Project (Alternative 1) Scenario 4-5
4.1.6 Year 2030 plus Project (Alternative 1) Scenario 4-6
4.1.7 Traffic Service Objective Impacts 4-7
4.1.8 Freeway Segment Analysis 4-25
4.2 Parking Evaluation 4-27
4.2.1 Existing Parking Requirements 4-27
4.2.2 Proposed Parking Requirements 4-27
4.2.3 Railroad Avenue Station Parking Demand 4-30
4.3 Transportation Circulation Assessment and Station Access 4-30
4.3.1 Station Location 4-31
4.3.2 Vehicle Traffic Circulation 4-31
4.3.3 Transit Circulation 4-31
4.3.4 Bicycle Circulation 4-32
4.3.5 Pedestrian Circulation 4-33
4.4 Multimodal Level of Service Analysis – Future Conditions 4-34
4.4.1 Facility 1 4-34
4.4.2 Facility 2 4-35
4.4.3 Facility 3 4-36
4.4.4 Facility 4 4-37
4.4.5 Facility 5 4-37

5.0 Project Impacts and Mitigation Measures 5-1
5.1 Significant Project Impacts and Mitigaiton Meaures 5-1
5.1.1 Year 2015 Project Impacts 5-1
5.1.2 Year 2030 Project Impacts 5-2
5.1.3 Year 2015 Project Build (Alternative 1) Impacts 5-3
5.1.4 Year 2030 Project Build (Alternative 1) Impacts 5-5
5.1.5 Parking Impacts 5-7
5.1.6 Transit Impacts 5-7
5.1.7 Pedestrian Impacts 5-8
5.1.8 Bicycle Impacts 5-8

6.0 Conclusion 6-1

Appendix A – Level of Service (LOS) Calculation Sheets
Appendix B – Pedestrian and Bicycle Counts
Appendix C – Signal Warrant Analysis
Appendix D – Traffic Mitigation Outputs
Appendix E – Multimodal Level of Service (MMLOS) Data

List of Tables

2-1 Level of Service Standards for Signalized Intersections on Non-Regional Routes 2-4
2-2 Summary of Traffic Service Objectives for Regional Routes of Significance..... 2-4
2-3 Trip Generation Estimate – Year 2030..... 2-8
2-4 Roadway Improvements within the Study Area..... 2-9
3-1 Level of Service Criteria – Signalized Intersections 3-5
3-2 Level of Service Criteria – Unsignalized Intersections..... 3-6
3-3 Study Intersection Operations – Existing Conditions..... 3-8
3-4 Existing Weekday BART Frequency of Service..... 3-10
3-5 Tri Delta Transit Bus Line Near or Serving the Study Area 3-12
3-6 Existing Bicycle Facilities Near or Serving the Study Area 3-15
3-7 Multimodal Level of Service Analysis – Facility 1 Railroad Avenue, from Civic Avenue to Leland Road 3-19
3-8 Multimodal Level of Service Analysis – Facility 2 Leland Road, from Railroad Avenue to Loveridge Road..... 3-20
3-9 Multimodal Level of Service Analysis – Facility 3 California Avenue, from Loveridge Road to Railroad Avenue 3-20
3-10 Multimodal Level of Service Analysis – Facility 4 Harbor Avenue, from Leland Road to California Avenue 3-21
3-11 Multimodal Level of Service Analysis – Facility 5 Bliss Avenue, from Railroad Avenue to Harbor Street 3-21
4-1 Study Intersection Operations – 2015 No Build Conditions 4-9
4-2 Study Intersection Operations – 2030 No Build Conditions 4-10
4-3 Study Intersection Operations – 2015 Project Build Conditions..... 4-11
4-4 Study Intersection Operations – 2030 Project Build Conditions..... 4-12
4-5 Study Intersection Operations – 2015 Project Build (Alternative 1) Conditions 4-13
4-6 Study Intersection Operations – 2030 Project Build (Alternative 1) Conditions 4-14
4-7 City of Pittsburg Municipal Code – Existing Parking Requirments 4-27
4-8 Railroad Avenue Specific Plan TOD Parking Requirements per Land Use 4-28
4-9 Proposed Parking Supply – Civic Center Subarea 4-29
4-10 Proposed Parking Supply – Transit Village Subarea..... 4-29
4-11 Multimodal Level of Service Analysis – Facility 1 Future Conditions..... 4-35
4-12 Multimodal Level of Service Analysis – Facility 2 Future Conditions..... 4-36
4-13 Multimodal Level of Service Analysis – Facility 3 Future Conditions..... 4-36
4-14 Multimodal Level of Service Analysis – Facility 4 Future Conditions..... 4-37
4-15 Multimodal Level of Service Analysis – Facility 5 Future Conditions..... 4-38
5-1 Intersection Level Service and Average Delay Comparison Year 2015 plus Project Conditions with Mitigation Measures – PM Peak Hour..... 5-1
5-2 Intersection Level Service and Average Delay Comparison Year 2030 plus Project Conditions with Mitigation Measures – AM Peak Hour 5-2
5-3 Intersection Level Service and Average Delay Comparison Year 2030 plus Project Conditions with Mitigation Measures – PM Peak Hour..... 5-3
5-4 Intersection Level Service and Average Delay Comparison Year 2015 plus Project (Alternative 1) Conditions with Mitigation Measures – AM Peak Hour..... 5-4

5-5 Intersection Level Service and Average Delay Comparison Year 2015 plus Project (Alternative 1) Conditions with Mitigation Measures – PM Peak Hour 5-5
5-6 Intersection Level Service and Average Delay Comparison Year 2030 plus Project (Alternative 1) Conditions with Mitigation Measures – AM Peak Hour..... 5-6
5-7 Intersection Level Service and Average Delay Comparison Year 2030 plus Project (Alternative 1) Conditions with Mitigation Measures – PM Peak Hour 5-7

List of Figures

1-1 Project Location..... 1-3
1-2 Study Intersections 1-4
2-1 Multimodal Level of Service - Facilities Map..... 2-14
3-1 Regional Roadway Network..... 3-4
3-2 Pittsburg Traffic Study Study Intersections – Existing Conditions..... 3-9
3-3 Existing Transit Network..... 3-14
3-4 Existing Bicycle Network..... 3-16
3-5 Facility 1: Railroad Avenue Existing MMLOS..... 3-22
3-6 Facility 2: Leland Road Existing MMLOS 3-23
3-7 Facility 3: California Avenue Existing MMLOS 3-24
3-8 Facility 4: Harbor Street Existing MMLOS 3-25
3-9 Facility 5: Bliss Avenue Existing MMLOS 3-26
4-1 Study Intersection Operations – 2015 No Project Conditions..... 4-15
4-2 Study Intersection Operations – 2030 No Project Conditions..... 4-16
4-3 Study Intersection Operations – 2015 plus Project Conditions..... 4-17
4-3A Study Intersection Operations – 2015 plus Project Trips 4-18
4-4 Study Intersection Operations – 2030 plus Project Conditions..... 4-19
4-4 Study Intersection Operations – 2030 plus Project Trips..... 4-20
4-5 Study Intersection Operations – 2015 plus Project (Alternative 1) Conditions 4-21
4-5A Study Intersection Operations – 2015 plus Project (Alternative 1) Trips 4-22
4-6 Study Intersection Operations – 2030 plus Project (Alternative 1) Conditions 4-23
4-6A Study Intersection Operations – 2030 plus Project (Alternative 1) Trips 4-24
4-7 Facility 1: Railroad Avenue Future Conditions MMLOS..... 4-39
4-8 Facility 2: Leland Road Future Conditions MMLOS..... 4-40
4-9 Facility 3: California Avenue Future Conditions MMLOS..... 4-41
4-10 Facility 4: Harbor Street Future Conditions MMLOS..... 4-42
4-11 Facility 5: Bliss Avenue Future Conditions MMLOS..... 4-43

Chapter 1
INTRODUCTION

The following document is a Transportation Impact Analysis (TIA) which presents the existing transportation conditions and assesses the transportation impacts associated with the future land use and roadway network changes proposed in the Railroad Avenue Specific Plan in Pittsburg, California. This TIA evaluates the increased development potential of the Railroad Avenue Specific Plan beyond that considered in the *Pittsburg 2020 General Plan* and in the *Pittsburg 2020 General Plan EIR.*

1.1 PROJECT DESCRIPTION

The San Francisco Bay Area Rapid Transit District (BART) is proposing to extend transit services into east Contra Costa County from its existing Pittsburg/Bay Point BART Station in the unincorporated community of Bay Point near the City of Pittsburg. The project is generally known as "eBART" in reference to the extension of service to the "east" portion of Contra Costa County. To accommodate this transit extension, the City of Pittsburg, in partnership with the local community and consultants, has developed plans to facilitate transit-oriented development (TOD) near the proposed transit station. As defined in the Railroad Avenue Specific Plan (RASP), the main objectives are to increase the intensity and density of development near the proposed station, as well as to improve existing roadway, pedestrian, transit, and bicycle facilities between the potential BART station and the surrounding community. Figure 1-1 presents the TIA study area location as well as the boundaries of the Railroad Avenue Specific Plan area.

The purpose of this analysis is to identify the potential impacts of the proposed mixed-use TOD and land use changes beyond the development potential in the *Pittsburg 2020 General Plan* and as evaluated in the *Pittsburg 2020 General Plan EIR*. The traffic analysis was prepared in accordance with the *Technical Procedure Update – Final (July 19, 2006)* manual published by the Contra Costa Transportation Authority (CCTA). The following existing traffic network intersections were analyzed for this project and are illustrated in Figure 1-2:

1. Civic Avenue/ 17th Street/ Davi Avenue
2. Power Avenue/ Davi Avenue
3. Railroad Avenue/ Civic Avenue
4. Railroad Avenue/ Center Drive
5. Railroad Avenue/ SR 4 westbound on-ramp
6. Railroad Avenue/ SR 4 eastbound on-ramp/ SR 4 westbound off-ramp
7. Railroad Avenue/ Bliss Avenue
8. Railroad Avenue/ Leland Road
9. Leland Road/ Harbor Street
10. Leland Road/ Freed Avenue
11. Leland Road/ Loveridge Road

12. Loveridge Road/ SR 4 eastbound Ramps
13. California Avenue/ SR 4 westbound ramps
14. Harbor Street/ California Avenue
15. Harbor Street/ Bliss Avenue
16. Harbor Street/ Garcia Avenue

The following future traffic network intersection was also analyzed as part of this project:[1]

1. Railroad Avenue/ Garcia Avenue

The operations of the key intersections were evaluated during the weekday morning (AM) and evening (PM) peak traffic periods for four scenarios. The study also evaluated future traffic operating conditions for Year 2015 Mid-Term and Year 2030 Long-Term Cumulative conditions. The scenarios are listed below.

Scenario 1: Existing Conditions includes the analysis of existing traffic volumes obtained from traffic counts.

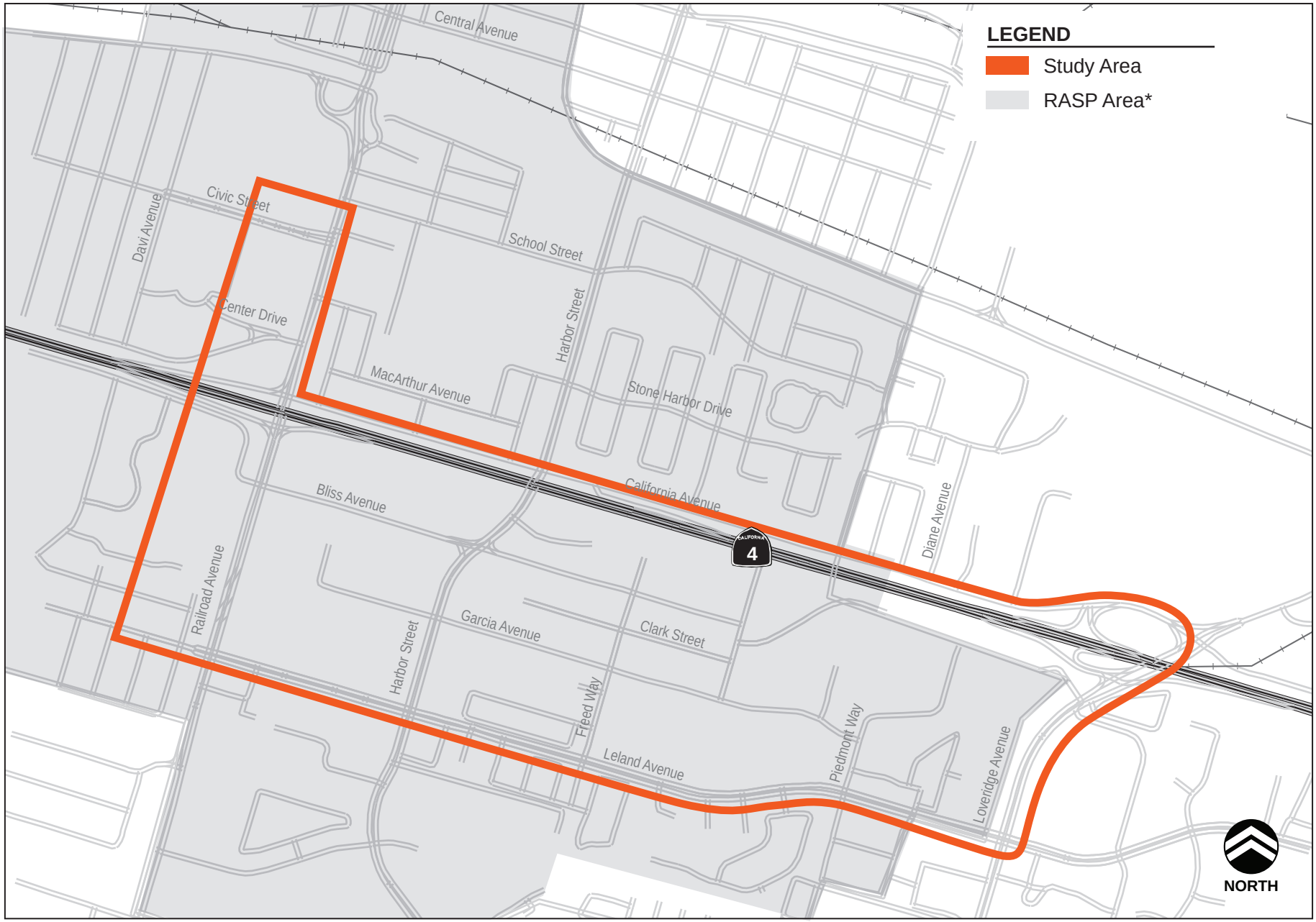
Scenario 2: Future without Project Conditions includes the future land use coded in the current CCTA Model and includes the roadway network improvements proposed in the Railroad Avenue Specific Plan.

Scenario 3: Future with Project Conditions includes the Railroad Avenue Specific Plan proposed land use and roadway network improvements.

Scenario 4: Future with Project Conditions (Alternative 1) includes a variation in land use from the proposed Railroad Avenue Specific Plan and No Project alternatives, and includes the roadway network improvements proposed in the Railroad Avenue Specific Plan.

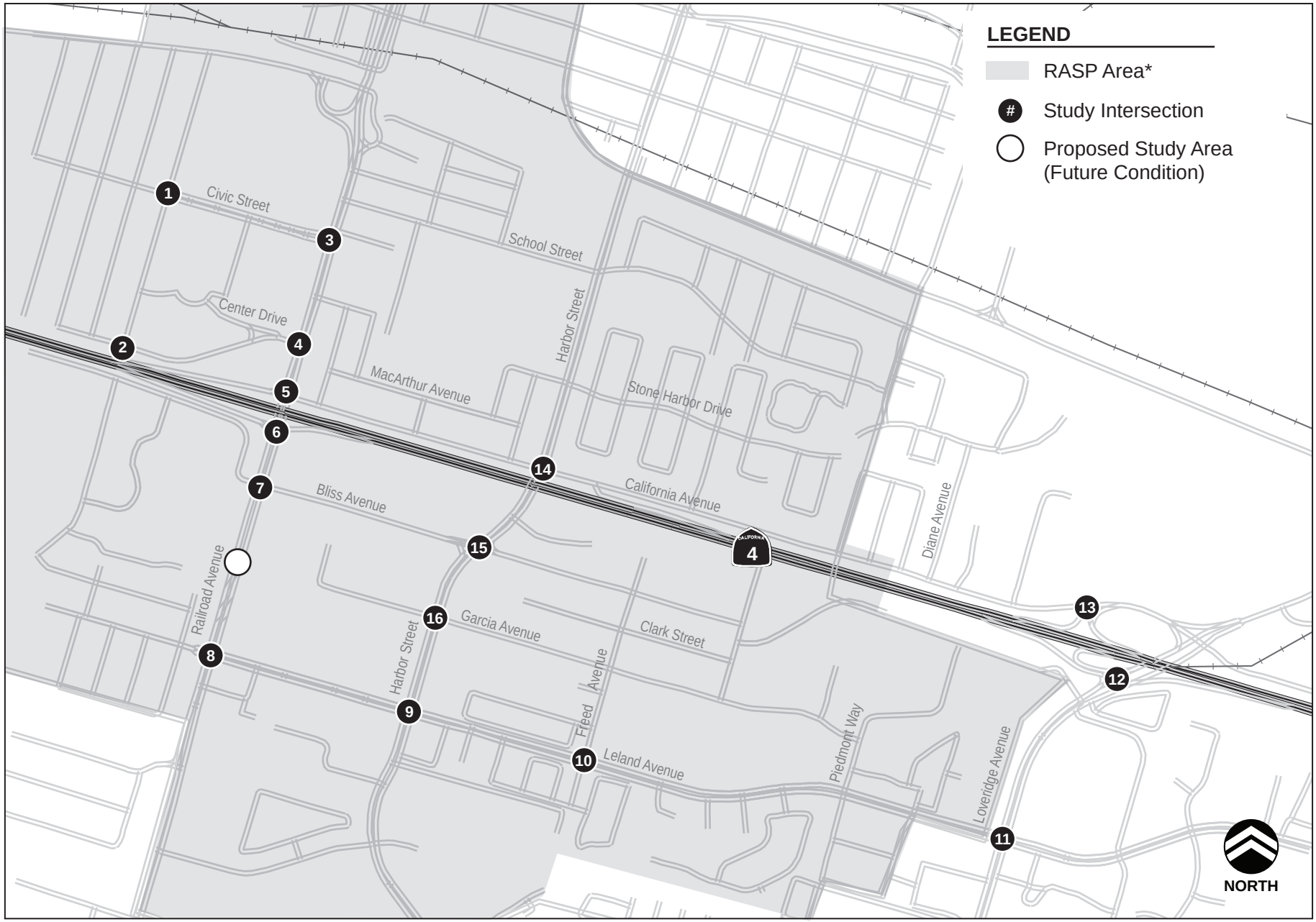
The report is divided into six chapters. Chapter 2 describes the methodologies used to estimate vehicle trips under Future Conditions and conduct a Multimodal Level of Service (MMLOS) analysis. Chapter 3 describes roadway facilities, transit services, pedestrian and bicycle facilities, and analysis methodologies for Existing Conditions. Chapter 4 describes transportation impacts including intersection operations and roadway segment operations under Future Conditions with vehicle trips and eBART station access trips generated from each land use alternative for the AM and PM peak hour Year 2015 Mid-Term Cumulative and Year 2030 Long-Term Cumulative conditions. Chapter 4 also includes an evaluation of the parking demand resulting from land use build out of each project alternative under all scenarios. The results of the future project condition analysis compared to the results of the Future without Project Conditions (Year 2015 and 2030) analysis are used to identify significant project impacts. Chapter 5 discusses project impacts and includes recommended improvements, and mitigation measures for these impacts. Chapter 5 also includes an assessment of study area pedestrian, bicycle, and transit circulation. A qualitative discussion of the eBART station access requirements and proposed improvements to the station area is also included. Chapter 6 presents the study conclusions.

[1] Under future conditions, the intersection of Power Avenue and Davi Avenue is omitted due to the presence of the proposed eBART station. Therefore, a total of 16 intersections were analyzed under future conditions.



** Railroad Avenue Specific Plan Area*

STUDY AREA LOCATION MAP
FIGURE 1-1



** Railroad Avenue Specific Plan Area*

STUDY INTERSECTIONS
FIGURE 1-2

Chapter 2
METHODOLOGY

This chapter is divided into two sections. The first section discusses the methodology involved in the development of Year 2015 (Mid-Term) and 2030 (Long-Term) traffic volumes, trip generation estimates, and the intersection operations under Year 2015 and Year 2030 Conditions. The second section discusses the Multimodal Level of Service (MMLOS) methodology and the techniques used to evaluate a multimodal transportation environment. These conditions form the baseline against which transportation impacts related to the increased development potential envisioned in the Railroad Avenue Specific Plan (beyond that included in the *Pittsburg 2020 General Plan* and evaluated in the *Pittsburg 2020 General Plan EIR*) are identified.

2.1 Intersection Level of Service Methodology

Per CEQA requirements, an existing conditions analysis was completed for the study area as described above. However, other projects and modifications to the roadway network would be in place before the developments defined in the Railroad Avenue Specific Plan are implemented, and further regional growth is anticipated during that period. Accordingly, the Railroad Avenue Specific Plan's impact would not be accurately represented by comparing it with conditions existing in 2008. Instead, in accordance with professional standards for traffic impact analysis, project-related impacts are compared to future conditions if the developments for the Railroad Avenue Specific Plans were not built (i.e. No Project conditions, or future conditions without the project). For purposes of this comparison, No Project conditions were examined for two future time periods, known as "horizon years". The horizon years selected for this analysis are Year 2015, when 25 percent of the development potential in the Railroad Avenue Specific Plan (beyond the included in the *Pittsburg 2020 General Plan* and evaluated in the *Pittsburg 2020 General Plan EIR*) would be expected to be built, and Year 2030, a longer term examination that would capture impacts when the developments has been fully matured for some time.

Both horizon years were assessed for No Project, plus Project and plus Project (Alternative 1), resulting in a total of six future scenarios as outlined below. Each scenario was used to examine traffic operations at key intersections during the weekday morning (AM) and evening (PM) peak hours

- **Existing Conditions**

- **No Project Conditions**
  - Year 2015 No Project
  - Year 2030 No Project

- **Project Conditions**
  - Year 2015 plus Project
  - Year 2030 plus Project

- **Alternative 1 – Project Conditions**
  - Year 2015 plus Project (Alternative 1)
  - Year 2030 plus Project (Alternative 1)

These scenarios are described in more detail in the following sections.

Scenario 1: Existing Conditions (Year 2008)

- Analyzes existing conditions

Scenario 2: No Project (No Build) Conditions

This scenario does not include any traffic that would be associated with the land use changes in the Railroad Avenue Specific Plan.

- *Year 2015 No Project Conditions*
- *Year 2030 No Project Conditions*

Scenario 3: Project Conditions

This scenario includes the traffic volumes generated with the development and build out of 25 percent of the development potential (beyond that included in the *Pittsburg 2020 General Plan* and evaluated in the *Pittsburg 2020 General Plan EIR*) provided with the land use changes of the Railroad Avenue Specific Plan.

- *Year 2015 plus Project Conditions*
- *Year 2030 plus Project Conditions*

Scenario 4: Project (Build) Conditions – Alternative 1

- *Year 2015 plus Project Conditions (Alternative 1) Conditions (Year 2015)* includes the analysis of Year 2015 traffic volumes obtained by applying a linear growth factor to the results obtained from the Year 2020 CCTA models plus traffic volumes that would be generated due to the variation in land use from the proposed Railroad Avenue Specific Plan and No project alternatives, and includes the roadway network improvements proposed in the Railroad Avenue Specific Plan.

- *Year 2030 plus Project Conditions (Alternative 1)* includes analysis of Year 2030 traffic volumes obtained by applying a linear growth factor to the results obtained from the Year 2035 CCTA models plus traffic volumes that would be generated due to the variation in

land use from the proposed Railroad Avenue Specific Plan and No project alternatives, and includes the roadway network improvements proposed in the Railroad Avenue Specific Plan.

Potential traffic impacts of the Railroad Avenue Specific Plan are assessed relative to existing and future No Project conditions in 2015 and 2030. Impacts are identified when the analyses indicates that future conditions with the Railroad Avenue Specific Plan are degraded as compared to the future baseline or future no project conditions. A summary of the thresholds for identifying potential impacts at study intersections is provided in the following section.

2.1.1 Standards of Significance

The analysis of potential project impacts relies on standards of significance established by the jurisdictions within the study area. These thresholds, which are based on intersection level of service (LOS), are used to identify significant project-related impacts and indicate a need for mitigation measures. This section describes the applicable policies and regulations that were included in the analysis. In the absence of established thresholds, alternate criteria are set that are consistent with the project and study purpose.

Intersections. The Contra Costa Transportation Authority (CCTA) criteria require that applicable jurisdiction criteria be followed for unsignalized intersections, the Congestion Management Plan (CMP) network, and state routes. Table 3-3 which is presented in *Chapter 3* identifies the jurisdictions which have authority for each intersection in the study area. In general, a project-related impact is considered significant if the Proposed Project is likely to result in any of the following:

- Deterioration of an intersection from LOS D or better to LOS E or F under project conditions, or cause a substantial increase in volume-to-capacity (V/C) ratio at an intersection operating at LOS E or F;
- Deterioration of a freeway segment to LOS F, unless LOS F was measured when the Congestion Management Plan was established in 1991; or
- Deterioration of an intersection or freeway segment to an LOS below the threshold of its jurisdiction

Contra Costa Transportation Authority (CCTA). All Contra Costa jurisdictions, including the City of Pittsburg, participate in the Measure C-1988 Growth Management Program. Measure C requires, among other things, that each jurisdiction adopt a level of service standard for Basic Routes based on the General Plan land use designations adjoining the routes and adhere to Traffic Service Objectives for Routes of Regional Significance. Measure C specifies that the standards listed in Table 2-1 be applied to all signalized intersections on Non-regional Routes.

Table 2-1
Level of Service Standards for Signalized Intersections on Non-Regional Routes

Land Use Type	LOS Standard
Rural	LOS (low) C
Semi-Rural	LOS (high) C
Suburban	LOS (low) D
Urban	LOS (high) D
Central Business District (CBD)	LOS (high) D

The following are the Routes of Regional Significance in the study area, which are evaluated according to a different criteria than Basic Routes:

- State Route 4 (SR 4)
- Leland Road
- Railroad Avenue

The Traffic Service Objectives which apply to these routes are shown in Table 2-2.

Table 2-2
Summary of Traffic Service Objectives for Regional Routes of Significance

Regional Route	Traffic Service Objectives
State Route 4 (freeway)	1.Vehicle Occupancy of 1.2 persons per vehicle or higher during the morning peak hour 2. Delay Index of less than 2.5 3. Transit Ridership increase of 25% by year 2010 compared to year 2000
Leland Road Railroad Avenue	1. Mid-Level of Service D or better at intersections (volume to-capacity ratio of 0.85 or less) 2. Delay Index less than 2.0

Source: Contra Costa Transportation Authority, *Technical Procedures Update*, 2006.

CCTA recognizes traffic impacts to be significant if the project-related traffic:

- Worsens intersection operating conditions by more than one degree of LOS; or

- Worsens intersection operating conditions to LOS E or F.

The CCTA is also the Congestion Management Agency (CMA) for the County, with the responsibility for preparing and monitoring the preparation of the Contra Costa Congestion Management Plan (CMP). The CMP is one part of an aggressive overall strategy to reduce congestion and improve mobility in the county. Within the study area, parts of Railroad Avenue (south of SR 4) are within the CMP network. CCTA has established a standard of LOS E for all parts of the CMP network except those that were already operating at worse levels of service in 1991.

In the absence of established local criteria to describe the operating conditions of intersections and ramp-freeway junctions, LOS D or better is typically considered to be acceptable for peak hours, while LOS E or worse is considered undesirable.

Caltrans -- At the intersections located on State Highway facilities, the following guidelines serve as LOS thresholds for the intersection operation conditions:

- Caltrans recommends a target LOS at the transition between LOS C and LOS D.

- In case the recommended LOS is not achievable, Caltrans should be consulted in order to determine the target LOS.

- If the intersection under existing conditions operates worse than the appropriate target LOS, then the existing LOS should be maintained.

City of Pittsburg -- The following guidelines are used by the City of Pittsburg to identify traffic impacts; these guidelines are limited to the purpose of the analysis and study area boundaries:

- LOS D or better (<85 percent capacity) on intersections along Major Arterials.

- Pre-existing unacceptable base case unsignalized intersection operation has an increase in the ratio of vehicles to capacity of 0.02 or greater or an increase in delay of 5 seconds or greater.

- Peak hour signal warrant criteria are met due to the addition of project traffic.

- Signal warrant criteria are met for a base case intersection condition and the project would contribute 25 or more trips to the intersection during a single peak traffic hour.

Freeway Segments.[1] The CCTA has set LOS E as the standard desired threshold for freeway segments in the Congestion Management Plan (CMP) network. However, the actual standards defined for individual freeway segments are based on the existing operating conditions when the standards were established. In this case, 1991 Caltrans data were used to establish these standards. The PM peak hour traffic traveling in the eastbound direction exhibits the worst levels of service on all segments compared to other peak periods and directions. One freeway segment in the Railroad Avenue Specific Plan study area from Railroad Avenue to Loveridge Avenue operates at LOS F during the eastbound PM peak hour. Thus, under the existing PM peak hour conditions, the Railroad Avenue to Loveridge Road Segment operates worse than CCTA's LOS E Standard in the eastbound direction. Thus LOS F would be the standard used in the analysis of the Proposed Project (Table 3.2-11 *eBART DEIR*).[2]

Parking. There are no established criteria for the assessment of parking impacts. For the purposes of this study, a significant parking impact would result if the proposed land uses in the Railroad Avenue Specific Plan substantially reduces parking supply more than it reduces the parking demand.

BART. According to the *eBART DEIR*, the actual maximum passenger capacity of a BART car is estimated as 150 persons per car. However, well before passenger loads approach this level, passengers will experience uncomfortable conditions and the time required at stations to unload and load passengers will cause delays affecting the overall operation of the system. BART staff determined that when the average passenger loads per car during the peak hour exceed 112 passengers per car, passenger comfort and system operations are compromised. The threshold of 112 passengers per car represents a load factor of 1.67 passengers per seat.

Tri Delta Transit. In the Short Range Transit Plan issued in January 2008, Tri Delta Transit documents the adoption of transit objectives, performance indicators, and standards for the system. In terms of transit operations, the standards focus on service quality, reliability, productivity, and safety. A significant transit impact would result if the project causes sustained service performance which violates the adopted standards as noted below:

- Schedule adherence – late service: Greater than 90 percent within 5 minutes of schedule
- Schedule adherence – early service: No bus ahead of schedule
- Productivity (passengers per hour) – minimum 15

Pedestrian and Bicycles. There are no established criteria for the assessment of pedestrian or bicycle impacts. For purposes of this study, a significant pedestrian impact would result if the Railroad Avenue Specific Plan caused substantial overcrowding on public sidewalks, creation of hazardous conditions for pedestrians, or elimination of pedestrian access to adjoining areas. Similarly, the Railroad Avenue Specific Plan would have a significant effect if it would create

[1] Since the trip generation calculated for the Railroad Avenue Specific Plan is less than or equal to that of the eBART DEIR, the impact is also less than or equal to that of the eBART DEIR. Therefore eBART DEIR freeway operations and methodology will be used to explain the impact of the Railroad Avenue Specific Plan on freeway operations for segments in the study area.

[2] Table 3.2-11, *Page 3.2-11. East Contra Costa BART Extension Draft EIR, September 2008.*

particularly hazardous conditions for bicyclists or eliminate bicycle access to adjoining areas. Finally, if the Railroad Avenue Specific Plan were to impede or thwart implementation of a planned pedestrian or bicycle pathway, or if the developments would conflict with adopted policies supporting alternative transportation (i.e. bus turnouts, bicycle racks); a significant pedestrian or bicycle impact would be identified.

2.1.2 Travel Demand Model

Traffic projections and ridership forecasts were developed for the transportation study using a Contra Costa Transportation Authority (CCTA) Travel Demand Model. A travel demand model is one of the most common methods of forecasting future travel demand in a given area. The model is based on inputs such as projections of population, employment, observed travel behavior, and anticipated changes to the transportation network.

The projections for Year 2015 and Year 2030 were developed using the CCTA travel demand model. Changes to the transportation network are identified later in the section under "Future (No Project) Conditions" and were integrated into the model assumptions. The model was also adjusted to account for differences between the existing year model outputs and actual counts, and balanced for the observed and forecast turning movements.

The CCTA model developed uses Year 2007 as the base year and Year 2030 as the future year. The model can generate highway and transit outputs for the AM and PM peak hour, AM and PM peak period (four hours), and daily traffic volumes. The model outputs with respect to the traffic network include link volumes, intersection turning movements, volume to capacity (V/C) ratios, vehicle miles traveled (VMT), vehicle hours traveled (VHT), and vehicle hours of delay. The model provides sufficient detail to permit travel demand forecasts down to the level of minor collector roadways. It does not, however, include residential streets.

2.1.2.1 Volume Development

Future Year 2030 traffic volumes obtained from the Year 2030 model were used to analyze the future operation conditions at the study intersections. However, Year 2030 traffic volumes were adjusted to account for the difference between the base-year model output and actual counts, and balanced for the observed and forecast turning movements. Future year traffic volumes were adjusted and balanced using the technique and procedures described in the *CCTA Technical Procedures Manual (July 2006)*.

Year 2015 traffic volumes were computed using a linear growth rate between the Base Year and Year 2020 model runs and applied to the existing traffic counts.

2.1.2.2 Trip Generation Estimate

For purposes of the study, an estimation of the number of vehicle trips associated with the land uses within the specific subareas of the Railroad Avenue Specific Plan were analyzed. Trip generation estimates were based on the CCTA model and household, population, employment

land use data derived from Traffic Analysis Zones (TAZs) for two subareas that encompass the majority of the study area. Due to the nature of the proposed TOD project (enhanced multimodal access and mixed land use development encouraging internal trip capture), trip reductions were made as part of the trip generation estimation. TOD trip reductions applied to the trip generation estimates were based on the following assumptions:

- Internal trips taken within the study area TAZs
- Transit within 0.5 mile radius of TAZ
- Walk access links connecting all TOD TAZs

The subareas specific to the trip generation estimates are listed below:

- Transit Village (west)
- Transit Village (east)
- Transit Village (southeast)
- Civic Center

The *Transit Village* subarea is located in the southern portion of the study area and is bounded by State Route 4 to the north, Harbor Street to the east, the Los Medanos Neighborhood to the west, and East Leland Road to the south. General proposed land uses within this subarea include medium-to-high intensity transit-oriented development (TOD), with commercial, public, institutional, and recreational facilities.

The *Civic Center* subarea is located in the northern portion of the study area and is bounded by City Park to the north, Railroad Avenue to the east, Davi Avenue to the west, and State Route 4 to the south. General proposed land uses within this subarea include TOD residential and mixed-use developments as well as commercial, public, institutional, and recreational uses.[3] Table 2-3 presents the peak hour trip generation estimates per TAZ within each subarea under Year 2030 conditions.

[3] Refer to Railroad Avenue Specific Plan, Chapter 3; pp. 58-62 for detailed information and illustrations of proposed land uses within each designated subarea.

Table 2-3
Trip Generation Estimate – Year 2030

		Year 2030 No Build				Year 2030 Build				Year 2030 Build (Alternative 1)			
CCTA TAZ	Subarea	AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
		IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
30048	TV-W	134	126	231	247	158	219	348	310	160	180	308	305
30065	TV-E	321	177	301	402	380	419	606	560	448	609	845	699
30069	TV-SW	139	116	211	235	145	154	254	252	145	154	253	252
30642	CC	255	196	346	425	305	292	482	533	253	195	345	424
Total		**849**	**615**	**1,089**	**1,309**	**988**	**1,084**	**1,690**	**1,655**	**1,006**	**1,138**	**1,751**	**1,680**

Source: Wilbur Smith Associates, December 2008
Notes:
Transit Village (west) – (TV-W)
Transit Village (east) – (TV-E)
Transit Village (southwest) – (TV-SW)
Civic Center – (CC)

2.1.3 Roadway Network Changes

The land use changes specified in the specific plan and the roadway network improvements planned in the study area was provided by the City of Pittsburg. There are also several proposed changes to the roadway network within the transportation study area, some are roadway changes, such as widening, while others are changes to the intersection geometry. These improvements are summarized in the following paragraph.

Local Roadways. A small number of intersection and lane configuration changes are expected to be in place by the Year of Opening (2015) and the Long-Term Year (2030). These changes to future intersection configurations, which were taken into account in the model, are presented in Table 2-4. In addition, in both the Year 2015 and Year 2030 scenarios, the intersection at Railroad Avenue/Power Avenue would no longer exist. In the Year 2030 scenario Garcia Avenue will be extended to intersect with Railroad Avenue.

Table 2-4 Roadway Improvements within the Study Area	
Project	**Year of Completion[1]**
Harbor St/Bliss Ave. - traffic signalization	Already Constructed
Harbor St./E. Leland Rd. - additional right-turn lanes, 4 approaches	Already Constructed
Railroad Ave./SR 4 eastbound ramps - additional eastbound shared through-right turn lane	Already Constructed
California Ave. – widening, phase 1 (north) from Loveridge Rd. to Harbor St.	2015
California Ave. – widening, phase II (south) from Loveridge Rd. to Harbor St.	2015
California Ave. – widening, phase III from Harbor St. to Railroad Ave.	2030
California Ave./SR 4 westbound off-ramp (Harbor Exit) – additional eastbound through lane and right-turn overlap phase	2015
Loveridge Rd./E. Leland Rd. – additional northbound right-turn lane and right-turn signal overlap phase	2015
Railroad Ave./SR 4 westbound ramps – westbound approach widened for exclusive right-turn lane	2030
California Ave./SR 4 westbound ramps (Loveridge Exit) – widen California Ave. (ramps to Loveridge Rd.) and widen off ramp	2015
Railroad Ave./Leland Rd. – additional eastbound and southbound right-turn lanes	2015
Loveridge Rd./SR 4 eastbound ramps – widen Loveridge Rd. for a northbound right-turn lane onto eastbound SR 4	2030
Civic Ave./Davi Ave. – additional northbound free right turn on Davi Ave. with eastbound receiving lane on Civic Ave.	2015
Railroad Ave. - Implement Class II and Class III bicycle facilities	2015
Central Ave. - Implement Class II and Class III bicycle facilities	2015

Source: City of Pittsburg. (October 2008).

1. Roadway improvement projects are to be completed prior to or by Year 2015 and Year 2030.

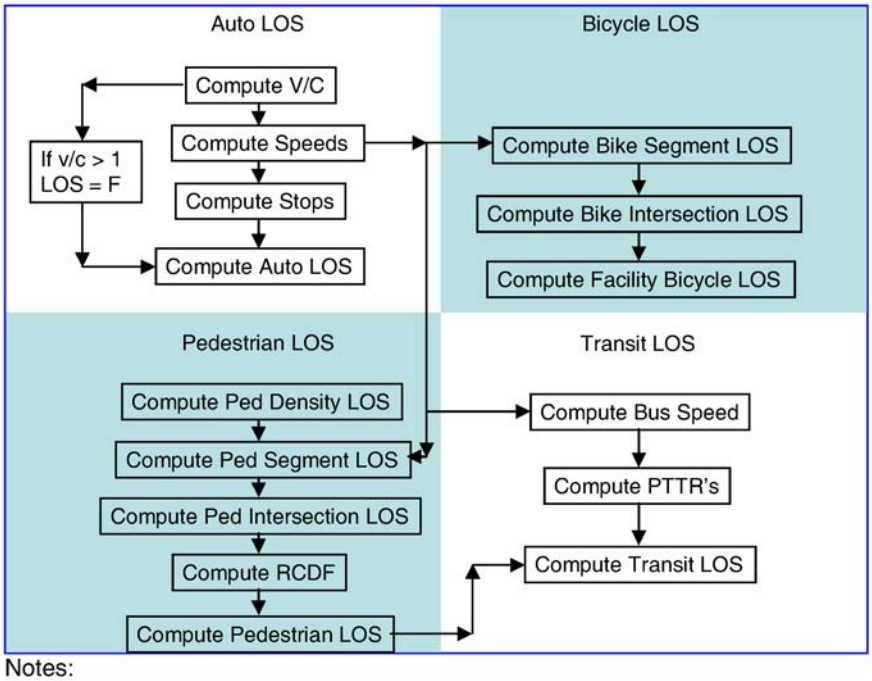
2.2 Multimodal Level of Service (MMLOS) Methodology

In order to quantify and comprehensively evaluate future development and the physical roadway network performance WSA applied the National Cooperative Highway Research Program (NCHRP) #128 Multimodal Level of Service (MMLOS) Analysis for Urban Streets for the Pittsburg Railroad Avenue Specific Plan Area. This technique provided a level of service estimate for a multimodal transportation environment as opposed to the traditional auto only level of service.

2.2.1 Roadway Segment Level of Service Methodology

The MMLOS methodology illustrated in the figure on the following page analyzes multimodal corridors (facilities) and breaks them down into segments, providing an LOS score for each segment and direction by mode (auto driver, bus passenger, bicyclist, and pedestrian). A segment consists of intersections and/or geometrical changes and the connecting roadway segment.

MMLOS Method Flow Chart:



Notes:
RCDF = Roadway crossing difficulty factor
PTTR = Perceived travel time rate.

Source: NCHRP 128 (2008) Multimodal Level of Service Analysis for Urban Streets: Users Guide, Exhibit 10, pg. 27

The corridor receives an average LOS score per direction for each mode based on the LOS received for each segment (refer to example output table below).

Direction = Eastbound

Segment	Auto LOS	Transit LOS	Bicycle LOS	Pedestrian LOS
1	C	B	E	E
2	C	B	E	E
3	C	A	E	E
4	C	B	E	E
5	B	C	E	E
Facility	C	B	E	E

Source: NCHRP 128 (2008) Multimodal Level of Service Analysis for Urban Streets: Users Guide, Exhibit 23, pg. 47

The methodology does not provide for the computation of an overall weighted average of the LOS results across the four modes of travel. It enables the analyst to see the changes in LOS from one mode to the other as changes are made to the design and operation of the urban street. Weighing the tradeoffs of improving the LOS for one mode versus worsening it for another

mode is left to the analyst and the public agency operating the urban street. The MMLOS Methodology is best suited for arterial and collector streets rather than residential and local access streets. The methodology per mode is discussed below:[4]

2.2.1.1 Auto Level of Service Methodology

The auto level of service in the MMLOS analysis is a function of the average travel speed over the length of the street and the average number of stops per mile. In essence, the auto LOS is a function of stops and left turn lanes. The more stops per mile, the poorer the LOS; the more intersections with exclusive left turn lanes, the better the LOS. When applied to the entire study length of the facility, the attribute "proportion of intersections with left turn lanes" is the ratio of intersections with one or more exclusive left turn lanes in the direction of travel divided by the total number of intersections within the section of the street. All signalized and unsignalized intersections are considered

2.2.1.2 Transit Level of Service Methodology

The transit level of service in the MMLOS analysis is based on a combination of the access, loading, and travel operations. As such, transit LOS is a function of its accessibility by pedestrians, the amenities at the bus stop, the waiting time for the bus, and the mean speed of the bus. For example, better pedestrian access, better shelters, increased bus frequencies and higher speed bus service would result in an acceptable transit LOS. Several factors are included in determining transit LOS. A "transit wait/ride score", which is a function of the headway between buses and the perceived travel time rate; pedestrian accessibility, bus headways, load factors, and route distance are key components. The segment levels of service (for a given direction of travel) are combined into an overall directional level of service for the study section of street by taking a length weighted average of the segment levels of service for the analysis direction.

2.2.1.3 Bicycle Level of Service Methodology

The bicycle level of service in the MMLOS analysis is a function of the perceived separation between motor vehicle traffic and the bicyclist, parked vehicle interference, and the quality of roadway pavement. Higher vehicle volumes, travel speeds, driveways, and bicycle facilities (i.e. striped bike lane) influence bicycle LOS. The segment levels of service (for a given direction of travel) are combined into an overall directional level of service for the study section of street by taking a length weighted average of the segment levels of service for the analysis segment.

[4] The following MMLOS methodologies are in reference to the NCHRP #128; Chapter 2.

2.2.1.4 Pedestrian Level of Service Methodology

The pedestrian level of service in the MMLOS analysis is based on a combination of pedestrian density, other factors including sidewalks, walkways, and additional physical barriers that separate pedestrians from vehicle traffic. Higher traffic speeds and higher traffic volumes would deteriorate pedestrian LOS whereas the presence of physical barriers between pedestrians and vehicles would improve pedestrian LOS. A "roadway crossing difficulty factor", which measures the difficulty of crossing the street between signalized intersections, and a "wait-for-gap" calculation, which considers waiting time, sidewalk width, roadway geometries, and intersection signal timing are additional factors considered in determining pedestrian LOS. The segment levels of service (for a given direction of travel) are combined into an overall directional level of service for the study section of street by taking a length weighted average of the segment levels of service for the analysis direction.

2.2.2 Multimodal Level of Service Limitations

The MMLOS analysis and methodologies take a critical step towards looking at roadway capacity in measures other than vehicle delay and vehicle capacity. Quantifying a multi-modal LOS at the segment level will allow existing and future roadway facilities to better accommodate a balanced transportation network that maximizes person capacity as opposed to vehicle capacity.

The City of Pittsburg was selected by the NCHRP team as one of the initial trials using the MMLOS methodology. Throughout the "beta" testing of the analysis technique a few limitations were recognized that relate to the sensitivity of the model and its ability to detect and quantify certain changes within the multimodal network. These limitations are recognized as minor issues and are not significant enough to discredit the methodology of the model.

The geometric configuration is the principle input of the segments under study using the MMLOS assessment. Daily volume of autos, buses per hour and peak hour pedestrian volumes are the volume inputs into the model; however, these inputs are much less sensitive to the LOS than the physical inputs of the network. This assumes that the bike and pedestrian networks have little to no capacity constraint and incremental increases in volume will not impact the LOS. Although not observed in any of the following analysis, this should be pointed out as a limitation of the model.

Arterial and collector streets in developed urban areas that will likely use the MMLOS methodology are often times limited in terms of right-of-way expansion and need to employ creative strategies within the existing right of way. Another limitation of the model is its sensitivity to minor improvements, ADA considerations and surrounding land uses that often contribute significant benefits to pedestrian, bike and transit networks. Land use which brings active uses to the street can improve the pedestrian experience within the network and add passive security elements that make the environment more enjoyable to use. Minor pedestrian and bike improvements and ADA measures such as curb bulbouts, truncated domes, audible or countdown signal heads, pedestrian scaled lighting, sharrow bike stencils, and pedestrian and

bike signage/wayfinding do not show up as an input anywhere in the model resulting in no quantifiable improvement.

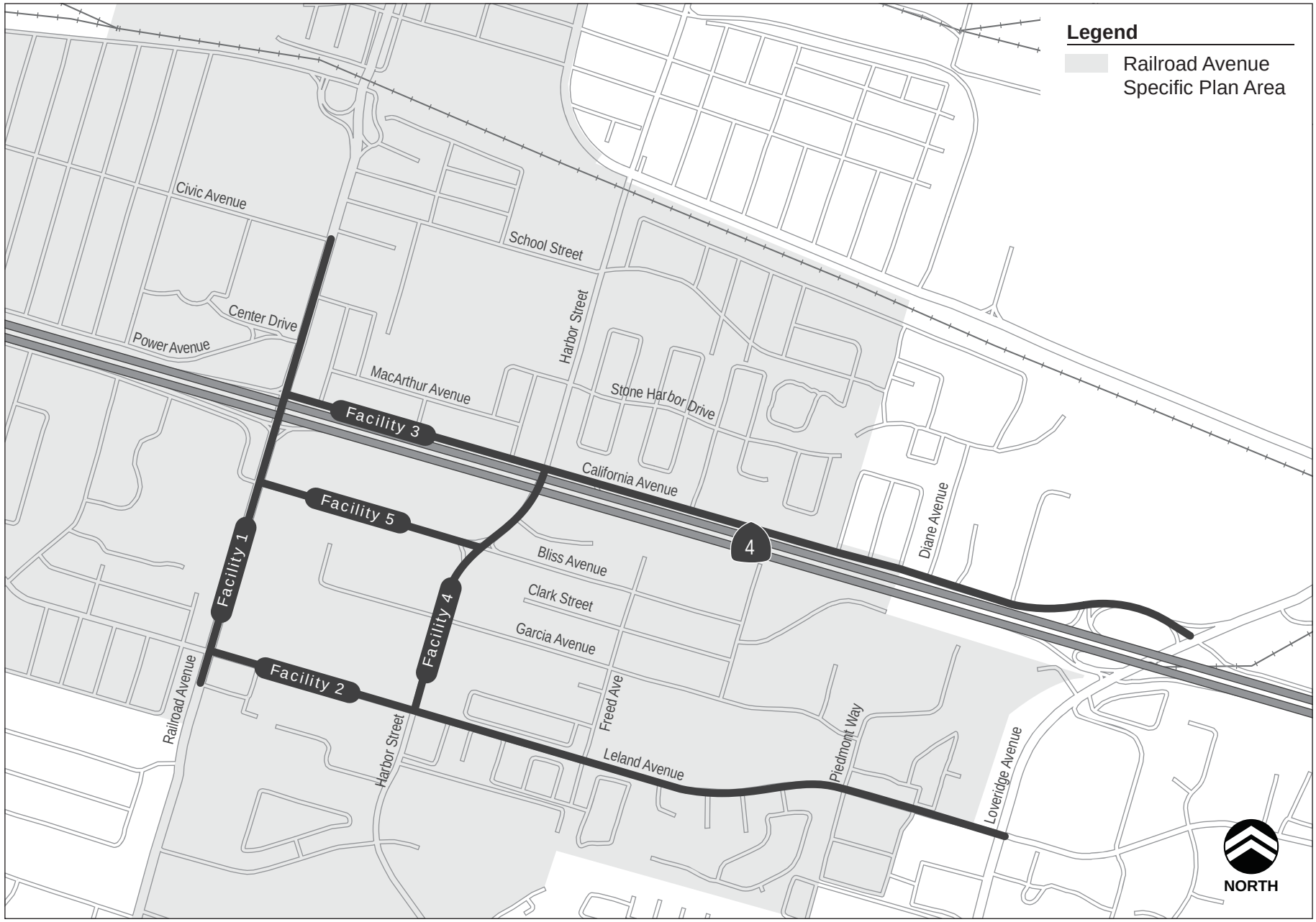
Transit LOS is calculated as a function of the whole route so incremental improvements within a study segments will also likely be masked in the segment analysis. Improvements at congested intersections for transit through measures such as queue jump lanes, bus bulbouts, and traffic signal priority or preemption are difficult to capture in the segment analysis unless these measures are implemented and modeled throughout the whole transit route. These improvements often require a high level of simulation or assumptions to quantify the saving in travel time and improvements to on-time performance which often times difficult to achieve.

2.2.3 Railroad Avenue Specific Plan (Project) Corridors

Five multimodal corridors (facilities) were included in the analysis:

- *Facility 1* - Railroad Avenue, from Civic Avenue to Leland Road
- *Facility 2* - Leland Road, from Railroad Ave to Loveridge Road
- *Facility 3* - California Avenue, from Loveridge Road to Railroad Ave
- *Facility 4* - Harbor Avenue, from Leland Road to California Avenue
- *Facility 5* - Bliss Avenue, from Railroad Avenue to Harbor Street

These corridors will be divided into analysis segments based on each of the facilities' physical and operational characteristics. Typical analysis segments extend across an intersection from one midblock point to another, however, multiple intersections with minor streets will often times be included in an analysis segment due to the uniformity of the physical and operational characteristics. Davi Avenue was not studied as a separate facility in the MMLOS analysis because there is an approved multi-use path that will operate along the southern boundary of the Civic Center subarea parallel to State Route 4 to allow pedestrians and bicyclists to travel east to the eBART station from the western neighborhoods. Figure 2-1 presents the study area and the five multimodal facilities that were analyzed.



STUDY AREA LOCATION MAP
FIGURE 2-1

Chapter 3
EXISTING CONDITIONS

This chapter is divided into two sections. The first section includes a description of the existing transportation network (traffic, transit, pedestrian, bicycle, and parking facilities) and intersection operating conditions. The second section includes an evaluation of existing transportation conditions based on the Multimodal Level of Service (MMLOS) performance criteria.

3.1 Existing Transportation Network

3.1.1 EXISTING ROADWAY NETWORK

The project area includes a number of major roadways that serve regional trips within east Contra Costa County, as well as provide access to the commercial and residential areas adjacent to the project area. Several types of roadways serve the study area according to the Pittsburg and Antioch General Plans:

- *Arterials* are high-capacity local facilities that meet demand for longer, through trips in the community.

- *Collectors* are relatively moderate-speed, moderate-capacity streets that are designed for circulation within neighborhoods and connect arterials with local streets.

- *Local Streets* are generally low-speed facilities that provide direct access to abutting properties.

The regional roads within the study area are described below and shown in Figure 3-1. The following discussion describes the methodology for evaluating traffic operations at the intersection level.

3.1.1.1 Regional Access

This section provides a discussion of the existing regional roadway network in the vicinity of the proposed eBART station area, including the location of the nearest access points.

State Route 4 (SR 4) – the primary east-west transportation corridor in Contra Costa County, connecting Intersection 80 in the City of Hercules to the west with SR 160 and the cities of Oakley and Brentwood to the east. SR 4 is a divided freeway from Interstate 680 east through Concord, Pittsburg, and Antioch, and is currently a two-lane roadway through Oakley and Brentwood. SR 4 has been on of the more congested freeways in Contra Costa County, in particular, the segments between Lone Tree Way and Railroad Avenue in the morning and Bailey Road to Lone Tree Way in the afternoon. These segments are in the process of being

widened. SR 4 has been widened to eight lanes, four in the each direction including High Occupancy Vehicle (HOV) lanes from SR 242 to Railroad Avenue. Between Railroad Avenue and SR 160, SR 4 is a four-lane freeway. Interchanges along SR 4 in the study area include:

- Railroad Avenue
- Loveridge Road

3.1.1.2 Local Access

This section provides a discussion of the existing local roadway system in the vicinity of the proposed Project site, including the roadway designation, number of travel lanes, and traffic flow directions.

Railroad Avenue – This north-south roadway runs between 3rd Street and Castlewood Drive. In the vicinity of the study area, Railroad Avenue has two travel lanes in each direction, with a landscaped, tree-lined median north and south of SR 4 and left turn pockets at major intersections. Railroad Avenue has a five-foot sidewalk on the west side and a 10-foot-wide sidewalk on its east side, and many segments have landscaping buffers. The *Pittsburg 2020 General Plan* identifies Railroad Avenue as a Major Arterial in the roadway system.

Harbor Street – This north-south roadway runs from East 3rd Street to Buchanan Road. In the vicinity of the study area, Harbor Street has two travel lanes with left turn pockets, marked by incongruently spaced narrow and wide tree-lined medians. Six-foot-wide sidewalks are located along most of its length. The *Pittsburg 2020 General Plan* identifies Harbor Street as a Minor Arterial in the roadway system.

Loveridge Road – is a north-south roadway that runs between Waterfront Road and Buchanan Road. In the vicinity of the study area, Loveridge Road has two travel lanes and bike lanes in each direction with narrow and wide tree-lined medians and left lane turning pockets at major intersections. The *Pittsburg 2020 General Plan* identifies Loveridge Road as a Major Arterial in the roadway system.

Leland Road – is an east-west roadway that runs between Century Boulevard and San Marco Boulevard. In the vicinity of the study area, Leland Road has two travel lanes and a bike lane in each direction with a large tree-lined median and left lane turning pockets at major intersections. Ten-foot-wide sidewalks are located along most of its length.

Davi Avenue – is a north-south roadway that runs between Power Avenue and North Parkside Drive. In the vicinity of the study area, Davi Avenue has one travel lane in each direction. A six-foot-wide sidewalk is located along its eastern edge. The *Pittsburg 2020 General Plan* identifies Davi Avenue as a Collector in the roadway system.

Civic Avenue – is an east-west roadway that runs between Railroad Avenue and Davi Avenue (becomes West 17th Street west of Davi Avenue). In the vicinity of the study area, Civic Avenue has two travel lanes in each direction with a large tree-lined median and a left lane turning pocket leading to the driveway entrance to City Hall. Six-foot-wide sidewalks are located along

its length. The *Pittsburg 2020 General Plan* identifies Civic Avenue as a Collector in the roadway system.

Power Avenue – is an east-west roadway that runs between Railroad Avenue and west of the Pacific Gas and Electric (PG&E) right-of-way. In the vicinity of the study area, Power Avenue has one travel lane in each direction. There is a six-foot-wide sidewalk along its northern edge, and parallel parking along both sides of the street. The *Pittsburg 2020 General Plan* identifies Power Avenue as a Collector in the roadway system.

Freed Avenue – is a north-south roadway that runs from Bliss Avenue to Leland Road. In the vicinity of the study area, Freed Avenue has one travel lane in each direction with no paved sidewalks along most of its length. The *Pittsburg 2020 General Plan* identifies Freed Avenue as a Local Street/Minor Road in the roadway system.

Bliss Avenue – is an east-west roadway that runs between Railroad Avenue and Martin Way. In the vicinity of the study area, Bliss Avenue has one travel lane in each direction with no paved sidewalks along most of its length. The *Pittsburg 2020 General Plan* identifies Bliss Avenue as a Local Street/Minor Road in the roadway system.

Garcia Avenue – is an east-west roadway that runs between Piedmont Way and ends west of Harbor Street. In the vicinity of the study area, Garcia Avenue has one travel lane in each direction with paved sidewalks on the north side of the street along a portion of its length. The *Pittsburg 2020 General Plan* identifies Garcia Avenue as a Local Street/Minor Road in the roadway system.

3.1.1.3 Methodology for Evaluating Intersection Traffic Operations

Traffic operations were evaluated based on the methodologies in the *2000 Highway Capacity Manual* (HCM 2000).

Intersection Analysis. LOS is a qualitative description of the performance of an intersection based on the average delay per vehicle. Intersection levels of service range from LOS A, which indicates free flow or excellent conditions with short delay, to LOS F, which indicates congested or overloaded conditions with extremely long delays. The HCM 2000 methodology calculates LOS values based on the average delay in seconds at the intersection, which is converted to an LOS value. The *CCTA Technical Procedures* guidelines permit this approach to deriving LOS using HCM 2000 methodologies (and Synchro 7 traffic analysis software), and this approach has been used in this traffic study.

- *Signalized Intersections* – The average delay for study area signalized intersections was calculated using the Synchro analysis software based on HCM 2000 methodology and the delay at the intersections are correlated to LOS as shown in Table 3-1.

REGIONAL ROADWAY NETWORK

FIGURE 3-1

- *Unsignalized Intersections* – These intersections were evaluated using the HCM 2000 methodology. In this case, the LOS is based on the "weighted average control delay" expressed in seconds per vehicle as illustrated in Table 3-2. Control delay includes the sum of all the individual movements that a vehicle might go through at an unsignalized intersection, including initial deceleration delay, queue move-up time, stopped delay, and final acceleration.

Table 3-1
Level of Service Criteria – Signalized Intersections

Level of Service	Description of Operations	Average Delay (seconds)
A	Operations with very low delay occurring with favorable progression and/or short cycle length.	≤ 10.0
B	Operations with low delay occurring with good progression and/or short cycle lengths.	10.1–20.0
C	Operations with average delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	20.1–35.0
D	Operations with longer delays due to a combination of unfavorable progression, long cycle lengths, or high V/C ratios. Many vehicles stop and individual cycle failures are noticeable.	35.1–55.0
E	Operations with high delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences. This is considered to be the limit of acceptable delay.	55.1–80.0
F	Operation with delays unacceptable to most drivers occurring due to over saturation, poor progression, or very long cycle lengths.	≥ 80.1

Source: Transportation Research Board, *Highway Capacity Manual*, 2000.

Table 3-2
Level of Service Criteria – Unsignalized Intersections

Level of Service	Description of Operations	Average Delay (seconds)
A	No Delay for stop-controlled approaches.	≤ 10.0
B	Operations with minor delays.	10.1–15.0
C	Operations with moderate delays.	15.1–25.0
D	Operations with some delays.	25.1–35.0
E	Operations with high delays, and long queues.	35.1–50.0
F	Operations with extreme congestion, with very high delays and long queues unacceptable to most drivers.	≥ 50.1

Source: Transportation Research Board, *Highway Capacity Manual*, 2000.

At Two-Way Stop-Controlled (TWSC) intersections, LOS is calculated for each controlled movement, as opposed to the intersection as a whole. For All-Way Stop-Controlled (AWSC) locations, LOS is computed for the intersection as a whole.

3.1.2 EXISTING TRAFFIC CONDITIONS

3.1.2.1 Existing Intersection Operating Conditions

WSA used Year 2007 counts collected for the eBART EIR/EIS traffic study for key intersections to develop the Year 2008 traffic volumes using the growth factor obtained from the CCTA Travel Demand Model.[1] Existing intersection operating conditions were evaluated for the morning peak hour (7:00 AM to 8:00 AM) and evening peak hour (4:00 PM to 6:00 PM) using Synchro software.

A total of 16 intersections were analyzed, of which 11 are signalized, four are Two-Way Stop-Controlled (TWSC) intersections, and one is an All-Way Stop-Controlled (AWSC) intersection. Figure 3-2 shows the existing geometric configuration and AM and PM peak hour turning movement volumes at the study intersections under Existing Conditions. The existing lane configurations and peak hour turning movement volumes were used to calculate the LOS for the study intersections.

Under the existing AM peak hour conditions, 15 of the 16 study intersections operate at acceptable conditions; i.e. at an LOS better or equal to the threshold defined by the applicable jurisdiction. The Harbor Street and Garcia Avenue intersection operates at an unacceptable LOS.

[1] Refer to *Chapter 2* for more detailed information about Contra Costa Transportation Authority (CCTA) Travel Demand Model and Synchro Modeling Software. In addition, the turning movement volumes at the intersection of Harbor Street and Garcia Avenue were obtained from the City of Pittsburg.

Under the existing PM peak hour conditions, 13 of the 16 study intersections operate at acceptable conditions; i.e. at an LOS better or equal to the threshold defined by the applicable jurisdiction. The following intersections operate at unacceptable conditions:

- Leland Road/Freed Avenue
- California Avenue/SR 4 Westbound Ramps
- Harbor Street/Garcia Avenue

Table 3-3 summarizes the intersection operations under Existing conditions.

Table 3-3
Study Intersection Operations – Existing Conditions

#	Intersection	Threshold			AM Peak			PM Peak		
		Control	Jurisdiction	LOS	V/C	Delay	LOS	V/C	Delay	LOS
1	Civic Avenue – W.17th Street/Davi Avenue	AWSC	City of Pittsburg	E		8.3	A		8.2	A
2	Power Avenue/Davi Avenue	TWSC	City of Pittsburg	E	0.11	12.1 (SB)	B	0.12	13.4 (SB)	B
3	Railroad Avenue/Civic Avenue	Signal	CCTA	D[b]	0.44	18.6	B	0.37	14.4	B
4	Railroad Avenue/Center Drive	TWSC	City of Pittsburg	E	0.62	21.4 (EB)	C	0.51	17.1 (EB)	C
5	Railroad Avenue/SR 4 Westbound On-Ramp	Signal	Caltrans	C/D[a]	0.92	51	D	0.61	15.4	B
6	Railroad Avenue/SR 4 Eastbound Ramps	Signal	Caltrans	C/D[a]	0.73	18.6	B	0.80	16.8	B
7	Railroad Avenue/Bliss Avenue	Signal	CCTA CMP	E	0.57	17.7	B	0.84	24.5	C
8	Railroad Avenue/Leland Road	Signal	CCTA CMP	E	0.82	33.9	C	0.99	55.3	E
9	Leland Road/Harbor Street	Signal	CCTA	D[b]	0.74	31.4	C	0.83	41.2	D
10	Leland Road/Freed Avenue	TWSC	City of Pittsburg	E	0.31	44 (SB)	E	**1.08**	**>80 (NB)**	**F**
11	Leland Road/Loveridge Road	Signal	CCTA	D[b]	0.72	36.5	D	0.84	33.8	C
12	Loveridge Road/SR 4 Eastbound Ramps	Signal	Caltrans	C/D[a]	0.63	16.2	B	0.67	12.9	B
13	California Avenue/SR 4 Westbound Ramps	Signal	Caltrans	C/D[a]	0.70	31.2	C	**0.91**	**58.6**	**E**
14	Harbor Street/California Avenue	Signal	CCTA	D[b]	0.74	33.4	C	0.88	43.1	D
15	Harbor Street/Bliss Avenue	Signal	City of Pittsburg	E	0.63	5.7	A	0.56	16.7	B
16	Harbor Street/Garcia Avenue	TWSC	City of Pittsburg	E	**0.98**	**>80 (WB)**	**F**	**7.13**	**>80 (EB)**	**F**

Source: Wilbur Smith Associates, December 2008.

Notes:

AWSC – All-way Stop Control; TWSC – Two-way Stop Control

Signal – Traffic Signal

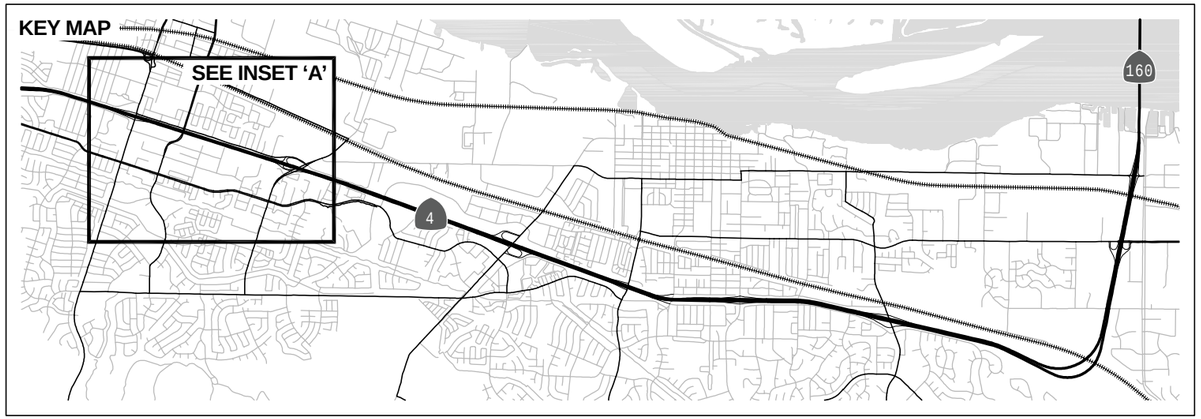
Delay presented in seconds per vehicle.

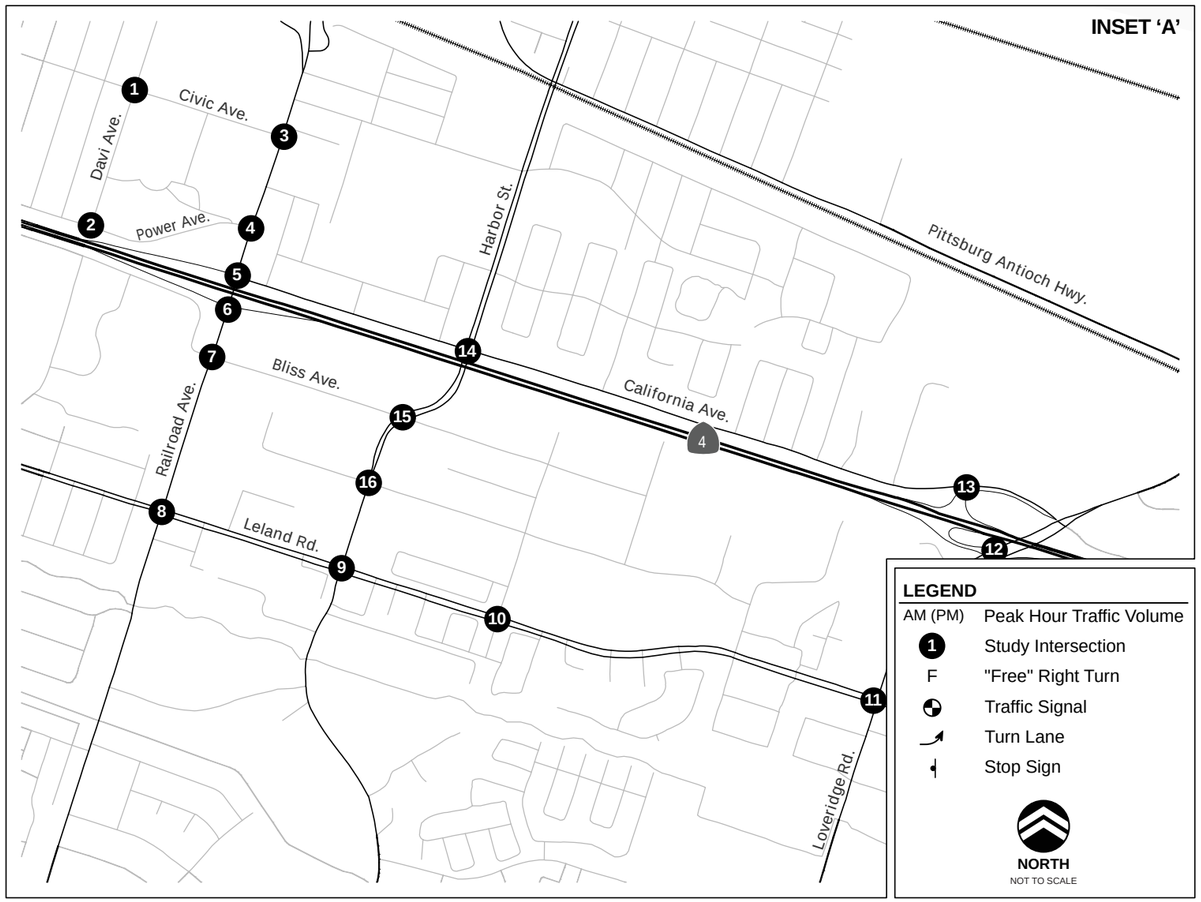
Delay and LOS presented for worst approach for two-way stop controlled intersections.

Boldface type indicates unacceptable values.

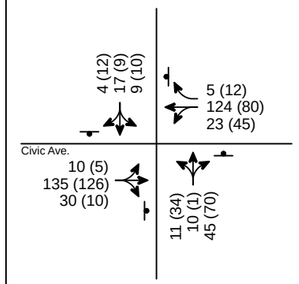
a. Represents a target LOS at the transition between LOS C and LOS D.

b. For an Urban Area V/C ratio must be between 0.85 and 0.89.

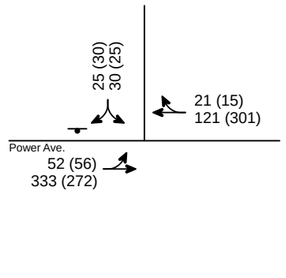




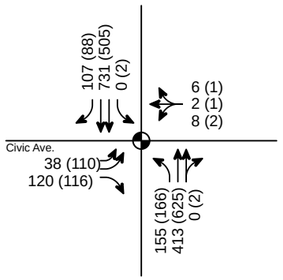
1. Civic Ave./Davi Ave.



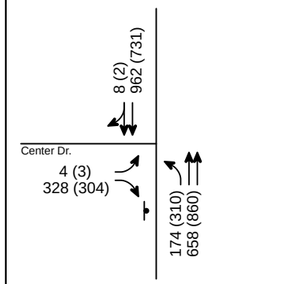
2. Power Ave./Davi Ave.



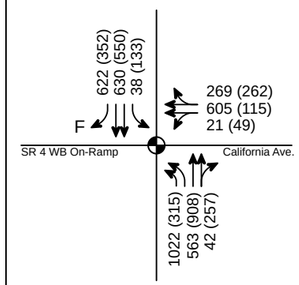
3. Civic Ave./Railroad Ave.



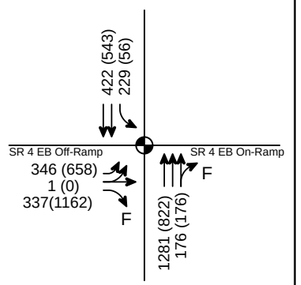
4. Center Dr./Railroad Ave.



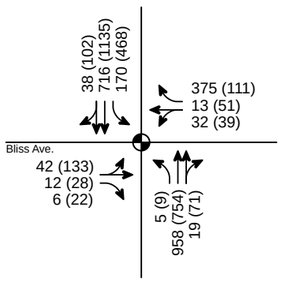
5. SR 4 WB On-Ramp/Railroad Ave.



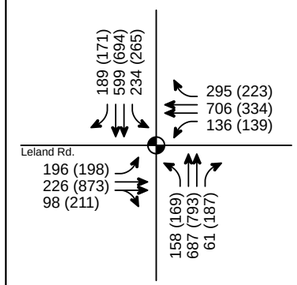
6. SR 4 EB Ramps/Railroad Ave.



7. Bliss Ave./Railroad Ave.



8. Leland Rd./Railroad Ave.



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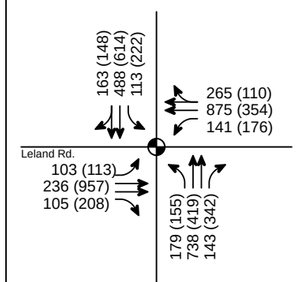
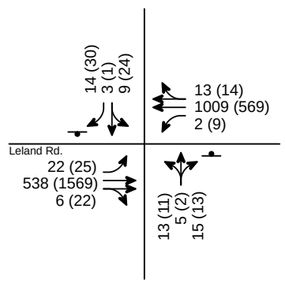
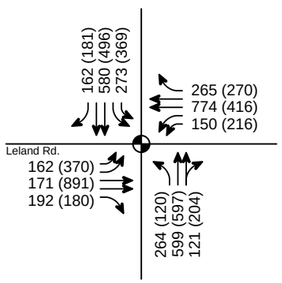


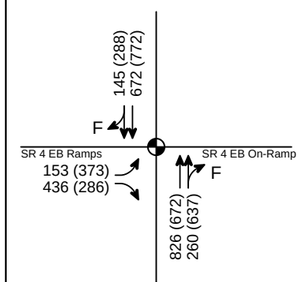
10. Leland Rd./Freed Ave.



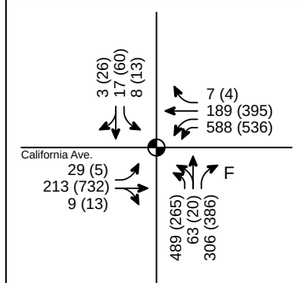
11. Leland Rd./Loveridge Rd.



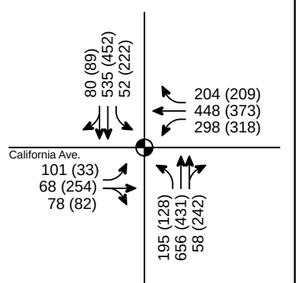
12. SR 4 EB Ramps/Loveridge Rd.



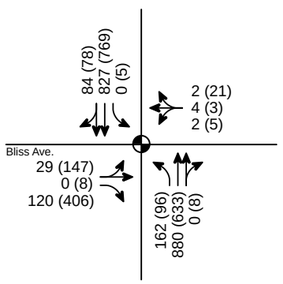
13. California Ave./SR 4 WB Ramps



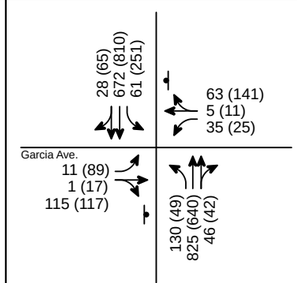
14. California Ave./Harbor St.



15. Bliss Ave./Harbor St.



16. Garcia Ave./Harbor St.



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PITTSBURG TRAFFIC STUDY INTERSECTIONS - EXISTING CONDITIONS

FIGURE 3-2

Traffic Service Objectives. The ability of the current freeway and roadway network to meet the Traffic Service Objects for the Regional Routes of Significance set forth in the East County Action Plan of 2000 was evaluated. Eleven of the 16 study intersections are on routes of regional significance. Of these intersections, the following two intersections currently fail to satisfy the traffic service objectives:

- #8 Railroad Avenue/Leland Road
- #10 Leland Road/Freed Avenue

In addition the freeway portion of SR 4 does not meet the vehicle occupancy and delay index standards.

3.1.3 TRANSIT NETWORK

Two major public transit operators provide service within or adjacent to the study area, BART and the Eastern Contra Costa Transit Authority, or Tri Delta Transit. Limited service is also provided by other transit agencies that mainly serve areas further from the study area. Figure 3-3 illustrates the existing transit network in reference to the Railroad Avenue Specific Plan boundaries and Tri Delta routes. Table 3-4 presents the service frequencies for BART routes and Table 3-5 presents the Tri Delta Transit bus lines within the study area.

3.1.3.1 BART Service

The Pittsburg/Bay Point BART service terminates at the southwest quadrant of the SR 4/Bailey Road interchange. During weekdays, scheduled trains complete over 80 outbound trips from the Pittsburg/Bay Point BART Station to other Bay Area destinations. In FY 2007, the station had an average of 4,986 weekday patron exits. The SFO-Pittsburg/Bay Point line, also referred to as the Concord Line, provides direct service to and from San Francisco and runs from 4:00 AM to 12:00 AM daily. Weekday service frequencies for outbound trains range from six minutes during the morning peak hour to 15 minutes off peak, and are summarized in Table 3-4. The table also shows the average frequency of trains through the Transbay Tube between the West Oakland and Embarcadero Stations.

Table 3-4
Existing Weekday BART Frequency of Service

	Transbay Tube Frequency (min)		Concord Line Frequency (min)	
	Westbound	**Eastbound**	**Westbound**	**Eastbound**
AM Peak	2.75	3.00	6.00	7.50
AM Shoulder[a]	4.00	5.00	7.50	7.50
PM Peak	5.00	2.75	7.50	6.00
PM Shoulder[a]	7.50	3.75	7.50	7.50
Midday	7.50	4.00	15.00	15.00
Weekday Average	6.00	4.25	11.42	11.42

Sources: BART, 2008; Arup, 2008.

Notes:
a. The AM and PM shoulders are defined as the hour before and after the peak hour.

3.1.3.2 Tri Delta Transit Service

Tri Delta Transit serves East Contra Costa County including the cities of Pittsburg, Antioch, Oakley, and Brentwood; and the unincorporated areas of East County, along with Bay Point. Tri Delta Transit operates 16 local bus routes from Monday to Friday, including four express services, and three local bus routes during weekends and holidays. Figure 3-3 presents the bus routes within the study area. BART regional rail service can be accessed from the Tri Delta Transit local and express bus service. Paratransit ("Dial-A-Ride") service is also provided by Tri Delta Transit. The Dial-A-Ride service utilizes a computerized dispatch system to match van routing with passenger trip requests.

Tri Delta Transit has an annual fixed route ridership of over 2.5 million boardings. Route 380, a weekday local route from Pittsburg/Bay Point BART Station through Hillcrest Park-and-Ride Lot into Antioch, carried the largest volume of riders, and was one of the most productive routes in terms of passengers per revenue hour. Route 300, a service between Brentwood and the Pittsburg/Bay Point BART Station, which also passes through the Antioch Park-and-Ride Lot, had the highest ridership among the weekday express service.[2] Table 3-5 presents the Tri Delta Transit bus routes, service type and service frequency.

[2] Source: Tri Delta Transit Short Range Transit Plan (SRTP) FY 2007/2008 – FY 2017/2018 (January 30, 2008).

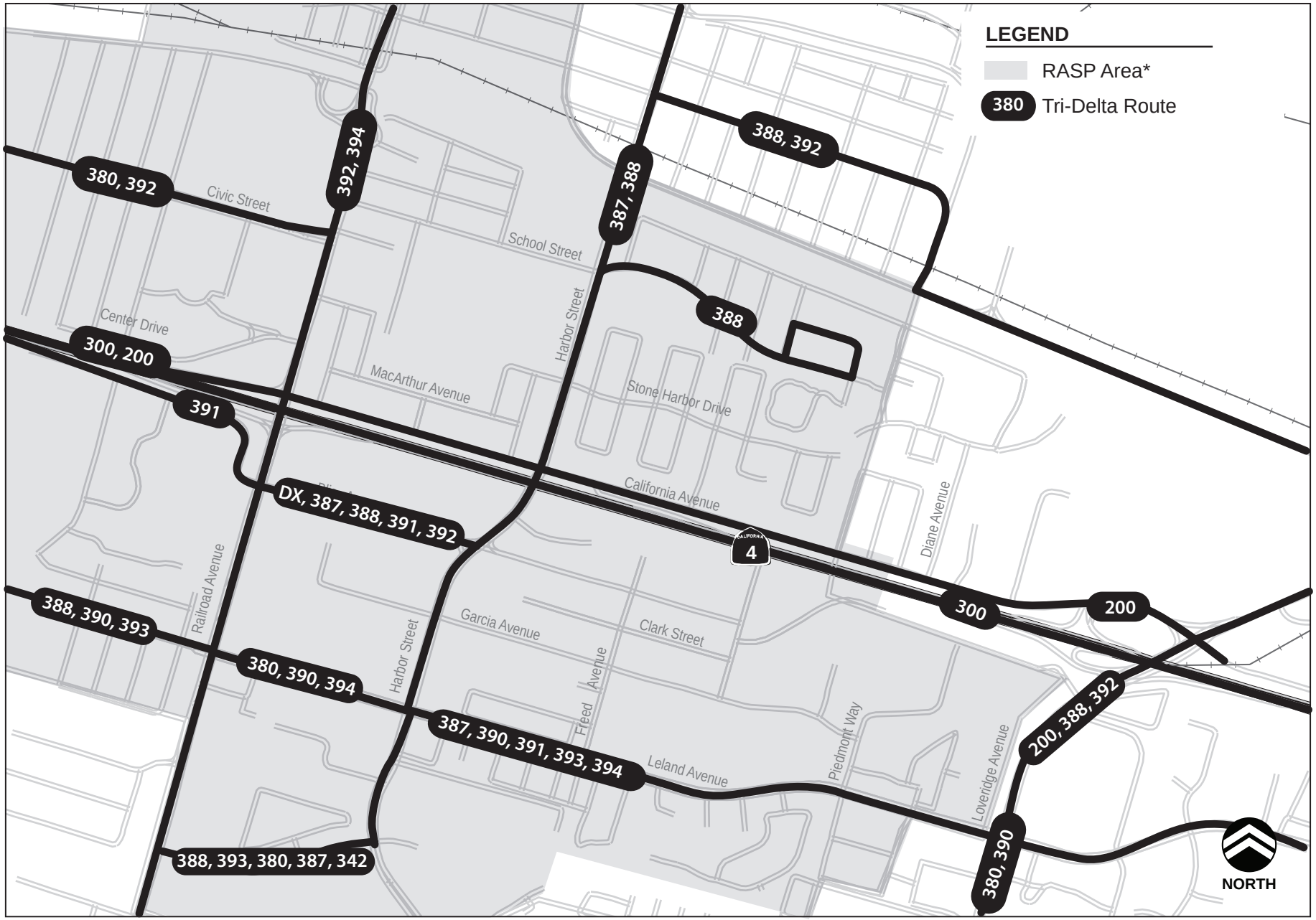
Table 3-5
Tri Delta Transit Bus Lines Near or Serving the Study Area

Route	Service Type	Service Frequency (minutes)		
		AM	Midday	PM
70 Pittsburg Marina/Buchanan	Weekday Local	40–80	40–80	40–80
200 Martinez/Pittsburg	Weekday/Express	60–75	60	60–75
201 Pittsburg BART/Concord BART	Weekday/Commute	30–60	60	30–60
300 Pittsburg BART/Brentwood	Weekday/Express	20	30	15–30
380 Pittsburg BART/Tri Delta Antioch	Weekday Local	20–60	5–75	20–60
383 Antioch Park & Ride/Oakley	Weekday Local	55–70	60	5–80
384 Antioch Park & Ride/Brentwood	Weekday Local	15–60	30–75	60
385 Antioch Park & Ride/Brentwood	Weekday Local	60	60–85	60
386 Brentwood/Discovery Bay/Byron	Weekday Local	120–210	1 bus	90–210
387 Pittsburg BART/Tri Delta Antioch	Weekday Local	50–80	50–70	60
388 Pittsburg BART/Kaiser Medical Clinic	Weekday Local	10-45	30–80	30–120
389 Pittsburg BART/Bay Point	Weekday Local	60	60	60
390 Pittsburg BART/Antioch Park & Ride	Weekday/Commute	5–30	N/A	15–30
391 Pittsburg BART/Brentwood Park & Ride	Weekday Local	30–60	60	15–75
392 Pittsburg BART/Antioch Park & Ride	Weekend/Holiday	60	60	60–90
393 Pittsburg BART/Brentwood Park & Ride	Weekend/Holiday	60	60	60–80
394 Pittsburg BART/Antioch Park & Ride	Weekend/Holiday	60	60	60
BDR Brentwood Dimes-a-Ride	Weekday Local	60	60	60
DX Antioch Park & Ride/Martinez	Weekday/Commute	1 bus	N/A	1 bus
DX Antioch Park & Ride/Livermore	Weekday/Express	60	N/A	60
DX Antioch Park & Ride/Dublin BART	Weekday/Express	30	N/A	75

Source: Tri Delta Transit Schedule, 2008.

3.1.3.3 County Connection Transit Service

The County Connection Transit Service, operated by the Contra Costa County Transit Authority (CCCTA), serves most Contra Costa cities, with limited service to East County areas. County Connection operates Route 930 through Pittsburg, which originates in Walnut Creek and travels to Ygnacio Valley Road/Kirker Pass Road to Buchanan Road. Its terminus is at the Hillcrest Park-and-Ride Lot in Antioch. Westbound service is offered weekday mornings, from 5:30 AM to 7:00 AM, approximately every 30 minutes. Eastbound evening service runs from 3:00 PM to 7:00 PM, at frequencies of 30 to 60 minutes. The County Connection Transit Service can be accessed through Tri Delta Transit Route 70, as well as routes that pass through the Hillcrest Park-and-Ride Lot.



** Railroad Avenue Specific Plan Area*

TRI DELTA TRANSIT ROUTES
FIGURE 3-3

WilburSmith ASSOCIATES

3.1.4 PEDESTRIAN CONDITIONS

There are existing sidewalks along most of the roadways within the study area. The sidewalks range from five to 10 feet wide at various locations and are generally in good condition. Crosswalks are present at most of the study intersections; however, at a majority of the intersections on arterials, pedestrian crossings exist only along one approach each in the north-south and east-west directions to limit pedestrian crossing conflicts and exposure in high traffic areas. Existing gaps in the pedestrian network throughout the study area are summarized below.

- South side of Power Avenue, adjacent to SR 4
- East side of Davi Avenue, adjacent to the City Hall grounds
- West side of Loveridge Road, north of SR 4
- East side of Loveridge Road, north of SR 4 overpass
- Bliss Avenue, entire length except segment along BART park-and-ride lot
- Portions of north side and all of south side of Garcia Avenue
- Freed Avenue, entire length

3.1.5 BICYCLE CONDITIONS

According to the Pittsburg General Plans and the Contra Costa Countywide Bicycle and Pedestrian Plan, there are existing bicycle lanes along some of the roadways as well as an off-street bike path (Class I facility) close to the two proposed eBART stations. Bicycle lanes are generally well-connected to one another, and most of the major roads in the vicinity of the proposed stations provide Class II or Class III bicycle facilities. Table 3-6 presents existing bicycle facilities that traverse the study area.

Table 3-6
Existing Bicycle Facilities Near or Serving the Study Area

Street	From:	To:	Class[a]
Harbor Street	Buchanan Road	East 10th Street	III/II[b]
Railroad Avenue	State Route 4	East 10th Street	III
E. Leland Road	Railroad Avenue	Antioch City Limit	II
Loveridge Road	Buchanan Road	Waterfront Road	II

Source: Wilbur Smith Associates, 2008.

Notes:

a. Bicycle facility classifications:
Class I – Off-street bike path
Class II – Marked on-street bike lane
Class III – Shared bike route; roadways recommended for use by bicycles and are designated by signs only

b. Existing Class III facility, planned Class II

Figure 3-4 presents the existing bicycle facilities throughout the study area.

** Railroad Avenue Specific Plan Area*

EXISTING BICYCLE FACILITIES
FIGURE 3-4

3.1.6 PARKING CONDITIONS

3.1.6.1 Off-Street Parking

Most of the available on-street parking within the study area is located along residential streets and minor roads. The City of Pittsburg has established Preferential Residential Permit Parking Programs (PRPPs). These programs allow residential areas to be designated as restricted parking areas in order to prevent long-term non-resident and commuter parking. The City of Pittsburg has established a PRPP area and within that area, the City does not currently charge for permits. In general, off-street parking requirements are set to provide a sufficient number of spaces and prevent spillover onto neighboring residential streets.

3.1.6.2 Park-and-Ride Lots

There is one main park-and-ride lot located within the study area. This lot is generally well served by local transit and is owned by BART. All of the parking lots are free and provide lighting. The Pittsburg Park-and-Ride Lot is located on Bliss Avenue, between Harbor Street and Railroad Avenue, has a parking supply of 185 parking spaces. Five of the Tri Delta Transit routes service this location, including the Delta Express (DX) lines.

3.1.6.3 BART Station Parking

The parking lot at the Pittsburg/Bay Point BART Station offers free parking and provides 2,036 patron spaces, including 117 designated carpool spaces, 35 ADA spaces, and over 50 mid-day spaces, which are spaces that are available only after 10:00 AM[3]. According to the BART website, the estimated fill time for this lot is 7:25 AM, and parking is limited to 24 hours.

[3] Accessible parking spaces are provided in compliance with the regulations specified in the Americans with Disabilities Act (ADA) of 1990.

3.2 Multimodal Level of Service (MMLOS) Analysis – Existing Conditions

The following section evaluates the transportation facilities (previously discussed) under existing conditions based on the Multimodal Level of Service (MMLOS) criteria. As discussed in *Chapter 2*, the MMLOS analyzes multimodal corridors (facilities) and breaks them down into segments, providing an LOS score for each segment and direction by mode (auto driver, bus passenger, bicyclist, and pedestrian).[4] As such, five facilities were designated throughout the study area as listed below:

- *Facility 1* - Railroad Avenue, from Civic Avenue to Leland Road
- *Facility 2* - Leland Road, from Railroad Avenue to Loveridge Road
- *Facility 3* - California Avenue, from Loveridge Road to Railroad Avenue
- *Facility 4* - Harbor Avenue, from Leland Road to California Avenue
- *Facility 5* - Bliss Avenue, from Railroad Avenue to Harbor Street

3.2.1 Facility 1

Facility 1 operates along Railroad Avenue, from Civic Avenue (to the north) to Leland Road (to the south) with five segments in the northbound and southbound directions. This facility experiences high traffic volumes and is serviced by Tri Delta Transit Routes 392 and 394, with four bus stops along the roadway and several transit routes operating adjacent to Facility 1. A Class III Bicycle facility is planned to be located in the northern portion of the facility; specifically from the State Route 4 ramps to East 10th Street along Railroad Avenue. Sidewalks and striped crosswalks are present along Facility 1; however high traffic volumes were observed to constrain pedestrian accessibility and affect perception of safety. Table 3-7 and Figure 3-5 presents the MMLOS for Facility 1 under existing conditions.

[4] Refer to Appendix E for detailed MMLOS calculation tables per facility.

Table 3-7 Multimodal Level of Service Analysis - Facility 1 Railroad Avenue, from Civic Avenue to Leland Road				
Segment	**Auto LOS**	**Transit LOS**	**Bicycle LOS**	**Pedestrian LOS**
Northbound				
1	F	C	F	D
2	F	C	E	D
3	C	C	D	D
4	B	C	F	D
5	C	C	F	D
Facility NB	**E**	**C**	**F**	**D**
Southbound				
1	B	C	F	E
2	C	C	E	E
3	C	C	D	E
4	C	C	D	E
5	C	C	E	F
Facility SB	**C**	**C**	**E**	**E**

3.2.2 Facility 2

Facility 2 operates along Leland Road, from Railroad Avenue (to the west) to Loveridge Road (to the east) with three segments in the eastbound and westbound directions. As a major arterial, Facility 2 experiences high traffic volumes and is serviced by Tri Delta Transit Routes 380, 387, 390, 391, 393,and 394, with five bus stops along its length. A Class II Bicycle Route is located along the facility from Railroad Avenue to Antioch city limits where it terminates. Five to 10-foot sidewalks and wide medians are present along Facility 2; however there are only two striped crosswalks (at the intersections of Leland Road/Leland Court and Leland Road/Piedmont Way) and the remaining side streets that intersect Leland Road do not have marked crosswalks, which were observed to constrain pedestrian accessibility and affect perception of safety. Table 3-8 and Figure 3-6 presents the MMLOS for Facility 2 under existing conditions.

Table 3-8 Multimodal Level of Service Analysis - Facility 2 Leland Road, from Railroad Avenue to Loveridge Road				
Segment	**Auto LOS**	**Transit LOS**	**Bicycle LOS**	**Pedestrian LOS**
Eastbound				
1	B	A	F	E
2	B	A	F	D
3	F	A	F	E
Facility EB	**F**	**A**	**F**	**E**
Westbound				
1	B	A	E	D
2	C	F	F	E
3	E	A	F	E
Facility WB	**B**	**A**	**F**	**E**

3.2.3 Facility 3

Facility 3 operates along California Avenue, from Railroad Avenue (to the west) to Loveridge Road (to the east) with two segments in the eastbound and westbound directions. As a minor arterial, this facility experiences high traffic volumes, primarily due to its connection to Railroad Avenue and State Route 4 ramps. The Tri Delta Transit Route 200 operates along Facility 3; however there are no bus stops located along the roadway. Five-foot sidewalks are present; however there are no buffers or striped crosswalks along side streets that intersect with California Avenue. There are no bicycle facilities along the Facility 3. Table 3-9 and Figure 3-7 presents the MMLOS for Facility 3 under existing conditions.

Table 3-9 Multimodal Level of Service Analysis - Facility 3 California Avenue, from Loveridge Road to Railroad Avenue				
Segment	**Auto LOS**	**Transit LOS**	**Bicycle LOS**	**Pedestrian LOS**
Eastbound				
1	B	F	F	E
2	B	F	F	E
Facility EB	**B**	**F**	**F**	**E**
Westbound				
1	F	F	E	E
2	B	F	F	E
Facility WB	**F**	**F**	**F**	**E**

3.2.4 Facility 4

Facility 4 operates along Harbor Street, from California Avenue (to the north) to Leland Road (to the south) with two segments in the northbound and southbound directions. As a minor arterial, this facility experiences a moderate amount of traffic volumes and is serviced by Tri Delta Transit Route 387 and 388 with two bus stop locations along the roadway. There are Class II and Class III Bicycle Routes from Buchanan Road to East 10th Street along Facility 4. Sidewalks and wide roadway medians are present along Facility 4. There are two striped crosswalks at the intersection of Harbor Street/Bliss Avenue and Harbor Street/California Avenue, no striped crosswalks at each driveway, no mid-block crossings, and no roadway buffers along Facility 4. Table 3-10 and Figure 3-8 presents the MMLOS for Facility 4 under existing conditions.

Table 3-10
Multimodal Level of Service Analysis - Facility 4
Harbor Avenue, from Leland Road to California Avenue

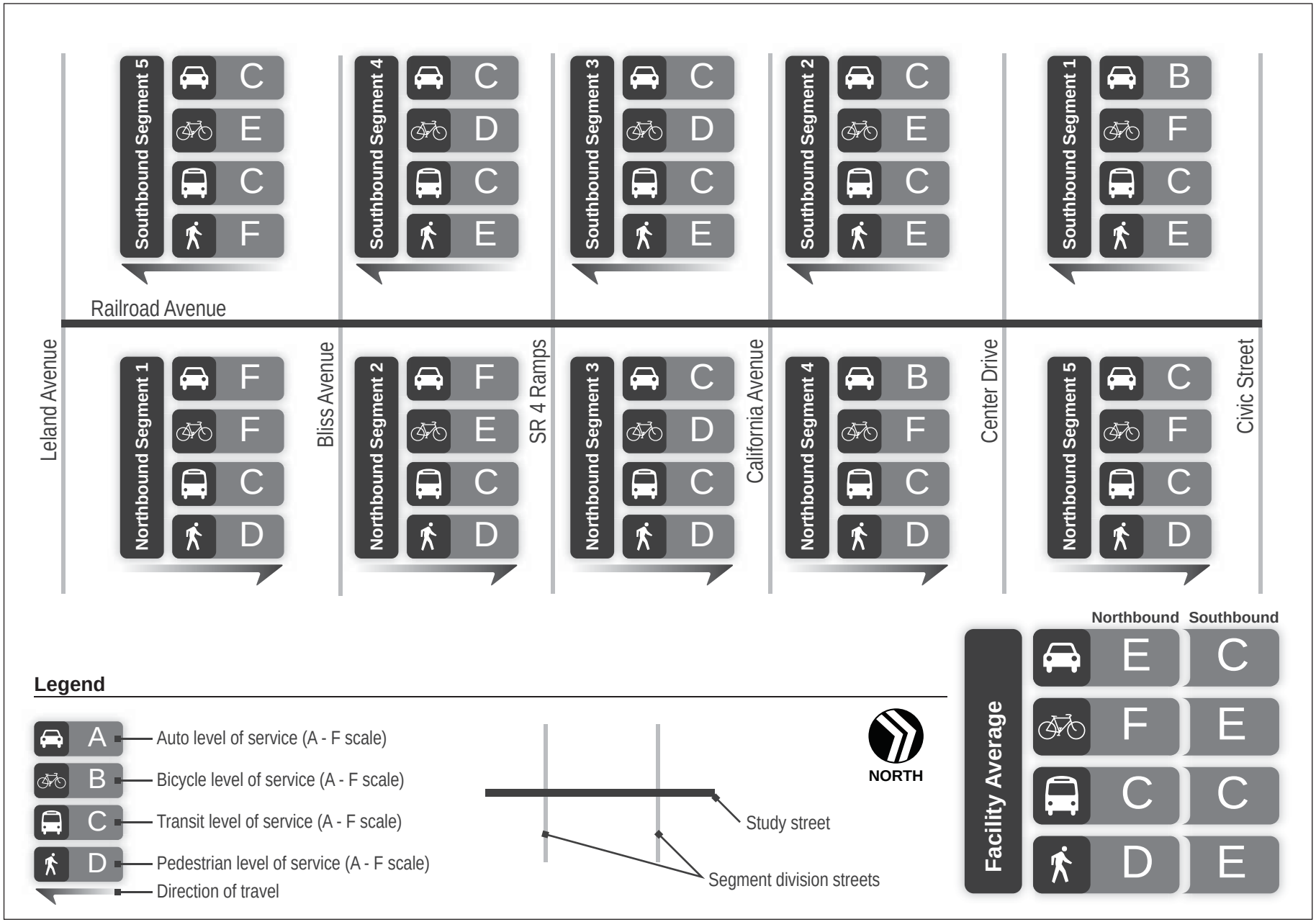
Segment	Auto LOS	Transit LOS	Bicycle LOS	Pedestrian LOS
Northbound				
1	B	A	F	D
2	F	F	F	E
Facility NB	**F**	**B**	**F**	**D**
Southbound				
1	B	F	F	D
2	F	A	F	E
Facility SB	**F**	**B**	**F**	**E**

3.2.5 Facility 5

Facility 5 operates along Bliss Avenue, from Railroad Avenue (to the west) to Harbor Street (to the east) with one segment in the eastbound and westbound directions. As a local street, this facility experiences a low-to-moderate amount of traffic volumes and is serviced by Tri Delta Transit Routes DX, 387, 388, 391,and 392; however there are no bus stops along the roadway. There are no bicycle facilities and sidewalks are only located along the northern portion of Facility 5 (to allow pedestrian access to the BART park-and-ride lot) but are not continuous. There are no striped crosswalks present and no roadway buffers along Facility 5. Table 3-11 and Figure 3-9 present the MMLOS for Facility 5 under existing conditions.

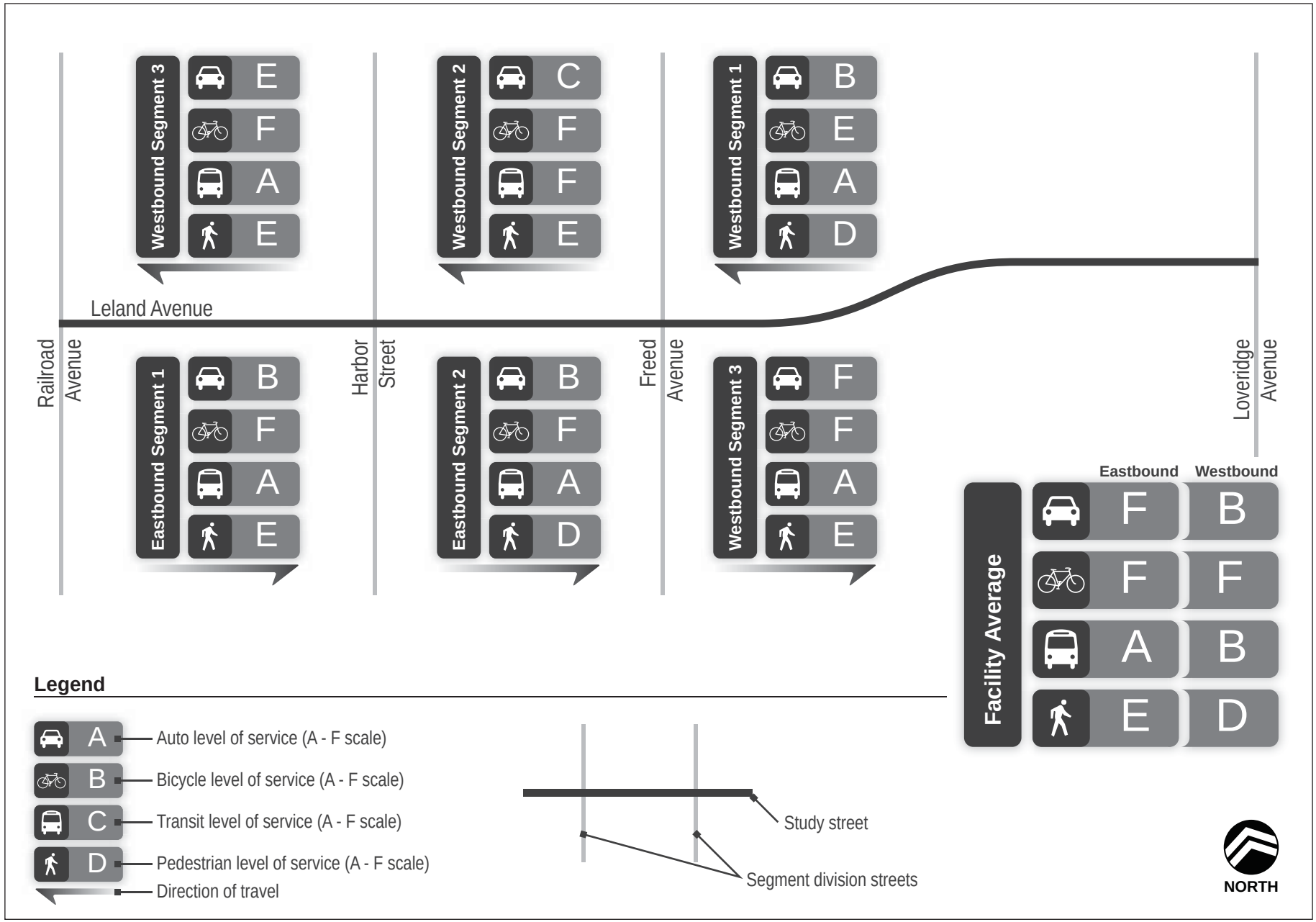
Table 3-11
Multimodal Level of Service Analysis - Facility 5
Bliss Avenue, from Railroad Avenue to Harbor Street

Segment	Auto LOS	Transit LOS	Bicycle LOS	Pedestrian LOS
Eastbound				
1	F	F	F	E
Facility EB	**F**	**F**	**F**	**E**
Westbound				
1	C	F	F	E
Facility WB	**C**	**F**	**F**	**E**



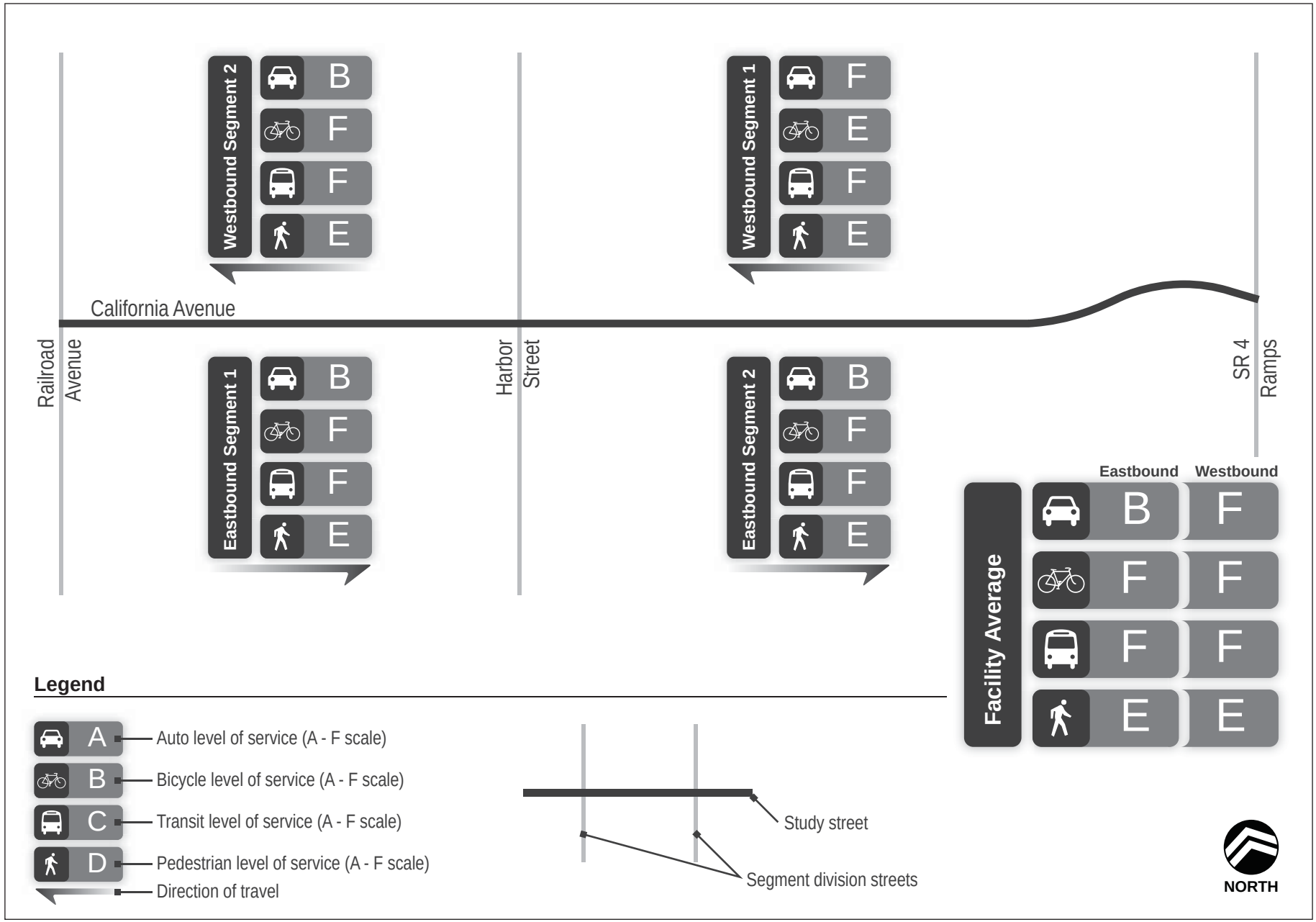
FACILITY 1: RAILROAD AVENUE EXISTING MMLOS

FIGURE 3-5



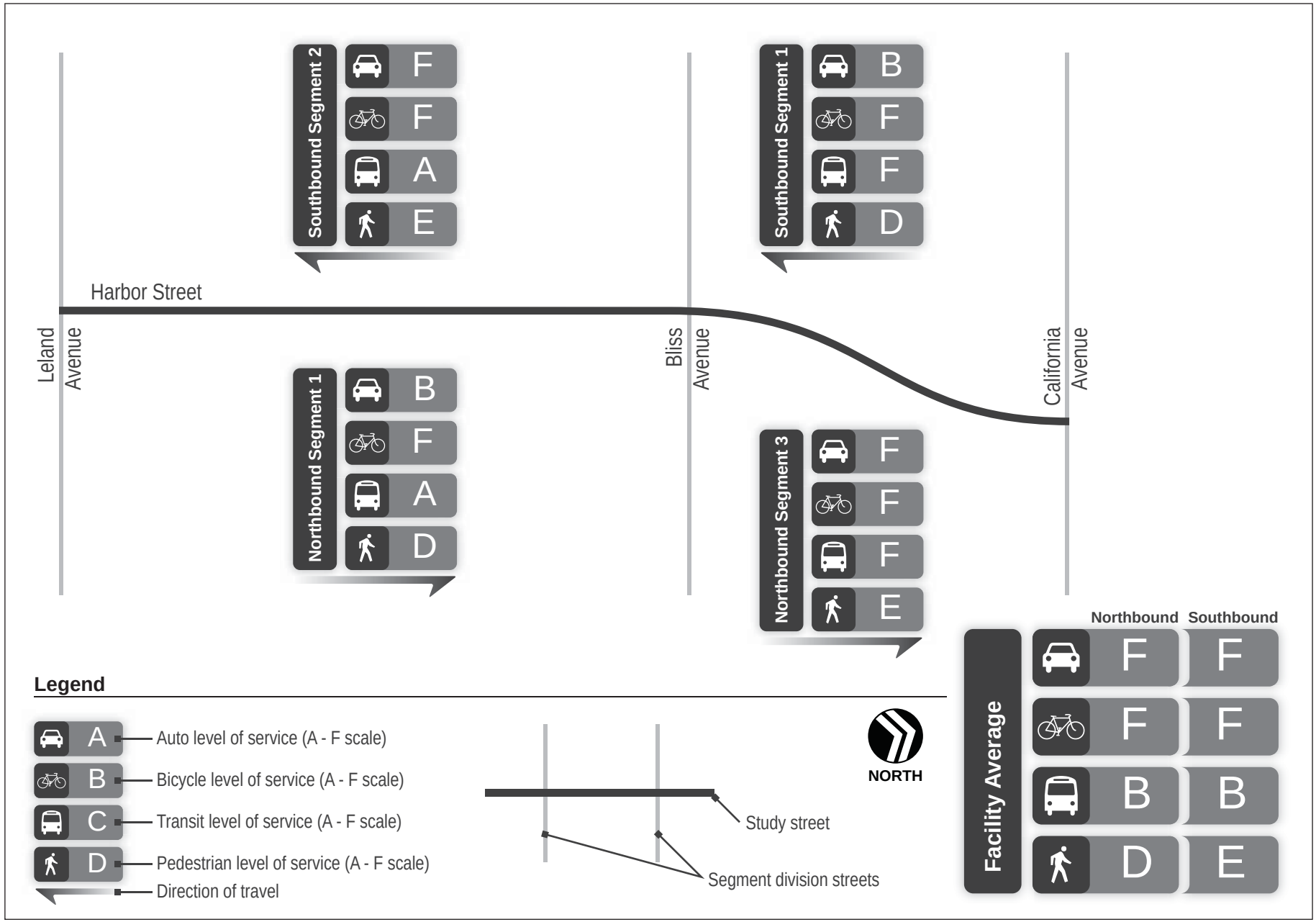
FACILITY 2: LELAND AVENUE EXISTING MMLOS

FIGURE 3-6



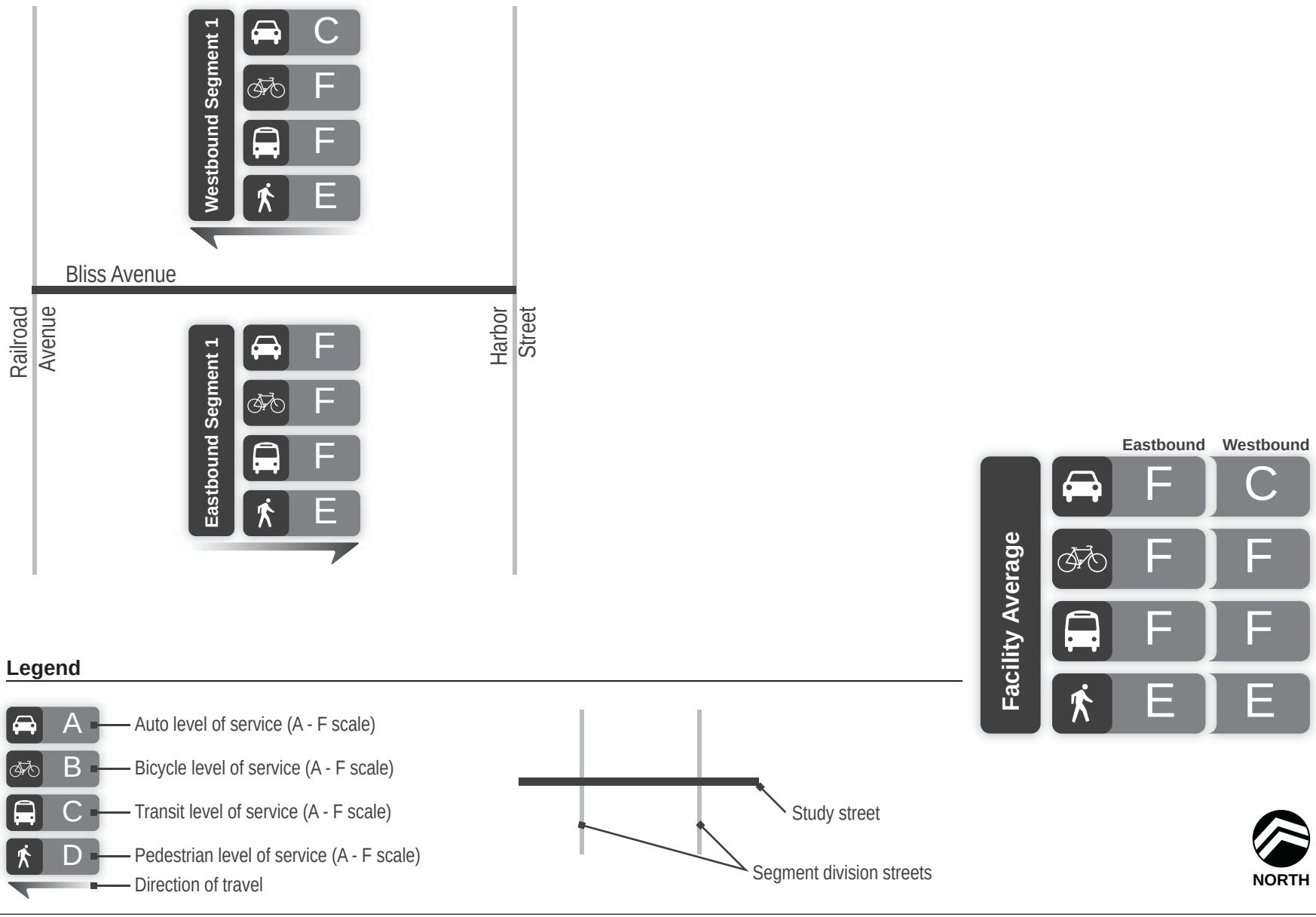
FACILITY 3: CALIFORNIA AVENUE EXISTING MMLOS

FIGURE 3-7



FACILITY 4: HARBOR STREET EXISTING MMLOS

FIGURE 3-8



FACILITY 5: BLISS AVENUE EXISTING MMLOS

FIGURE 3-9

Chapter 4
TRANSPORTATION IMPACT ANALYSIS

This chapter discusses the transportation operations under future conditions. Traffic (intersection), parking, and transportation circulation conditions are analyzed in this chapter. These conditions form the basis against which transportation impacts related to the proposed project would be identified.

Three scenarios were analyzed as a part of the traffic impact analysis. The following sections include the traffic operations for key intersections within the study area under Year 2015 No Project, Year 2015 plus Project, Year 2015 plus Project (Alternative 1), Year 2030 No Project, Year 2030 plus Project, and Year 2030 plus Project (Alternative 1) conditions.[1] The Levels of Service (LOS) of the study intersections were calculated using the same methodologies mentioned in *Chapter 2*. Potential transportation impacts related to the increased development potential envisioned the Railroad Avenue Specific Plan (beyond that included in the *Pittsburg 2020 General Plan* and evaluated in the *Pittsburg 2020 General Plan EIR*) are identified in this chapter. Refer to Appendix A for LOS calculations and output data sheets.

Parking and transportation circulation near the proposed transit station is evaluated under future conditions. Potential parking and transportation circulation impacts associated with proposed station area are based on the planned transportation facilities presented in the Railroad Avenue Specific Plan and forecasted travel patterns based on the CCTA Travel Demand Model.

4.1 TRANSPORTATION IMPACT ANALYSIS

4.1.1 Year 2015 No Project Scenario

During the AM peak hour, 14 of the 16 study intersections would operate under acceptable conditions. The two intersections that would operate at an unacceptable level of service are:

- #9 - Leland Road/Freed Avenue
- #15 - Harbor Street/Garcia Avenue

During the PM peak hour, 14 of the 16 study intersections would operate under acceptable conditions. The two intersections that would operate at an unacceptable level of service are:

- #9 - Leland Road/Freed Avenue
- #15 - Harbor Street/Garcia Avenue

[1] Refer to Chapter 2 for a detailed description of the impact assessment methodology, volume development procedures, and complete description of each scenario.

Intersection operations under Year 2015 No Project conditions are presented in Table 4-1 on page 4-9 and Figures 4-1 on page 4-15. When the traffic forecasts for the Years 2015 and 2030 are viewed in comparison with the existing traffic counts collected in the Year 2007 it is important to consider the changes to the highway network that have occurred and will occur between now and Year 2030 as follows:

SR 4 Widening - Currently SR 4 narrows from four lanes in each direction including an HOV lane to two general traffic lanes at Railroad Avenue. The narrow two lane section extends from Railroad Avenue to SR 160. By the year 2015, it is expected that SR 4 will be widened to four lanes in each direction all the way to SR 160. This narrow section is currently a major traffic bottleneck in both directions. Due to the bottleneck there is a significant diversion of traffic to the routes that parallel SR 4 including the Pittsburg Antioch Highway, Leland Road, Buchanan Parkway, James Donlan Parkway, and 18th Street. This diverted traffic uses the various interchanges along SR 4 between Willow Pass Road and 18th Street (Antioch), including the Railroad Avenue interchange to reach these parallel routes or to reenter the freeway once past the queues at either end of the bottleneck. This results in high volumes of traffic on the on-ramps and off-ramps that eventually use SR 4 when the widening of the freeway is complete all the way to SR 160. The bottleneck condition also affects traffic on Harbor Street, which is one of the few crossings of SR 4. As a result of this, there are instances where the volumes observed in 2007 will be greater than those expected in Years 2015 and 2030 on particular freeway ramps and roadway links, resulting in improvements in LOS for the No Project Scenario.

4.1.2 Year 2030 No Project Scenario

During the AM peak hour, 14 of the 16 study intersections would operate under acceptable conditions. The two intersections that would operate at an unacceptable level of service are:

- #9 - Leland Road/Freed Avenue
- #15 - Harbor Street/Garcia Avenue

During the PM peak hour, 12 of the 16 study intersections would operate under acceptable conditions. The four intersections that would operate at an unacceptable level of service are:

- #7 - Railroad Avenue/Leland Road
- #9 - Leland Road/Freed Avenue
- #13 - Harbor Street/California Avenue
- #15 - Harbor Street/Garcia Avenue

Intersection operations under Year 2030 No Project conditions are presented in Table 4-2 on page 4-10 and Figure 4-2 on page 4-16. As discussed in detail in section 4.1.1, SR-4 widening may result in instances where the traffic volumes observed in 2007 will be greater than those expected in 2030 on particular freeway ramps and roadway links, resulting in improvements in LOS for the No Project Scenario.

4.1.3 Year 2015 plus Project Scenario

During the AM and PM peak hours, 14 of the 16 study intersections would operate under acceptable conditions. The two intersections that would operate at an unacceptable level of service are:

- #9 - Leland Road/Freed Avenue
- #15 - Harbor Street/Garcia Avenue

The intersection operations under Year 2015 plus Project conditions are presented in Table 4-3 on page 4-11 and Figure 4-3 on page 4-17. Figure 4-3A on page 4-18 illustrates project only trips for Year 2015 plus Project Conditions. It should be noted, that due to SR 4 widening scheduled by Caltrans before opening day (Year 2015) it is expected that existing trips will be redistributed regionally from the local network due to the removal of the 2-lane bottleneck. This results in a negative network allocation for some intersections as shown on the figure when vehicles that formerly exited the freeway to use alternative local routes will stay on the freeway and no longer be impacting the local network.

AM PEAK HOUR
Year 2015 plus Project conditions would result in an unacceptable LOS at two of the study intersections during the AM peak hour.

- Under Year 2015 plus Project conditions the Leland Road/Freed Avenue intersection would continue to operate at LOS F, similar to Year 2015 No Project conditions. However, the Proposed Project would not worsen the LOS at this intersection. Therefore, a significant impact would not occur as a result of the Proposed Project.

- Under Year 2015 plus Project conditions the Harbor Street/Garcia Avenue intersection would continue to operate at LOS F similar to Year 2015 No Project conditions. However, the Proposed Project would not worsen the LOS at this intersection. Therefore, a significant impact would not occur as a result of the Proposed Project.

PM PEAK HOUR
Year 2015 plus Project conditions would result in unacceptable levels of service at two of the study intersections during the PM peak hour.

- Under Year 2015 plus Project conditions the Leland Road/Freed Avenue intersection would continue to operate at LOS F, similar to Year 2015 No Project conditions. However, the Proposed Project would not worsen the LOS at this intersection. Therefore, a significant impact would not occur as a result of the Proposed Project.

- The Harbor Street/Garcia Avenue intersection would continue to operate at LOS F under Year 2015 plus Project conditions, with significant delays in the eastbound and westbound

approaches in comparison to Year 2015 No Project conditions; therefore a significant impact would occur as a result of the Proposed Project.

Significant Impact 1: *The intersection of Harbor Street/Garcia Avenue would operate at LOS F, with significant delays in the eastbound and westbound approaches under Year 2015 plus Project Conditions during the PM peak hour.*

4.1.4 Year 2030 plus Project Scenario

During the AM peak hour, 14 of the 16 study intersections would operate under acceptable conditions. The two intersections that would operate at an unacceptable level of service are:

- #9 - Leland Road/Freed Avenue
- #15 - Harbor Street/Garcia Avenue

During the PM peak hour, 12 of the 16 study intersections would operate under acceptable conditions. The two intersections that would operate at an unacceptable level of service are:

- #7 - Railroad Avenue/Leland Road
- #9 - Leland Road/Freed Avenue
- #13 - Harbor Street/California Avenue
- #15 - Harbor Street/Garcia Avenue

The intersection operations under Year 2030 Plus Project conditions are presented in Table 4-4 on page 4-12 and Figure 4-4 on page 4-19. Figure 4-4A on page 4-20 illustrates project only trips for Year 2030 plus Project Conditions. It should be noted, that due to SR 4 widening scheduled by Caltrans before opening day (Year 2015) it is expected that existing trips will be redistributed regionally from the local network due to the removal of the 2-lane bottleneck. This results in a negative network allocation for some intersections as shown on the figure when vehicles that formerly exited the freeway to use alternative local routes will stay on the freeway and no longer be impacting the local network.

AM PEAK HOUR
Year 2030 plus Project conditions would result in unacceptable levels of service at two of the study area intersections during the AM peak hour.

- The Leland Road/Freed Avenue intersection would operate better under the Year 2030 plus Project Conditions than under Year 2030 No Project conditions; therefore a significant impact would not occur as a result of the Proposed Project.

- The Harbor Street/Garcia Avenue intersection would continue to operate at LOS F under Year 2030 plus Project Conditions, with significant delays in the eastbound and westbound approaches compared to Year 2030 No Project conditions; therefore a significant impact would occur as a result of the Proposed Project.

Significant Impact 2: *The intersection of Harbor Street/Garcia Avenue would operate at LOS F, with significant delays in the eastbound and westbound approaches under Year 2030 plus Project Conditions during the AM peak hour.*

PM PEAK HOUR
Year 2030 plus Project conditions would result in unacceptable levels of service at four of the study area intersections during the PM peak hour.

- The Railroad Avenue/Leland Road intersection would operate better under Year 2030 plus Project conditions than under Year 2030 No Project conditions; therefore a significant impact would not occur as a result of the Proposed Project.

- The Leland Road/Freed Avenue, intersection would operate better under Year 2030 plus Project conditions than under Year 2030 No Project conditions; therefore a significant impact would not occur as a result of the Proposed Project.

- The Harbor Street/California Avenue intersection would continue to operate at LOS E under Year 2030 plus Project conditions, and the LOS would not deteriorate in comparison to Year 2030 No Project conditions; therefore a significant impact would not occur as a result of the Proposed Project.

- The Harbor Street/Garcia Avenue intersection would continue to operate at LOS F under Year 2030 plus Project conditions, with significant delays in the eastbound and westbound approaches in comparison to Year 2030 No Project conditions; therefore a significant impact would occur as a result of the Proposed Project.

Significant Impact 3: *The intersection of Harbor Street/Garcia Avenue would operate at LOS F, with significant delays in the eastbound and westbound approaches under Year 2030 plus Project conditions during the PM peak hour.*

4.1.5 Year 2015 plus Project (Alternative 1) Scenario

During the AM and PM peak hours, 14 of the 16 study intersections would operate under acceptable conditions. The two intersections that would operate at an unacceptable level of service are:

- #9 - Leland Road/Freed Avenue
- #15 - Harbor Street/Garcia Avenue

The intersection operations under Year 2015 plus Project (Alternative 1) conditions are presented in Table 4-5 on page 4-13 an Figure 4-5 on page 4-21. Figure 4-5A on page 4-22 illustrates project only trips for Year 2015 plus Project (Alternative 1) Conditions. It should be noted, that due to SR

4 widening scheduled by Caltrans before opening day (Year 2015) it is expected that existing trips will be redistributed regionally from the local network due to the removal of the 2-lane bottleneck. This results in a negative network allocation for some intersections as shown on the figure when vehicles that formerly exited the freeway to use alternative local routes will stay on the freeway and no longer be impacting the local network.

AM PEAK HOUR
Year 2015 plus Project (Alternative 1) conditions would result in unacceptable levels of service at two of the study area intersections during the AM peak hour.

- The Leland Road/Freed Avenue intersection would continue to operate at LOS F and level of service would not worsen compared to Year 2015 No Project conditions; therefore a significant impact would not occur as a result of the Proposed Project.

- The Harbor Street/Garcia Avenue intersection would continue to operate at LOS F under Year 2015 plus Project (Alternative 1) conditions, with significant delays in the eastbound and westbound approaches in comparison to Year 2015 No Project conditions; therefore a significant impact would occur as a result of the Proposed Project.

Significant Impact 4: *The intersection of Harbor Street/Garcia Avenue would operate at LOS F, with significant delays in the eastbound and westbound approaches under Year 2015 plus Project (Alternative 1) conditions during the AM peak hour.*

PM PEAK HOUR
Year 2015 plus Project (Alternative 1) conditions would result in unacceptable levels of service at two of the study area intersections during the PM peak hour.

- The Leland Road/Freed Avenue intersection would continue to operate at LOS F and level of service would not worsen in comparison to Year 2015 No Project conditions; therefore a significant impact would not occur as a result of the Proposed Project.

- The Harbor Street/Garcia Avenue intersection would continue to operate at LOS F under Year 2015 Project plus Project (Alternative 1) conditions, with significant delays in the eastbound and westbound approaches in comparison to Year 2015 No Project conditions; therefore a significant impact would occur as a result of the Proposed Project.

Significant Impact 5: *The intersection of Harbor Street/Garcia Avenue would operate at LOS F, with significant delays in the eastbound and westbound approaches under Year 2015 plus Project (Alternative 1) conditions during the PM peak hour.*

4.1.6 Year 2030 plus Project (Alternative 1) Scenario

During the AM peak hour, 14 of the 16 study intersections would operate under acceptable conditions. The two intersections that would operate at an unacceptable level of service are:

- #9 - Leland Road/Freed Avenue
- #15 - Harbor Street/Garcia Avenue

During the PM peak hour, 12 of the 16 study intersections would operate under acceptable conditions. The four intersections that would operate at an unacceptable level of service are:

- #7 - Railroad Avenue/Leland Road
- #9 - Leland Road/Freed Avenue
- #13 - Harbor Street/California Avenue
- #15 - Harbor Street/Garcia Avenue

The study intersection operations under Year 2030 conditions, with Project are presented in Table 4-6 on page 4-14 and Figure 4-6 on page 4-23. Figure 4-6A on page 4-24 illustrates project only trips for Year 2030 plus Project (Alternative 1) Conditions. It should be noted, that due to SR 4 widening scheduled by Caltrans before opening day (Year 2015) it is expected that existing trips will be redistributed regionally from the local network due to the removal of the 2-lane bottleneck. This results in a negative network allocation for some intersections as shown on the figure when vehicles that formerly exited the freeway to use alternative local routes will stay on the freeway and no longer be impacting the local network.

AM PEAK HOUR
Year 2030 plus Project conditions would result in unacceptable levels of service at two of the study area intersections during the AM peak hour.

- The Leland Road/Freed Avenue intersection would operate better under the Year 2030 plus Project (Alternative 1) conditions than under Year 2030 No Project conditions; therefore a significant impact would not occur as a result of the Proposed Project.

- The Harbor Street/Garcia Avenue intersection would continue to operate at LOS F under Year 2030 plus Project (Alternative 1) conditions, with significant delays in the eastbound and westbound approaches in comparison to Year 2030 No Project conditions; therefore a significant impact would occur as a result of the Proposed Project.

Significant Impact 6: *The intersection of Harbor Street/Garcia Avenue would operate at LOS F, with significant delays in the eastbound and westbound approaches under Year 2030 plus Project (Alternative 1) conditions during the AM peak hour.*

PM PEAK HOUR
Year 2030 plus Project conditions (Alternative 1) would result in unacceptable levels of service at four of the study area intersections during the PM peak hour.

- The Railroad Avenue/Leland Road intersection would operate better under the Year 2030 plus Project (Alternative 1) conditions than under Year 2030 No Project conditions; therefore a significant impact would not occur as a result of the Proposed Project.

- The Leland Road/Freed Avenue intersection would operate better under the Year 2030 plus Project (Alternative 1) conditions than under Year 2030 No Project conditions; therefore a significant impact would not occur as a result of the Proposed Project.

- The Harbor Street/California Avenue intersection would continue to operate at LOS E under Year 2030 plus Project (Alternative 1) conditions, and the LOS would not deteriorate compared to Year 2030 No Project conditions; therefore a significant impact would not occur as a result of the Proposed Project.

- The Harbor Street/Garcia Avenue intersection would continue to operate at LOS F under Year 2030 plus Project (Alternative 1) conditions, with significant delays in the eastbound and westbound approaches in comparison to Year 2030 No Project conditions; therefore a significant impact would occur as a result of the Proposed Project.

Significant Impact 7: *The intersection of Harbor Street/Garcia Avenue would operate at LOS F, with significant delays in the eastbound and westbound approaches under Year 2030 plus Project (Alternative 1) conditions during the PM peak hour.*

4.1.7 Traffic Service Objective Impacts

Under the Year 2015 plus Project conditions two of the 16 study intersections would not satisfy the Traffic Service Objectives in the East County Action Plan for the Proposed Project, Proposed Project (Alternative 1) and No Project conditions:

- #8 Railroad Avenue/Leland Road
- #10 Leland Road/Freed Avenue

The Proposed Project (Alternative 1) would worsen conditions at 1 of these intersections – Railroad Avenue/Leland Road– in 2015 to LOS E as compared to No Project Conditions LOS D. This LOS does meet the CCTA Standards of Significance Criteria for the intersection. Furthermore, roadway improvements planned for Year 2030 indicate the Proposed Project and Proposed Project (Alternative 1) would improve conditions from the 2030 No Project Alternative.

Under Year 2030 conditions, two of the 16 study intersections would not satisfy the Traffic Service Objectives in the East County Action Plan for the Proposed Project, Proposed Project (Alternative 1) and No Project conditions:

- #8 Railroad Avenue/Leland Road
- #10 Leland Road/Freed Avenue

However as noted above, traffic operations under the Year 2030 plus Project and Year 2030 plus Project (Alternative 1) conditions improve compared to the 2030 No Project Alternative.

Table 4-1
Study Intersection Operations – 2015 No Project Conditions

		Threshold			AM Peak			PM Peak		
#	Intersection	Control	Jurisdiction	LOS	V/C	Delay	LOS	V/C	Delay	LOS
1	Civic Avenue – W.17th Street/Davi Avenue	AWSC	City of Pittsburg	E		8.4	A		8.2	A
2	Railroad Avenue/Civic Avenue	Signal	CCTA	D[b]	0.47	11.7	B	0.4	11.1	B
3	Railroad Avenue/Center Drive	Signal	City of Pittsburg	E	0.46	6.1	A	0.73	9.3	A
4	Railroad Avenue/SR 4 Westbound On-Ramp	Signal	Caltrans	C/D[a]	0.69	12.8	B	0.53	10.5	B
5	Railroad Avenue/SR 4 Eastbound Ramps	Signal	Caltrans	C/D[a]	0.71	14.8	B	0.73	15.1	B
6	Railroad Avenue/Bliss Avenue	Signal	CCTA CMP	E	0.57	11.4	B	0.61	12.5	B
7	Railroad Avenue/Leland Road	Signal	CCTA CMP	E	0.85	33.8	C	0.95	40.9	D
8	Leland Road/Harbor Street	Signal	CCTA	D[b]	0.7	24.2	C	0.83	25.8	C
9	Leland Road/Freed Avenue	TWSC	City of Pittsburg	E	**0.42**	**>50 (SB)**	**F**	**0.67**	**>50 (SB)**	**F**
10	Leland Road/Loveridge Road	Signal	CCTA	D[b]	0.65	27.4	C	0.54	22.8	C
11	Loveridge Road/SR 4 Eastbound Ramps	Signal	Caltrans	C/D[a]	0.51	9	A	0.49	4.7	A
12	California Avenue/SR 4 Westbound Ramps	Signal	Caltrans	C/D[a]	0.33	17.6	B	0.61	19.2	B
13	Harbor Street/California Avenue	Signal	CCTA	D[b]	0.84	37	D	0.7	27.1	C
14	Harbor Street/Bliss Avenue	Signal	City of Pittsburg	E	1.09	12.7	B	0.44	11.1	B
15	Harbor Street/Garcia Avenue	TWSC	City of Pittsburg	E	**3.98**	**>50 (WB)**	**F**	**	**>50 (WB)**	F
16	Railroad Avenue/Garcia Avenue	Signal	CCTA CMP	E	0.38	7.2	A	0.88	38	C

Source: Wilbur Smith Associates, December 2008.

Notes:

AWSC – All-way Stop Control; TWSC – Two-way Stop Control

Signal – Traffic Signal

Delay presented in seconds per vehicle.

Delay and LOS presented for worst approach for two-way stop controlled intersections.

Boldface type indicates unacceptable values.

a. Represents a target LOS at the transition between LOS C and LOS D.

b. For an Urban Area V/C ratio must be between 0.85 and 0.89.

** Not computed

Table 4-2
Study Intersection Operations – 2030 No Project Conditions

		Threshold			AM Peak			PM Peak		
#	**Intersection**	**Control**	**Jurisdiction**	**LOS**	**V/C**	**Delay**	**LOS**	**V/C**	**Delay**	**LOS**
1	Civic Avenue – W.17th Street/Davi Avenue	AWSC	City of Pittsburg	E		25.7	D		9	A
2	Railroad Avenue/Civic Avenue	Signal	CCTA	D[b]	0.55	14.5	B	0.57	15.7	B
3	Railroad Avenue/Center Drive	Signal	City of Pittsburg	E	0.49	7.4	A	0.8	12.4	B
4	Railroad Avenue/SR 4 Westbound On-Ramp	Signal	Caltrans	C/D[a]	0.90	19.9	B	0.73	14.8	B
5	Railroad Avenue/SR 4 Eastbound Ramps	Signal	Caltrans	C/D[a]	0.86	19.2	B	0.97	30.6	C
6	Railroad Avenue/Bliss Avenue	Signal	CCTA CMP	E	0.66	13.5	B	0.85	19.4	B
7	Railroad Avenue/Leland Road	Signal	CCTA CMP	E	1.09	65.4	E	**1.27**	**>80**	**F**
8	Leland Road/Harbor Street	Signal	CCTA	D[b]	0.8	27.2	C	0.74	24.9	C
9	Leland Road/Freed Avenue	TWSC	City of Pittsburg	E	**1.58**	**>50 (SB)**	**F**	**2.7**	**>50 (SB)**	**F**
10	Leland Road/Loveridge Road	Signal	CCTA	D[b]	0.8	33.3	C	0.64	29.4	C
11	Loveridge Road/SR 4 Eastbound Ramps	Signal	Caltrans	C/D[a]	0.61	7.9	A	0.7	10.8	B
12	California Avenue/SR 4 Westbound Ramps	Signal	Caltrans	C/D[a]	0.47	16.2	B	0.82	28.7	C
13	Harbor Street/California Avenue	Signal	CCTA	D[b]	0.85	41.7	D	**1.09**	**70.2**	**E**
14	Harbor Street/Bliss Avenue	Signal	City of Pittsburg	E	0.53	4.5	A	0.58	11.7	B
15	Harbor Street/Garcia Avenue	TWSC	City of Pittsburg	E	**5.48**	**>50 (WB)**	**F**	******	**>50 (WB)**	**F**
16	Railroad Avenue/Garcia Avenue	Signal	CCTA CMP	E	0.54	7.2	A	0.8	30.7	C

Source: Wilbur Smith Associates, December 2008.

Notes:

AWSC – All-way Stop Control; TWSC – Two-way Stop Control

Signal – Traffic Signal

Delay presented in seconds per vehicle.

Delay and LOS presented for worst approach for two-way stop controlled intersections.

Boldface type indicates unacceptable values.

a. Represents a target LOS at the transition between LOS C and LOS D.

b. For an Urban Area V/C ratio must be between 0.85 and 0.89.

** Not computed

Table 4-3
Study Intersection Operations – 2015 plus Project Conditions

#	Intersection	Threshold			AM Peak			PM Peak		
		Control	Jurisdiction	LOS	V/C	Delay	LOS	V/C	Delay	LOS
1	Civic Avenue – W.17th Street/Davi Avenue	AWSC	City of Pittsburg	E		8.6	A		8.3	A
2	Railroad Avenue/Civic Avenue	Signal	CCTA	D[b]	0.46	11.9	B	0.58	16.2	B
3	Railroad Avenue/Center Drive	Signal	City of Pittsburg	E	0.48	6.2	A	0.73	10	B
4	Railroad Avenue/SR 4 Westbound On-Ramp	Signal	Caltrans	C/D[a]	0.69	13.1	B	0.53	10.4	B
5	Railroad Avenue/SR 4 Eastbound Ramps	Signal	Caltrans	C/D[a]	0.73	14.9	B	0.75	15.7	B
6	Railroad Avenue/Bliss Avenue	Signal	CCTA CMP	E	0.6	11.4	B	0.62	12.6	B
7	Railroad Avenue/Leland Road	Signal	CCTA CMP	E	0.84	34.6	C	0.95	41.7	D
8	Leland Road/Harbor Street	Signal	CCTA	D[b]	0.73	24.5	C	0.68	24.3	C
9	Leland Road/Freed Avenue	TWSC	City of Pittsburg	E	**0.46**	**>50 (SB)**	**F**	**0.67**	**>50 (SB)**	**F**
10	Leland Road/Loveridge Road	Signal	CCTA	D[b]	0.68	29.4	C	0.52	22.1	C
11	Loveridge Road/SR 4 Eastbound Ramps	Signal	Caltrans	C/D[a]	0.52	6.6	A	0.48	4.8	A
12	California Avenue/SR 4 Westbound Ramps	Signal	Caltrans	C/D[a]	0.34	15.2	B	0.61	19.5	B
13	Harbor Street/California Avenue	Signal	CCTA	D[b]	0.82	36.2	D	0.72	28.6	C
14	Harbor Street/Bliss Avenue	Signal	City of Pittsburg	E	0.94	8.9	A	0.5	12.2	B
15	Harbor Street/Garcia Avenue	TWSC	City of Pittsburg	E	**4.21**	**>50 (WB)**	**F**	**	**>50 (WB)**	**F**
16	Railroad Avenue/Garcia Avenue	Signal	CCTA CMP	E	0.41	8.5	A	0.95	37.6	D

Source: Wilbur Smith Associates, December 2008.

Notes:

AWSC – All-way Stop Control; TWSC – Two-way Stop Control

Signal – Traffic Signal

Delay presented in seconds per vehicle.

Delay and LOS presented for worst approach for two-way stop controlled intersections.

Boldface type indicates unacceptable values.

a. Represents a target LOS at the transition between LOS C and LOS D.

b. For an Urban Area V/C ratio must be between 0.85 and 0.89.

** Not computed

Table 4-4
Study Intersection Operations – 2030 plus Project Conditions

#	Intersection	Threshold		AM Peak			PM Peak			
		Control	Jurisdiction	LOS	V/C	Delay	LOS	V/C	Delay	LOS
1	Civic Avenue – W.17th Street/Davi Avenue	AWSC	City of Pittsburg	E		28.2	D		8.7	A
2	Railroad Avenue/Civic Avenue	Signal	CCTA	D[b]	0.59	16.5	B	0.48	16.4	B
3	Railroad Avenue/Center Drive	Signal	City of Pittsburg	E	0.53	8.9	A	0.94	18	B
4	Railroad Avenue/SR 4 Westbound On-Ramp	Signal	Caltrans	C/D[a]	0.90	19	B	0.64	13.3	B
5	Railroad Avenue/SR 4 Eastbound Ramps	Signal	Caltrans	C/D[a]	0.89	19.8	B	0.87	20.8	C
6	Railroad Avenue/Bliss Avenue	Signal	CCTA CMP	E	0.78	17.7	B	0.93	31.6	C
7	Railroad Avenue/Leland Road	Signal	CCTA CMP	E	1.02	59.4	E	**1.15**	**>80**	**F**
8	Leland Road/Harbor Street	Signal	CCTA	D[b]	0.81	28	C	0.78	41.8	D
9	Leland Road/Freed Avenue	TWSC	City of Pittsburg	E	**1.44**	**>50 (SB)**	**F**	**2.67**	**>50 (SB)**	**F**
10	Leland Road/Loveridge Road	Signal	CCTA	D[b]	0.76	32	C	0.62	23	C
11	Loveridge Road/SR 4 Eastbound Ramps	Signal	Caltrans	C/D[a]	0.56	7.1	A	0.44	7.4	A
12	California Avenue/SR 4 Westbound Ramps	Signal	Caltrans	C/D[a]	0.45	20.6	C	0.87	38.5	D
13	Harbor Street/California Avenue	Signal	CCTA	D[b]	1.01	50.7	D	**1.06**	**78.3**	**E**
14	Harbor Street/Bliss Avenue	Signal	City of Pittsburg	E	0.74	5.9	A	0.74	16.1	B
15	Harbor Street/Garcia Avenue	TWSC	City of Pittsburg	E	**9.44**	**>50 (WB)**	**F**	******	**>50 (WB)**	**F**
16	Railroad Avenue/Garcia Avenue	Signal	CCTA CMP	E	0.75	17.8	B	1.11	41.8	D

Source: Wilbur Smith Associates, December 2008.

Notes:

AWSC – All-way Stop Control; TWSC – Two-way Stop Control

Signal – Traffic Signal

Delay presented in seconds per vehicle.

Delay and LOS presented for worst approach for two-way stop controlled intersections.

Boldface type indicates unacceptable values.

a. Represents a target LOS at the transition between LOS C and LOS D.

b. For an Urban Area V/C ratio must be between 0.85 and 0.89.

** Not computed

Table 4-5
Study Intersection Operations – 2015 plus Project (Alternative 1) Conditions

		Threshold			AM Peak			PM Peak		
#	Intersection	Control	Jurisdiction	LOS	V/C	Delay	LOS	V/C	Delay	LOS
1	Civic Avenue – W.17th Street/Davi Avenue	AWSC	City of Pittsburg	E		8.7	A		8.2	A
2	Railroad Avenue/Civic Avenue	Signal	CCTA	D[b]	0.47	12.1	B	0.4	11.7	B
3	Railroad Avenue/Center Drive	Signal	City of Pittsburg	E	0.45	6	A	0.67	8.3	A
4	Railroad Avenue/SR 4 Westbound On-Ramp	Signal	Caltrans	C/D[a]	0.69	12.9	B	0.5	10.8	B
5	Railroad Avenue/SR 4 Eastbound Ramps	Signal	Caltrans	C/D[a]	0.73	15.1	B	0.71	13.8	B
6	Railroad Avenue/Bliss Avenue	Signal	CCTA CMP	E	0.59	11.3	B	0.73	15.6	B
7	Railroad Avenue/Leland Road	Signal	CCTA CMP	E	0.85	33.2	C	1.05	78.9	E
8	Leland Road/Harbor Street	Signal	CCTA	D[b]	0.69	25.4	C	0.67	23.3	C
9	Leland Road/Freed Avenue	TWSC	City of Pittsburg	E	**0.43**	**>50 (SB)**	**F**	**0.61**	**>50 (SB)**	**F**
10	Leland Road/Loveridge Road	Signal	CCTA	D[b]	0.65	27.9	C	0.53	19.6	B
11	Loveridge Road/SR 4 Eastbound Ramps	Signal	Caltrans	C/D[a]	0.52	9	A	0.44	7	A
12	California Avenue/SR 4 Westbound Ramps	Signal	Caltrans	C/D[a]	0.33	15.2	B	0.61	18.8	B
13	Harbor Street/California Avenue	Signal	CCTA	D[b]	0.85	36.7	D	0.71	31.7	C
14	Harbor Street/Bliss Avenue	Signal	City of Pittsburg	E	0.82	6.8	A	0.48	11.2	B
15	Harbor Street/Garcia Avenue	TWSC	City of Pittsburg	E	**4.65**	**>50 (WB)**	**F**	**	**>50 (WB)**	**F**
16	Railroad Avenue/Garcia Avenue	Signal	CCTA CMP	E	0.42	9.3	A	1.31	48.4	D

Source: Wilbur Smith Associates, December 2008.

Notes:

AWSC – All-way Stop Control; TWSC – Two-way Stop Control

Signal – Traffic Signal

Delay presented in seconds per vehicle.

Delay and LOS presented for worst approach for two-way stop controlled intersections.

Boldface type indicates unacceptable values.

a. Represents a target LOS at the transition between LOS C and LOS D.

b. For an Urban Area V/C ratio must be between 0.85 and 0.89.

** Not computed

Table 4-6
Study Intersection Operations – 2030 plus Project (Alternative 1) Conditions

		Threshold		AM Peak			PM Peak			
#	Intersection	Control	Jurisdiction	LOS	V/C	Delay	LOS	V/C	Delay	LOS
1	Civic Avenue – W.17th Street/Davi Avenue	AWSC	City of Pittsburg	E		42.1	E		8.7	A
2	Railroad Avenue/Civic Avenue	Signal	CCTA	D[b]	0.5	16.1	B	0.54	20.3	C
3	Railroad Avenue/Center Drive	Signal	City of Pittsburg	E	0.47	7.6	A	0.84	14.9	B
4	Railroad Avenue/SR 4 Westbound On-Ramp	Signal	Caltrans	C/D[a]	0.88	23.7	C	0.65	14.6	B
5	Railroad Avenue/SR 4 Eastbound Ramps	Signal	Caltrans	C/D[a]	0.85	22	C	0.86	22.4	C
6	Railroad Avenue/Bliss Avenue	Signal	CCTA CMP	E	0.71	12.8	B	0.89	24.5	C
7	Railroad Avenue/Leland Road	Signal	CCTA CMP	E	0.98	42.7	D	**1.15**	**>80**	**F**
8	Leland Road/Harbor Street	Signal	CCTA	D[b]	0.73	25	C	0.82	29.3	C
9	Leland Road/Freed Avenue	TWSC	City of Pittsburg	E	**1.44**	**>50 (SB)**	**F**	**1.29**	**>50 (SB)**	**F**
10	Leland Road/Loveridge Road	Signal	CCTA	D[b]	0.72	32.6	C	0.62	22.2	C
11	Loveridge Road/SR 4 Eastbound Ramps	Signal	Caltrans	C/D[a]	0.58	7.9	A	0.38	4.9	A
12	California Avenue/SR 4 Westbound Ramps	Signal	Caltrans	C/D[a]	0.48	14.9	B	0.83	29.8	C
13	Harbor Street/California Avenue	Signal	CCTA	D[b]	0.9	38.7	D	**1.16**	**78**	**E**
14	Harbor Street/Bliss Avenue	Signal	City of Pittsburg	E	0.55	5.9	A	0.62	13.5	B
15	Harbor Street/Garcia Avenue	TWSC	City of Pittsburg	E	**9.71**	**>50 (WB)**	**F**	**	**>50 (WB)**	**F**
16	Railroad Avenue/Garcia Avenue	Signal	CCTA CMP	E	0.78	14.5	B	1.41	59.3	E

Source: Wilbur Smith Associates, December 2008.

Notes:

AWSC – All-way Stop Control; TWSC – Two-way Stop Control

Signal – Traffic Signal

Delay presented in seconds per vehicle.

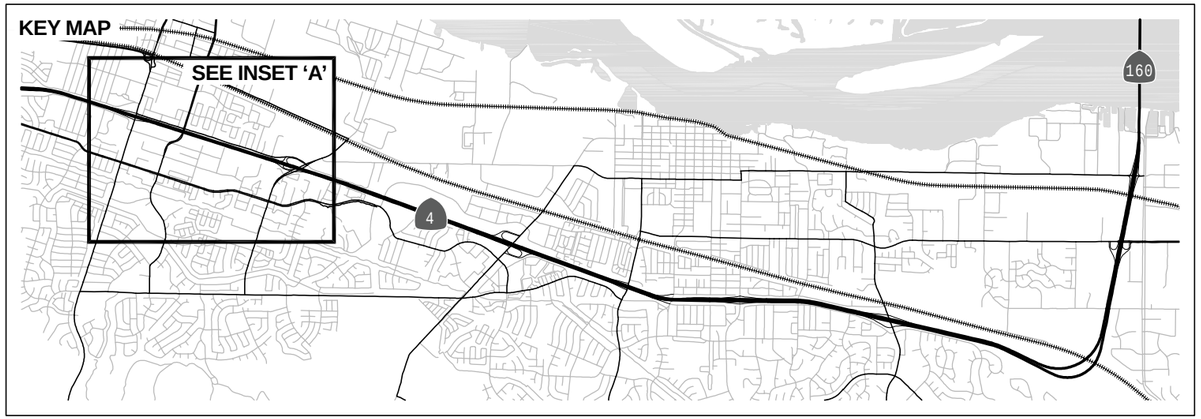
Delay and LOS presented for worst approach for two-way stop controlled intersections.

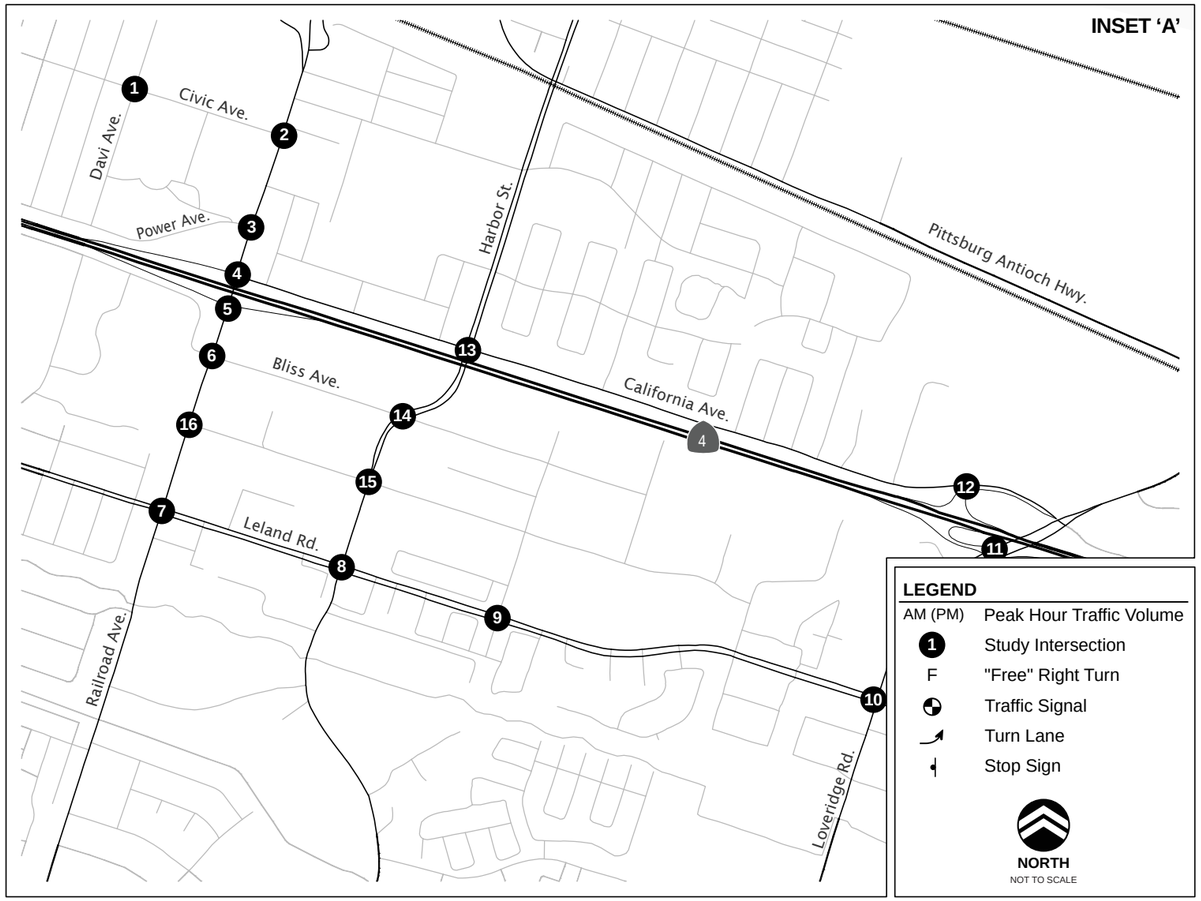
Boldface type indicates unacceptable values.

a. Represents a target LOS at the transition between LOS C and LOS D.

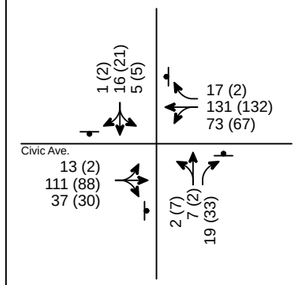
b. For an Urban Area V/C ratio must be between 0.85 and 0.89.

** Not computed





1. Civic Ave./Davi Ave.



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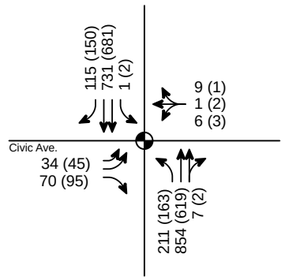
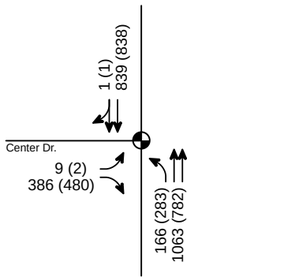


3. Center Dr./Railroad Ave.



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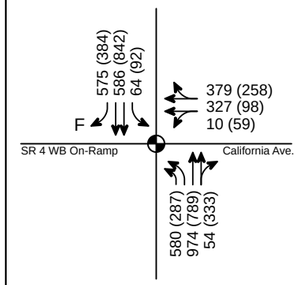

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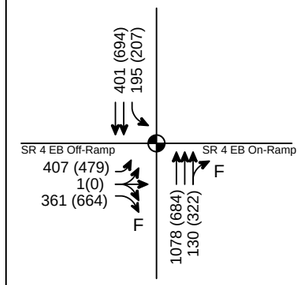

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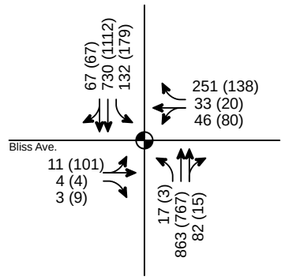

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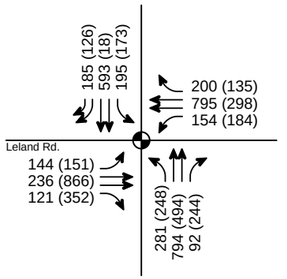

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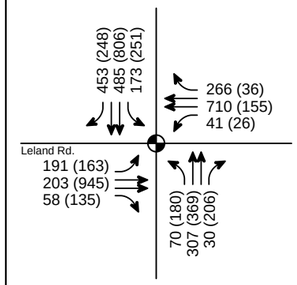

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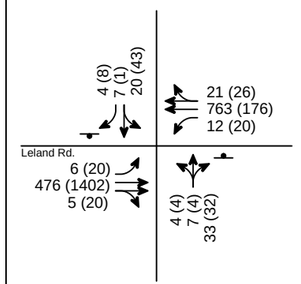

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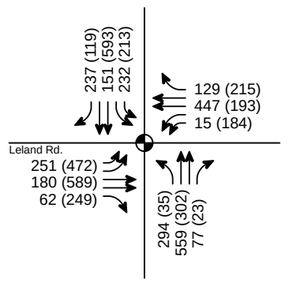

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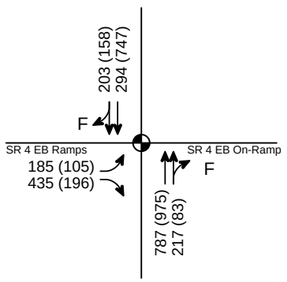

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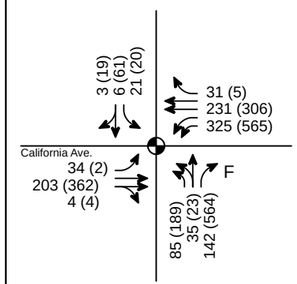

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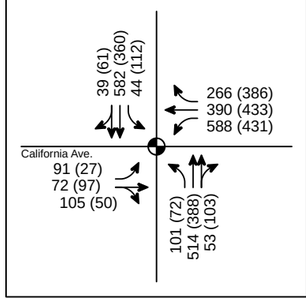

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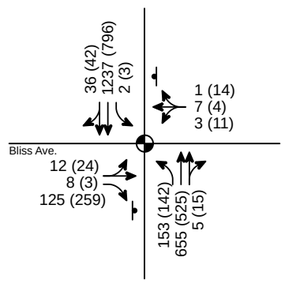

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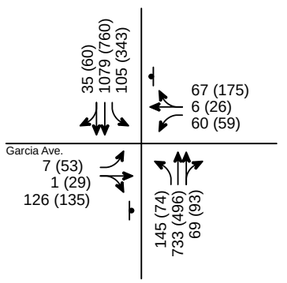

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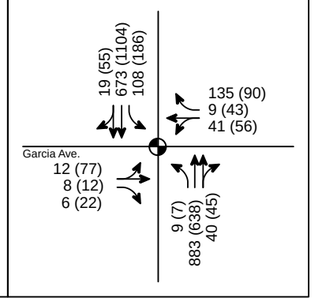
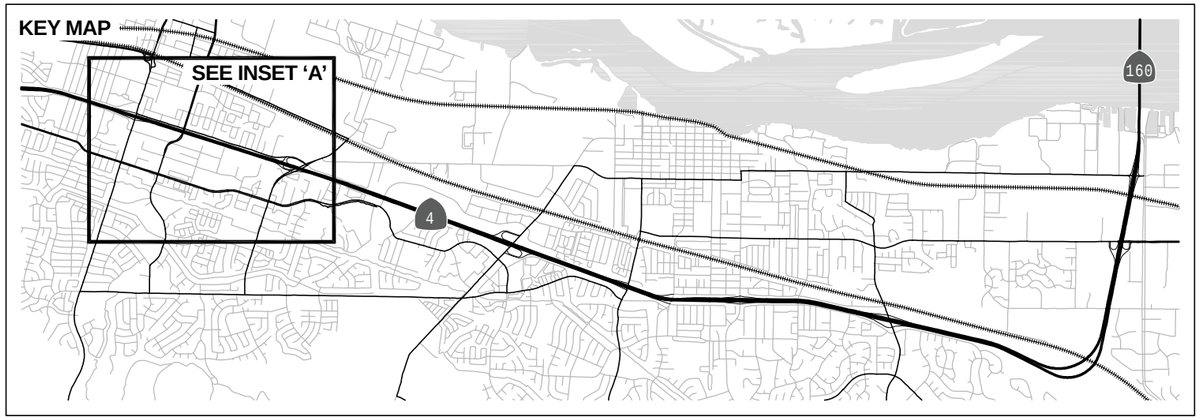
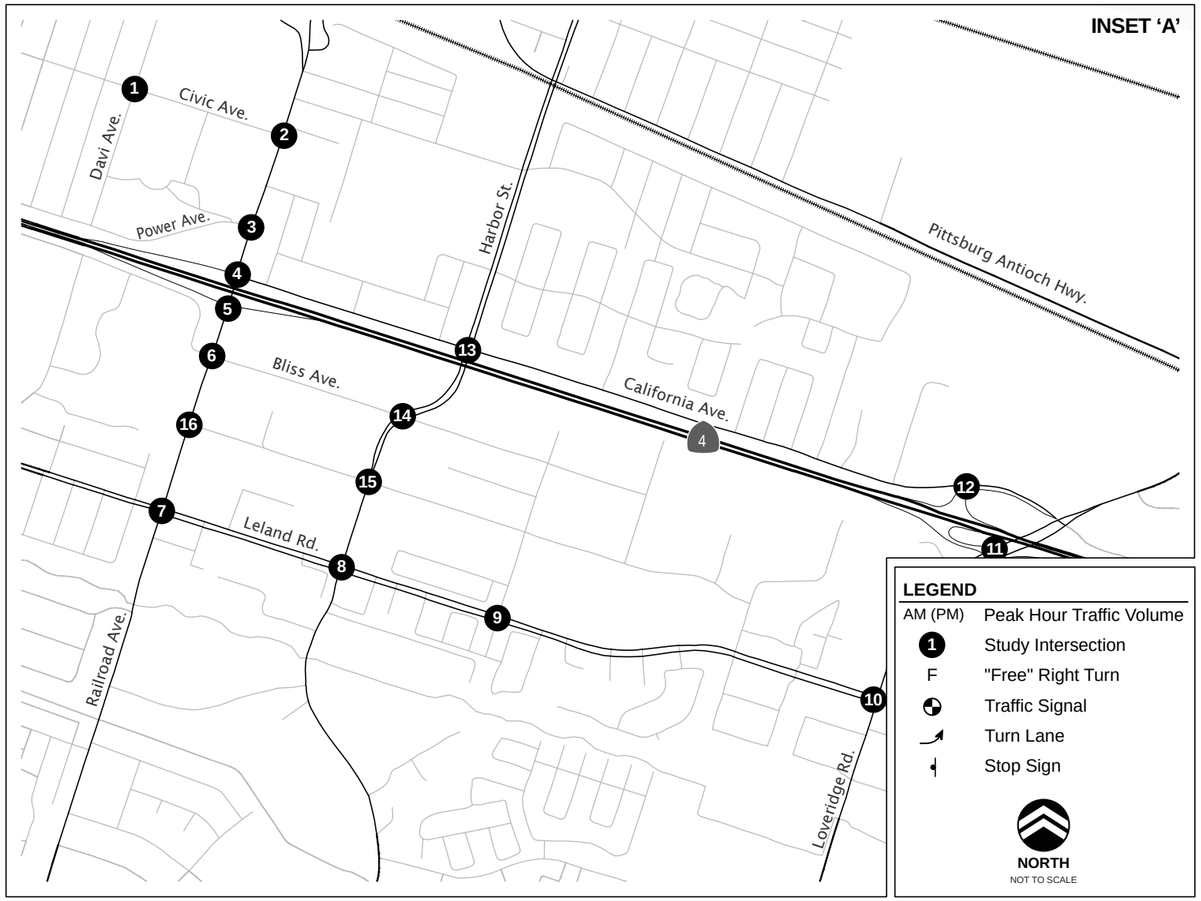


WilburSmith ASSOCIATES

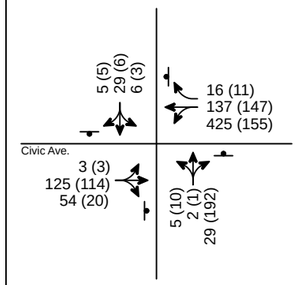
PITTSBURG TRAFFIC STUDY INTERSECTIONS - 2015 NO PROJECT CONDITIONS

FIGURE 4-1





1. Civic Ave./Davi Ave.



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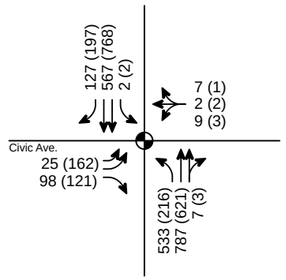

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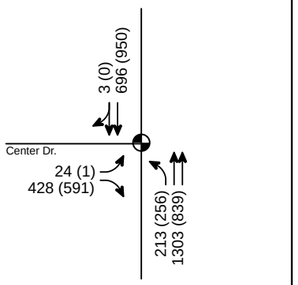
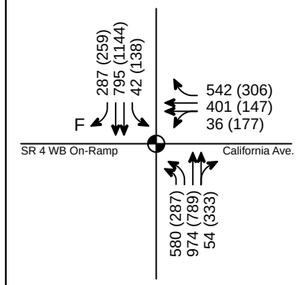
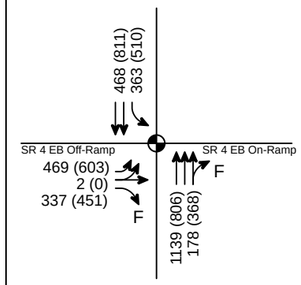


4. SR 4 WB On-Ramp/Railroad Ave.



5. SR 4 EB Ramps/Railroad Ave.



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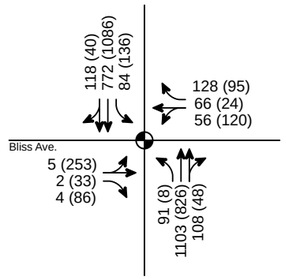
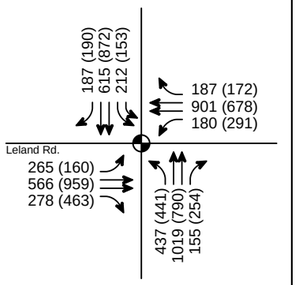
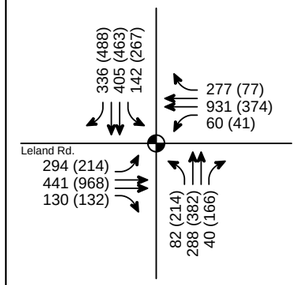


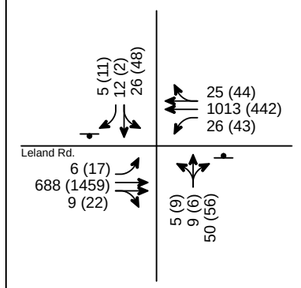
7. Leland Rd./Railroad Ave.



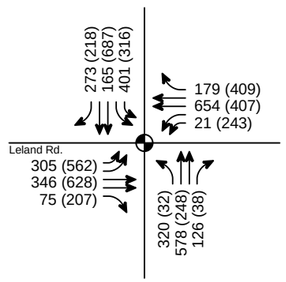
8. Leland Rd./Harbor St.



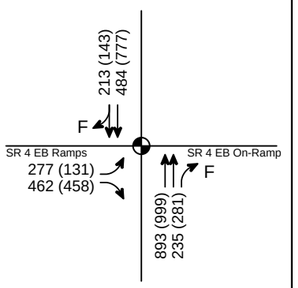
9. Leland Rd./Freed Ave.



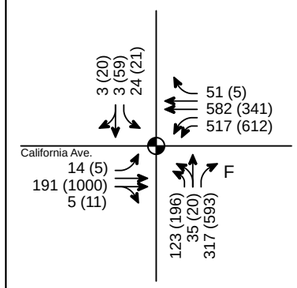
10. Leland Rd./Loveridge Rd.



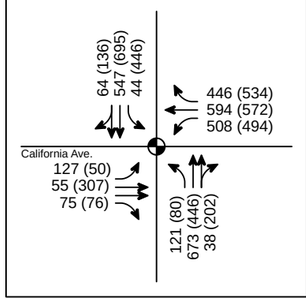
11. SR 4 EB Ramps/Loveridge Rd.



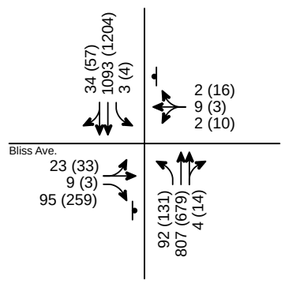
12. California Ave./SR 4 WB Ramps



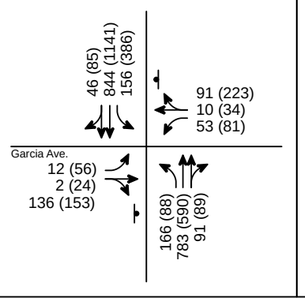
13. California Ave./Harbor St.



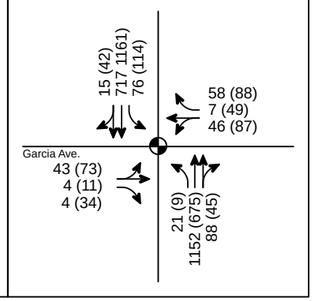
14. Bliss Ave./Harbor St.



15. Garcia Ave./Harbor St.



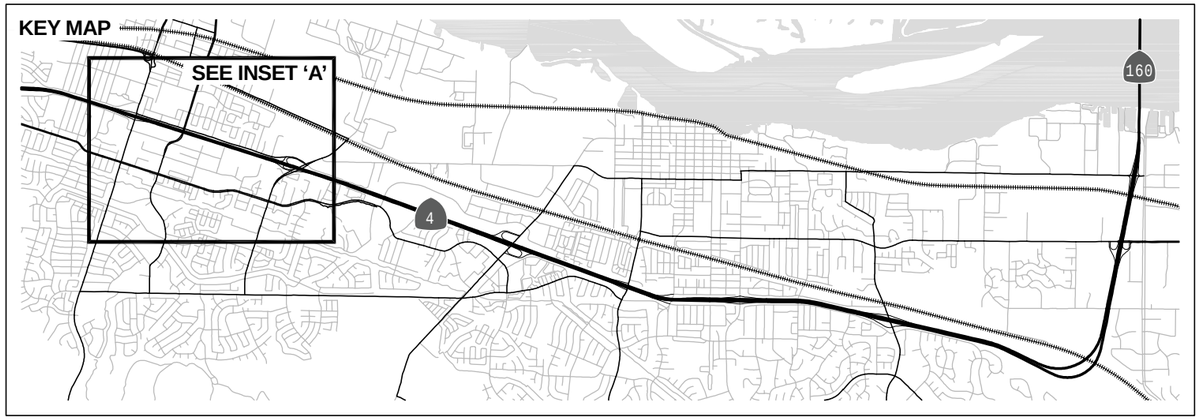
16. Garcia Ave./Railroad Ave.

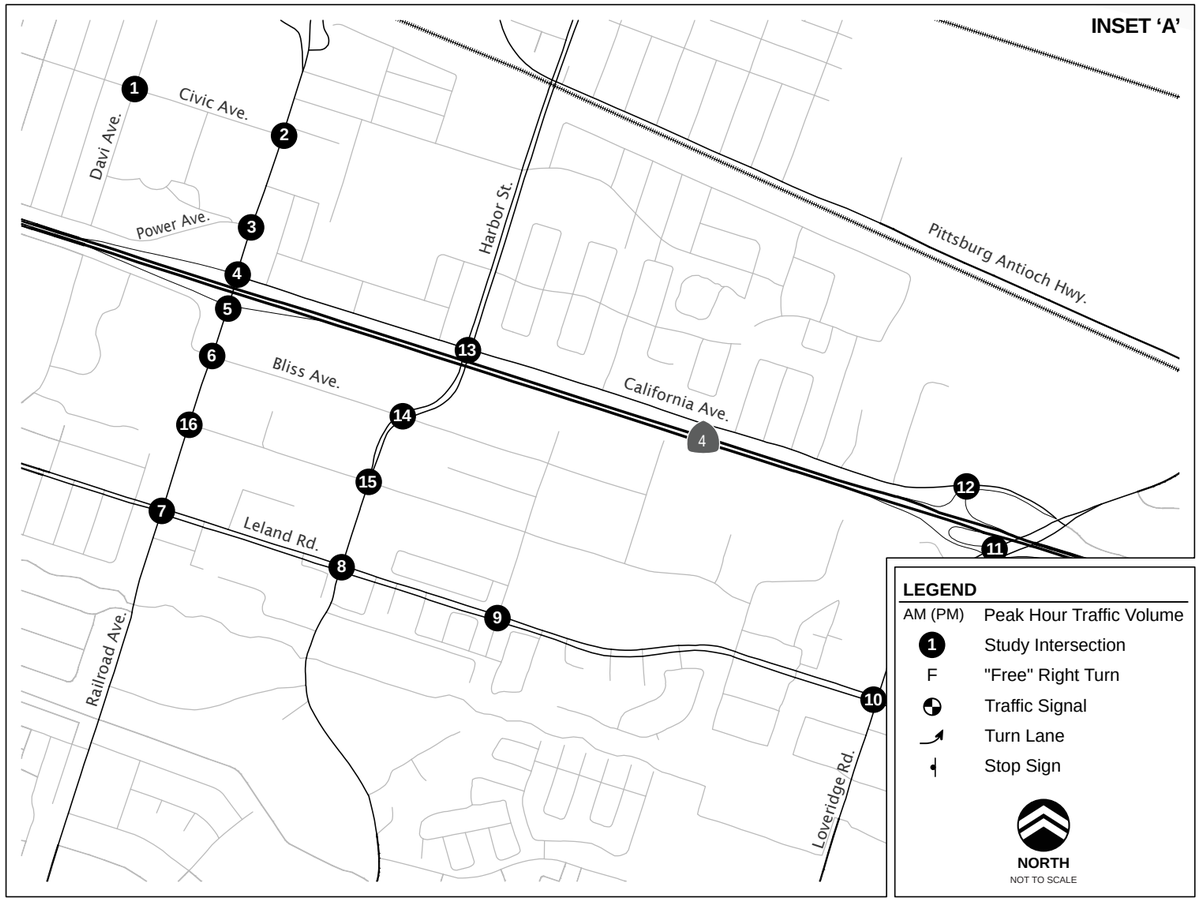


WilburSmith ASSOCIATES

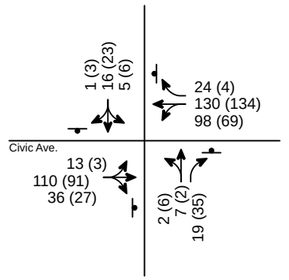
PITTSBURG TRAFFIC STUDY INTERSECTIONS - 2030 NO PROJECT CONDITIONS

FIGURE 4-2

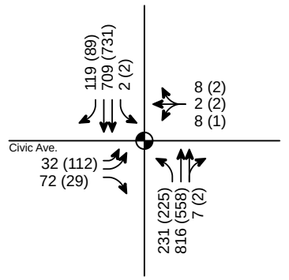




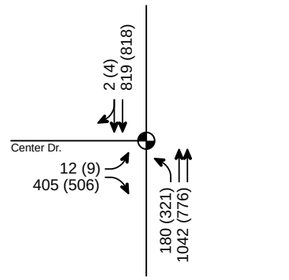
1. Civic Ave./Davi Ave.



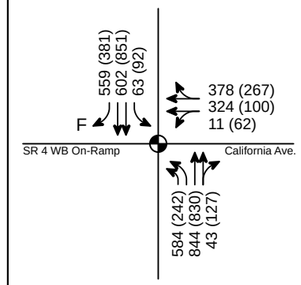
2. Civic Ave./Railroad Ave.



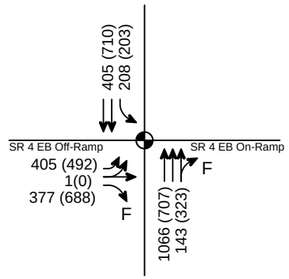
3. Center Dr./Railroad Ave.



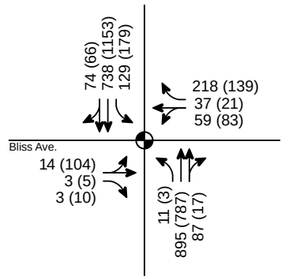
4. SR 4 WB On-Ramp/Railroad Ave.



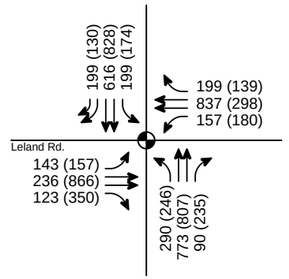
5. SR 4 EB Ramps/Railroad Ave.



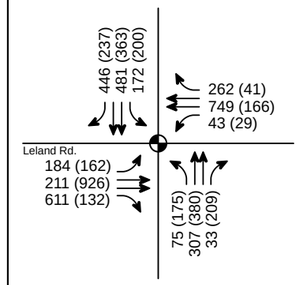
6. Bliss Ave./Railroad Ave.



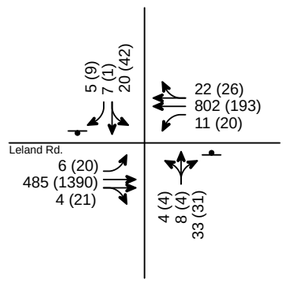
7. Leland Rd./Railroad Ave.



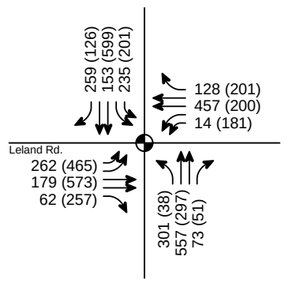
8. Leland Rd./Harbor St.



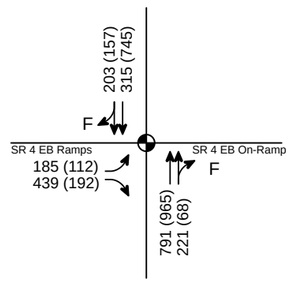
9. Leland Rd./Freed Ave.



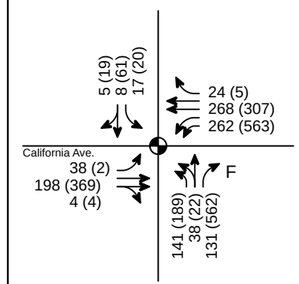
10. Leland Rd./Loveridge Rd.



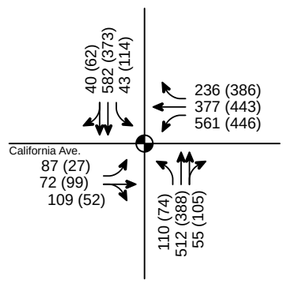
11. SR 4 EB Ramps/Loveridge Rd.



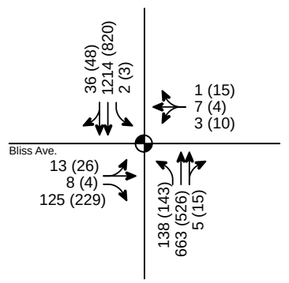
12. California Ave./SR 4 WB Ramps



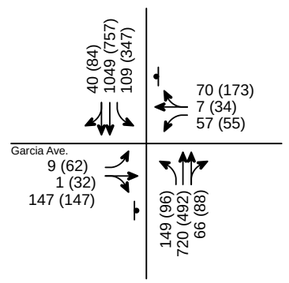
13. California Ave./Harbor St.



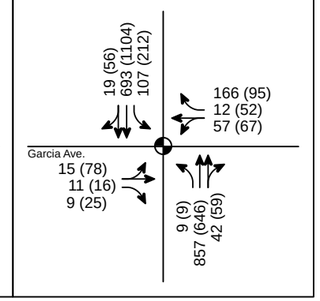
14. Bliss Ave./Harbor St.



15. Garcia Ave./Harbor St.



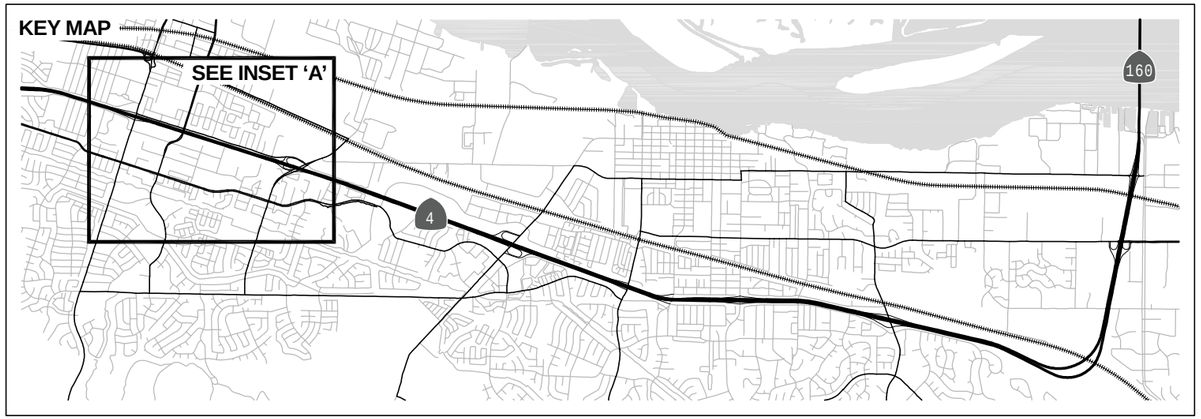
16. Garcia Ave./Railroad Ave.

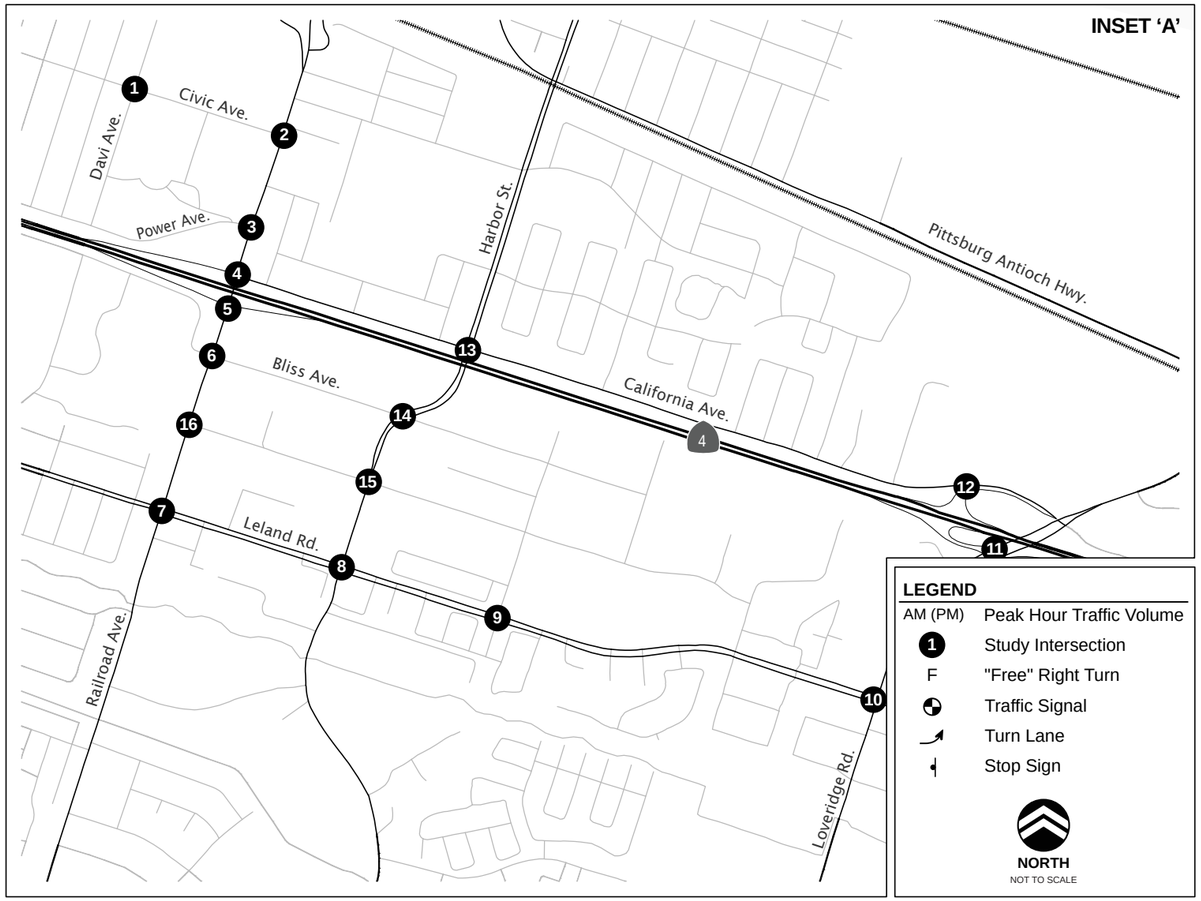


PITTSBURG TRAFFIC STUDY INTERSECTIONS - 2015 PROJECT BUILD CONDITIONS

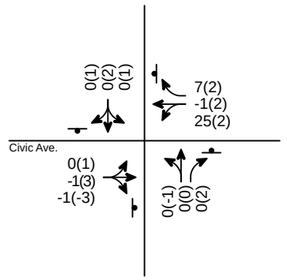
FIGURE 4-3

WilburSmith ASSOCIATES

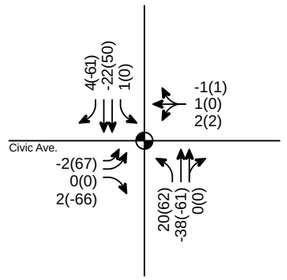




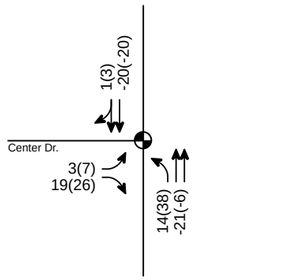
1. Civic Ave./Davi Ave.



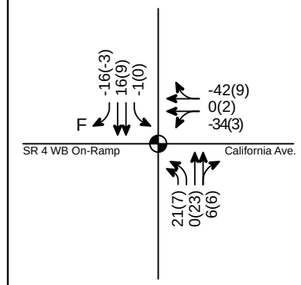
2. Civic Ave./Railroad Ave.



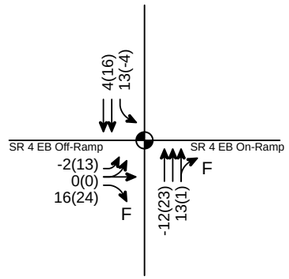
3. Center Dr./Railroad Ave.



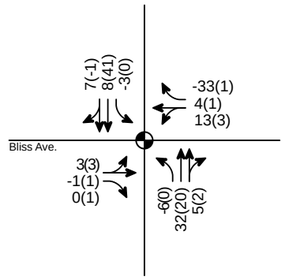
4. SR 4 WB On-Ramp/Railroad Ave.



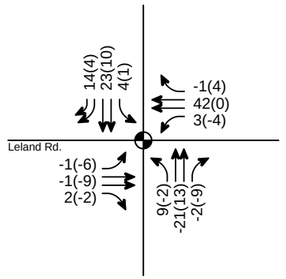
5. SR 4 EB Ramps/Railroad Ave.



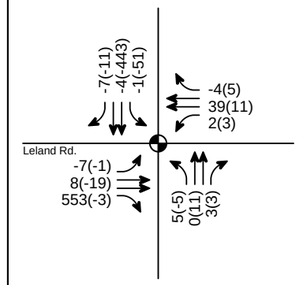
6. Bliss Ave./Railroad Ave.



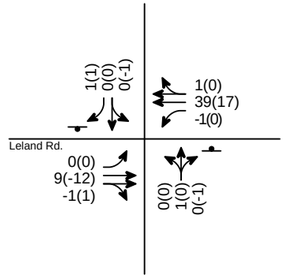
7. Leland Rd./Railroad Ave.



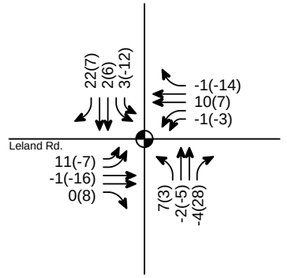
8. Leland Rd./Harbor St.



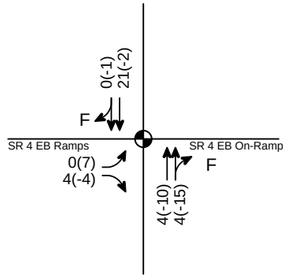
9. Leland Rd./Freed Ave.



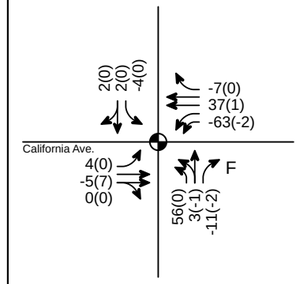
10. Leland Rd./Loveridge Rd.



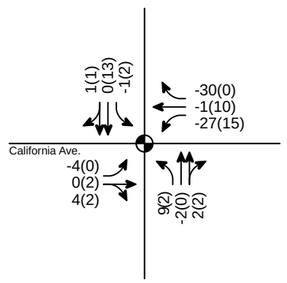
11. SR 4 EB Ramps/Loveridge Rd.



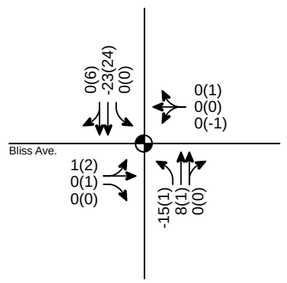
12. California Ave./SR 4 WB Ramps



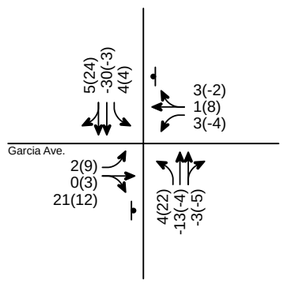
13. California Ave./Harbor St.



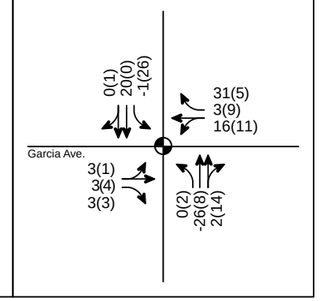
14. Bliss Ave./Harbor St.



15. Garcia Ave./Harbor St.



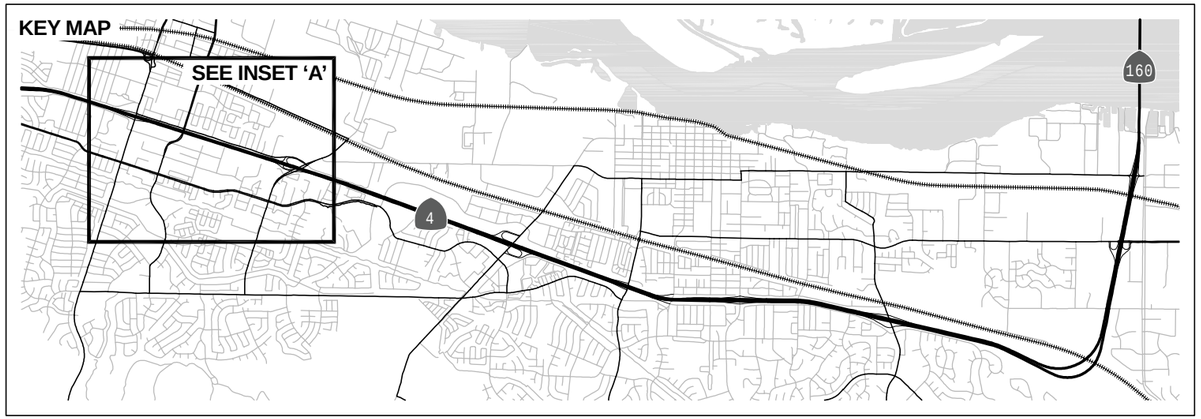
16. Garcia Ave./Railroad Ave.

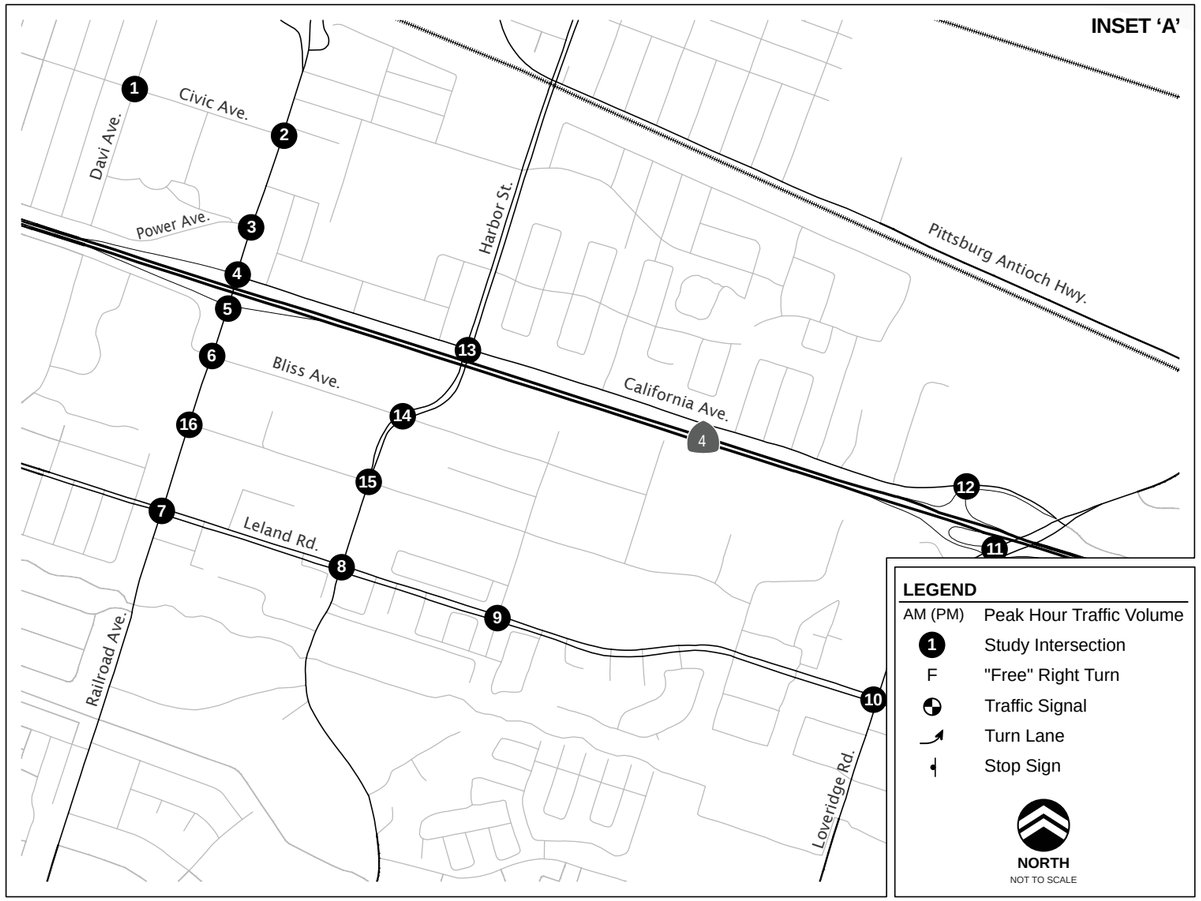


PITTSBURG TRAFFIC STUDY INTERSECTIONS - YEAR 2015 AM (PM) BUILD PROJECT TRIPS

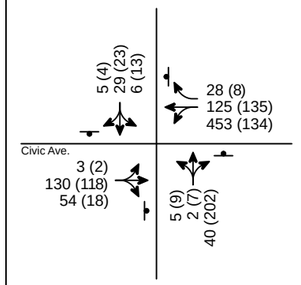
FIGURE 4-3A

WilburSmith ASSOCIATES

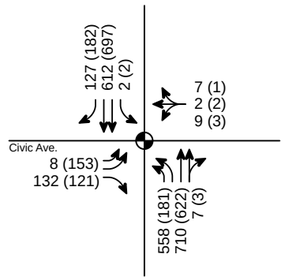




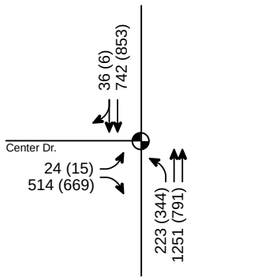
1. Civic Ave./Davi Ave.



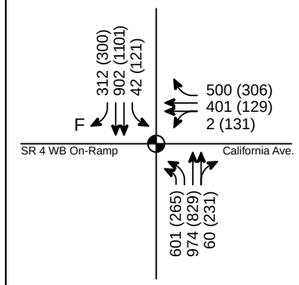
2. Civic Ave./Railroad Ave.



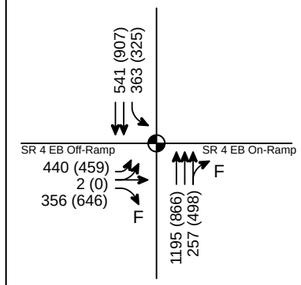
3. Center Dr./Railroad Ave.



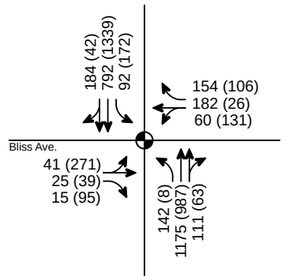
4. SR 4 WB On-Ramp/Railroad Ave.



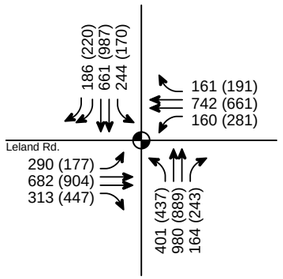
5. SR 4 EB Ramps/Railroad Ave.



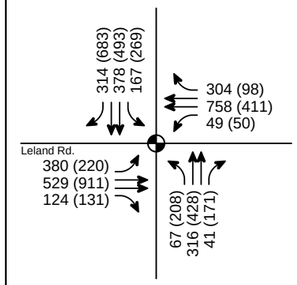
6. Bliss Ave./Railroad Ave.



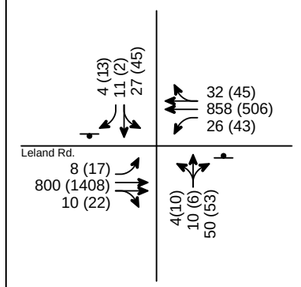
7. Leland Rd./Railroad Ave.



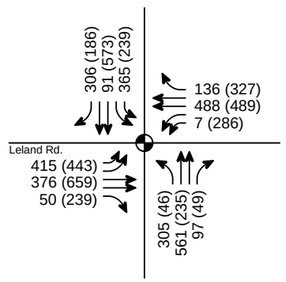
8. Leland Rd./Harbor St.



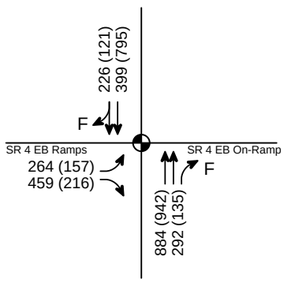
9. Leland Rd./Freed Ave.



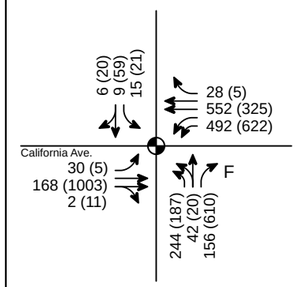
10. Leland Rd./Loveridge Rd.



11. SR 4 EB Ramps/Loveridge Rd.



12. California Ave./SR 4 WB Ramps



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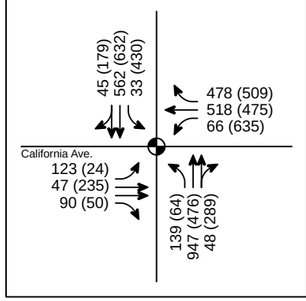
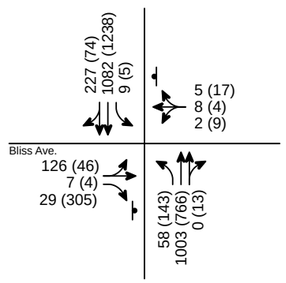
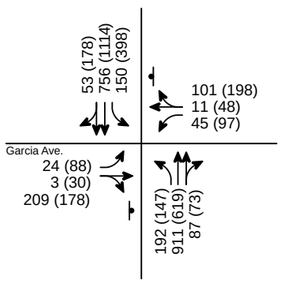


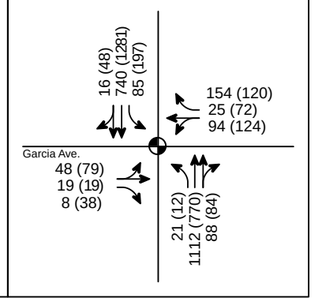
14. Bliss Ave./Harbor St.



15. Garcia Ave./Harbor St.



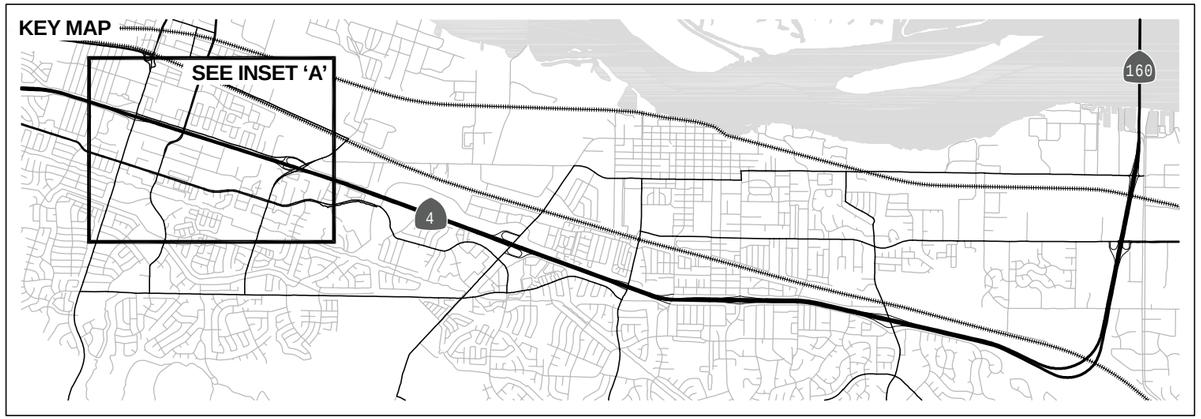
16. Garcia Ave./Railroad Ave.

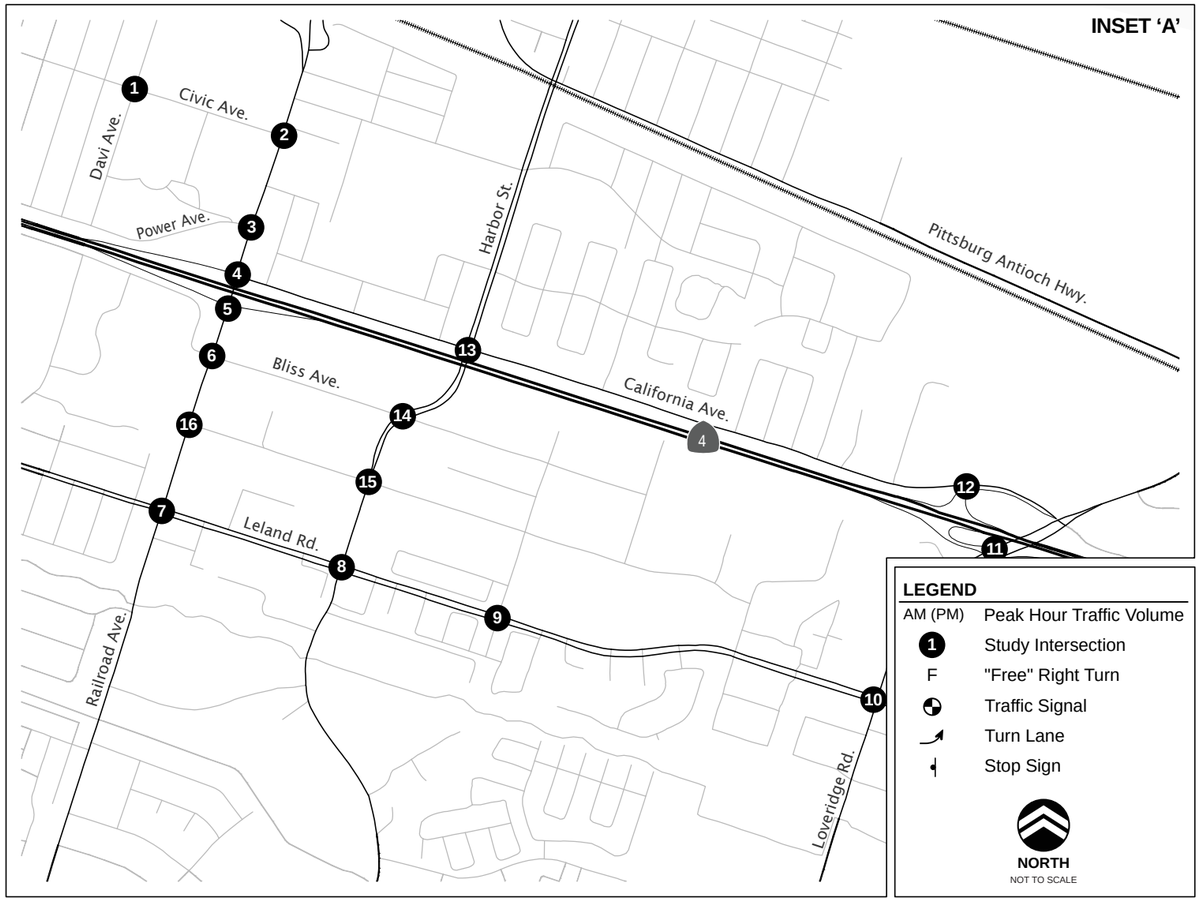


WilburSmith ASSOCIATES

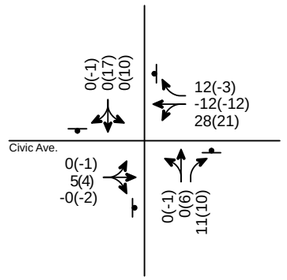
PITTSBURG TRAFFIC STUDY INTERSECTIONS - 2030 PROJECT BUILD CONDITIONS

FIGURE 4-4

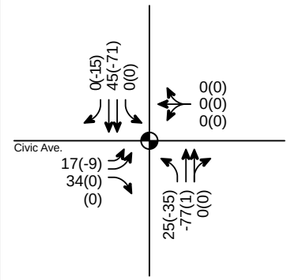




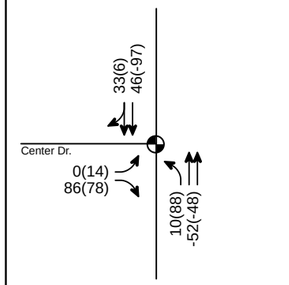
1. Civic Ave./Davi Ave.



2. Civic Ave./Railroad Ave.



3. Center Dr./Railroad Ave.



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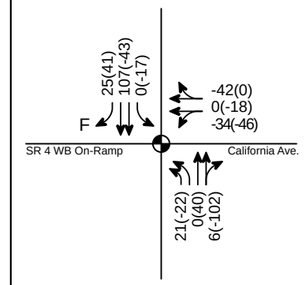
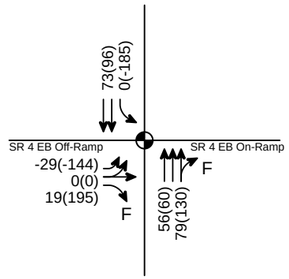
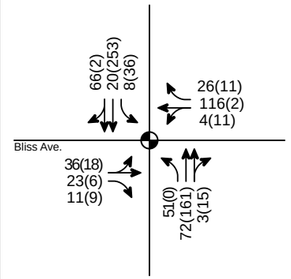


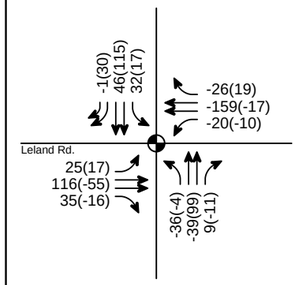
5. SR 4 EB Ramps/Railroad Ave.



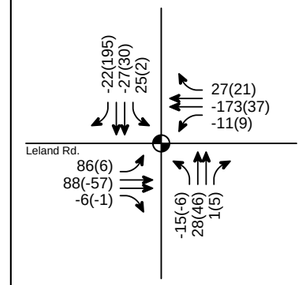
6. Bliss Ave./Railroad Ave.



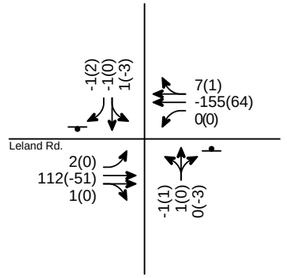
7. Leland Rd./Railroad Ave.



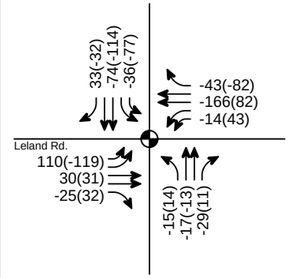
8. Leland Rd./Harbor St.



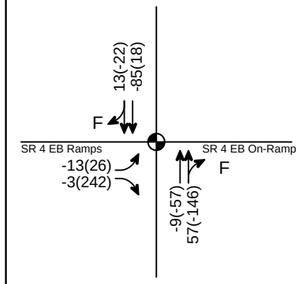
9. Leland Rd./Freed Ave.



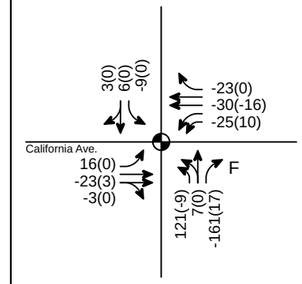
10. Leland Rd./Loveridge Rd.



11. SR 4 EB Ramps/Loveridge Rd.



12. California Ave./SR 4 WB Ramps



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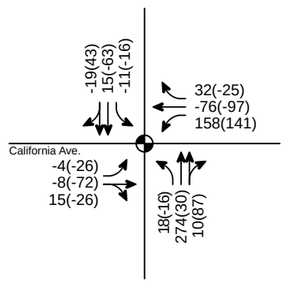

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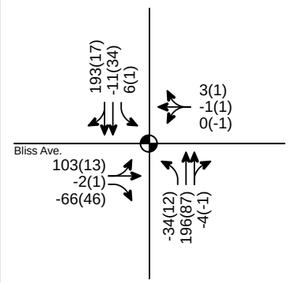
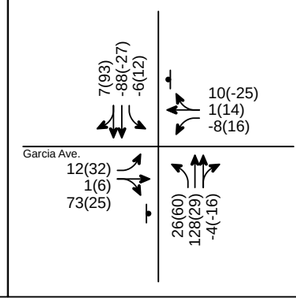
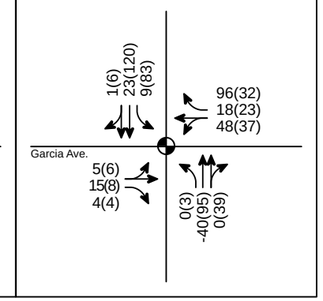


15. Garcia Ave./Harbor St.



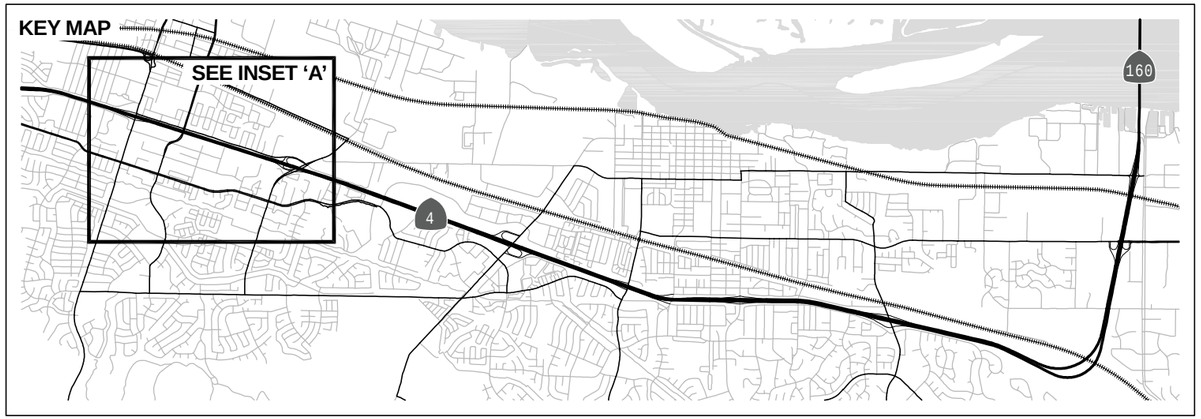
16. Garcia Ave./Railroad Ave.

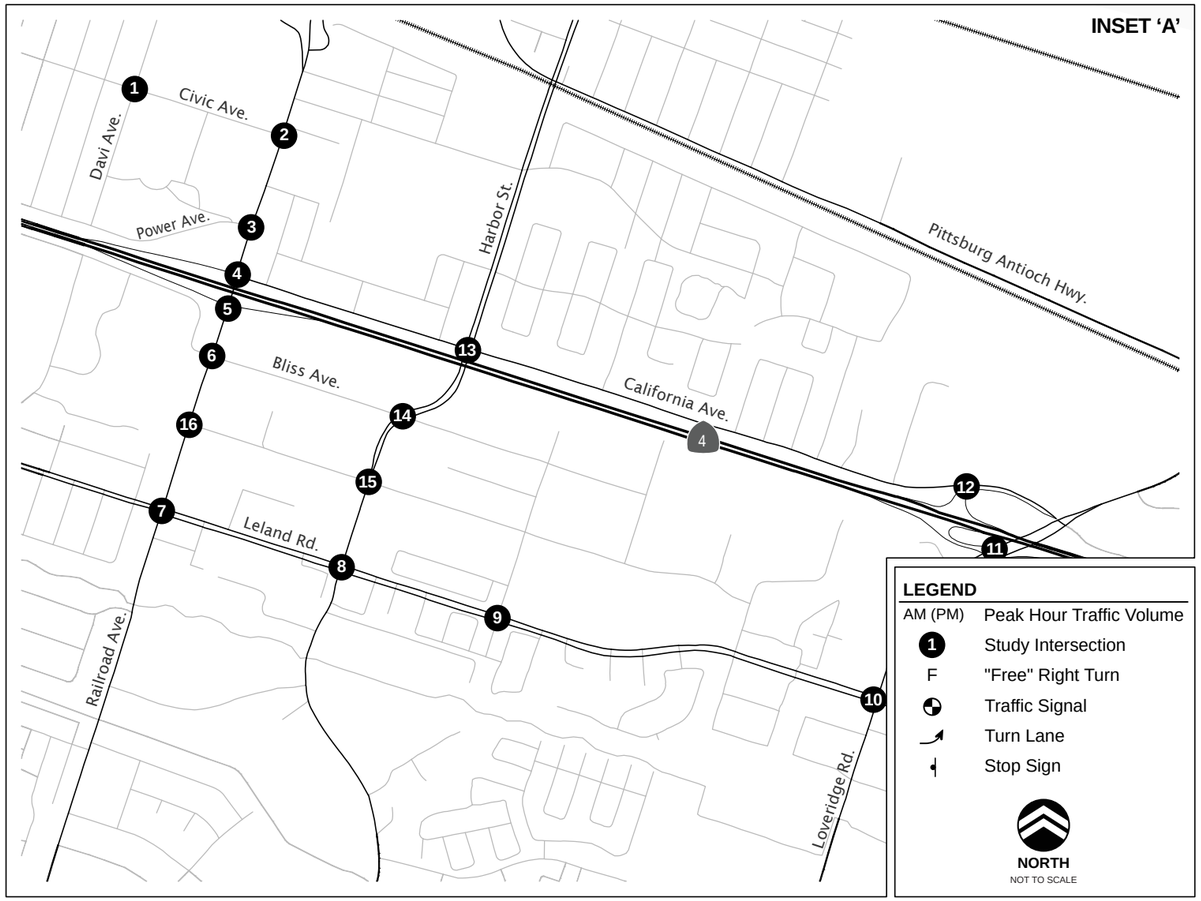


PITTSBURG TRAFFIC STUDY INTERSECTIONS - YEAR 2030 AM (PM) BUILD PROJECT TRIPS

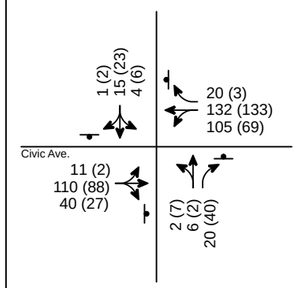
FIGURE 4-4A

WilburSmith ASSOCIATES

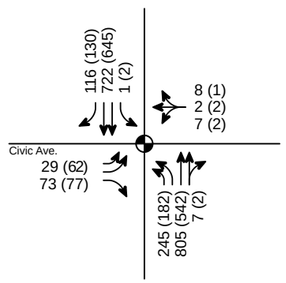




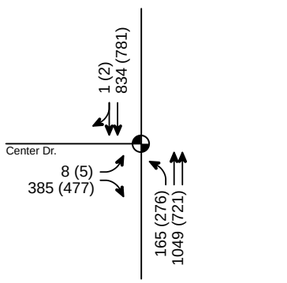
1. Civic Ave./Davi Ave.



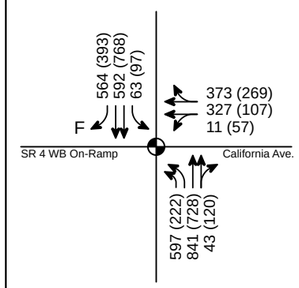
2. Civic Ave./Railroad Ave.



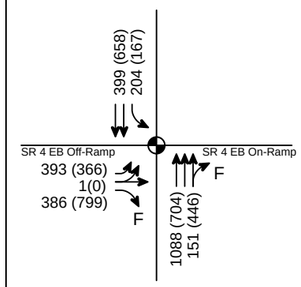
3. Center Dr./Railroad Ave.



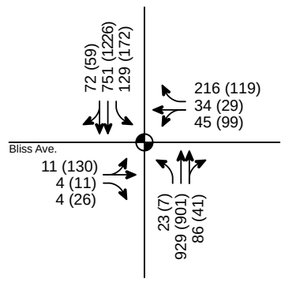
4. SR 4 WB On-Ramp/Railroad Ave.



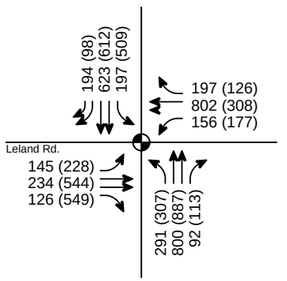
5. SR 4 EB Ramps/Railroad Ave.



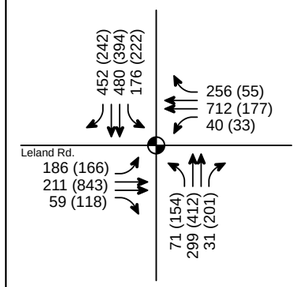
6. Bliss Ave./Railroad Ave.



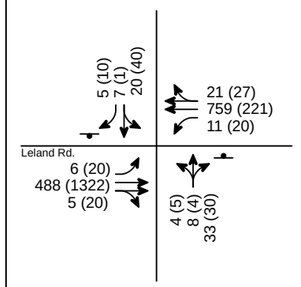
7. Leland Rd./Railroad Ave.



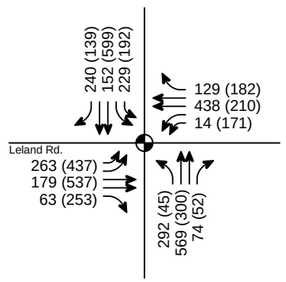
8. Leland Rd./Harbor St.



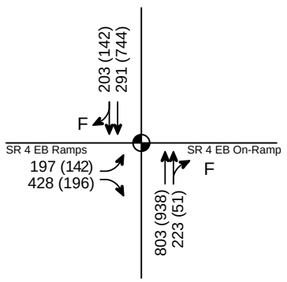
9. Leland Rd./Freed Ave.



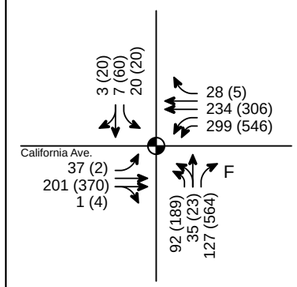
10. Leland Rd./Loveridge Rd.



11. SR 4 EB Ramps/Loveridge Rd.



12. California Ave./SR 4 WB Ramps



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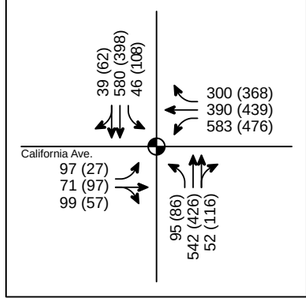
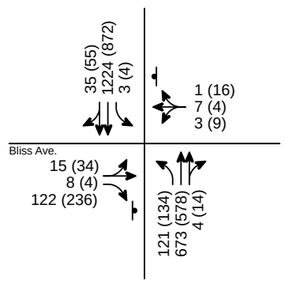
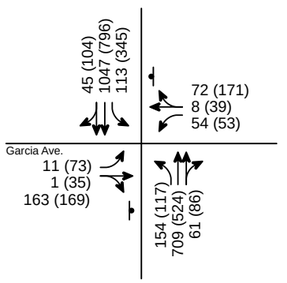


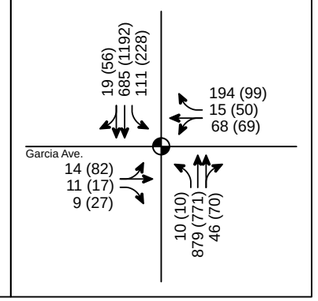
14. Bliss Ave./Harbor St.



15. Garcia Ave./Harbor St.



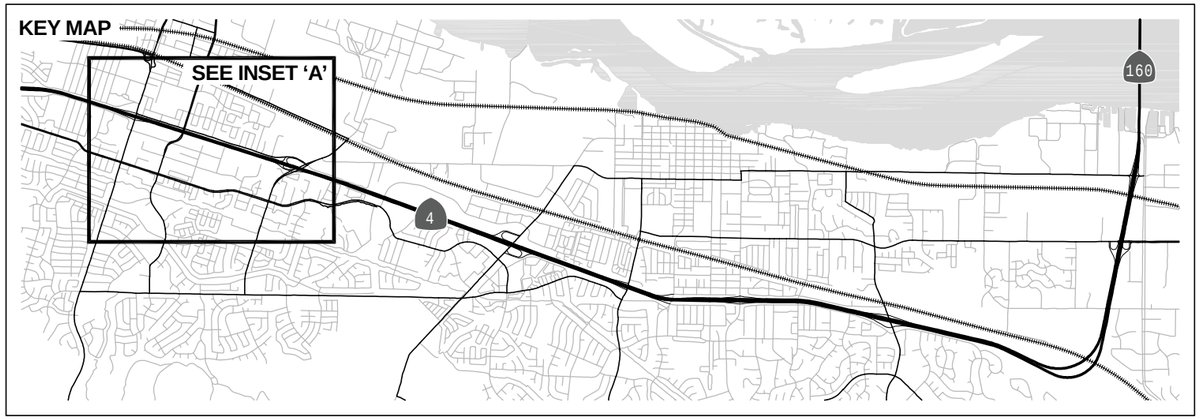
16. Garcia Ave./Railroad Ave.

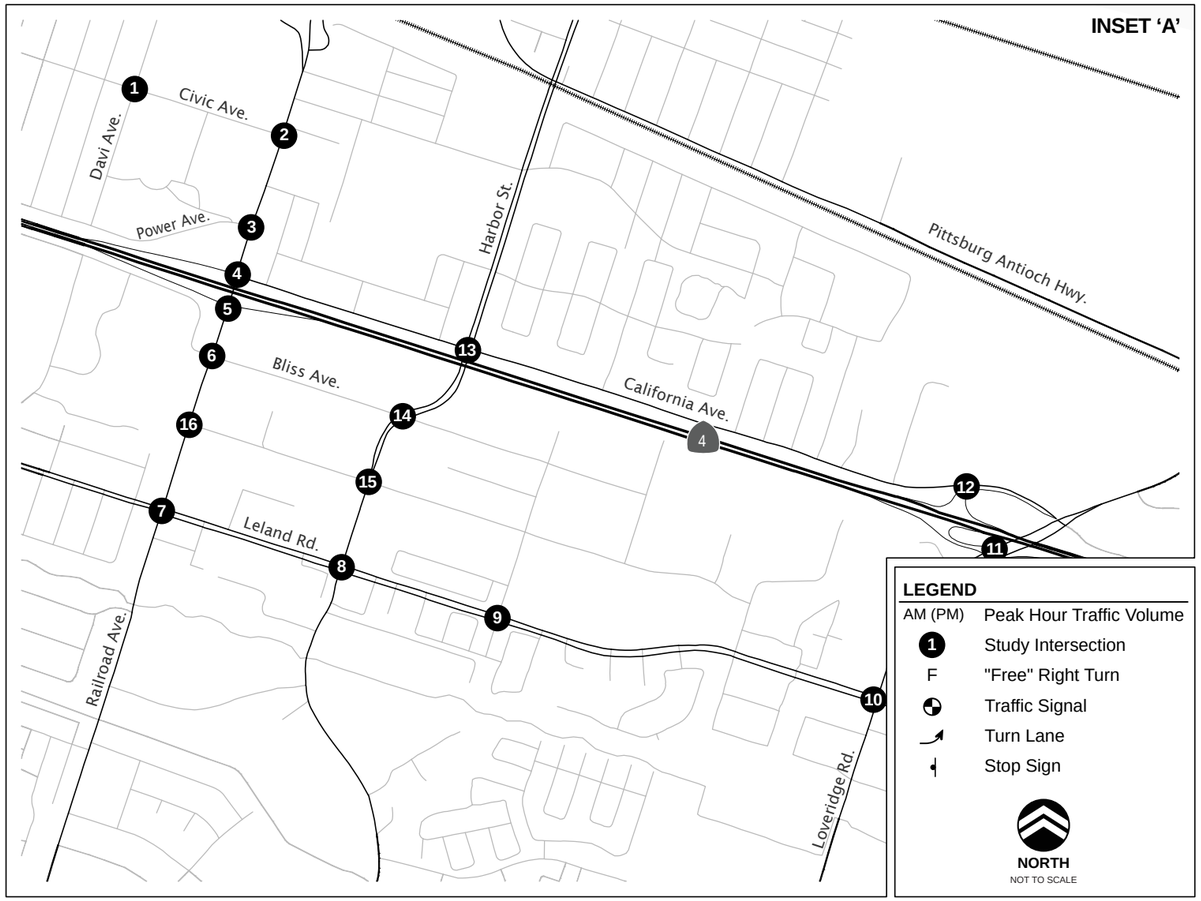


WilburSmith ASSOCIATES

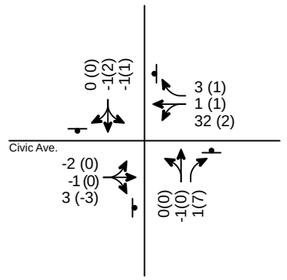
PITTSBURG TRAFFIC STUDY INTERSECTIONS - 2015 PROJECT BUILD (ALTERNATIVE 1) CONDITIONS

FIGURE 4-5

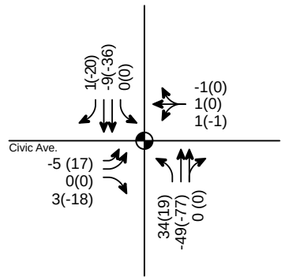




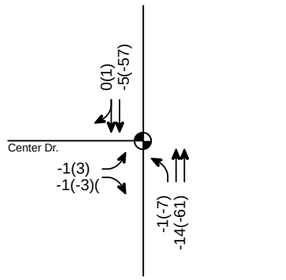
1. Civic Ave./Davi Ave.



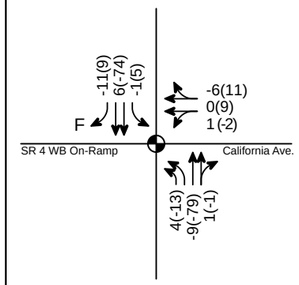
2. Civic Ave./Railroad Ave.



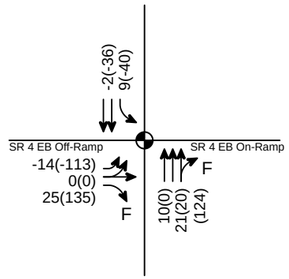
3. Center Dr./Railroad Ave.



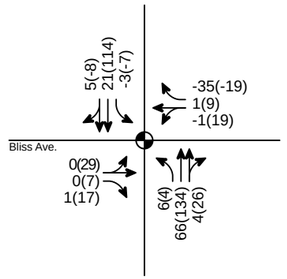
4. SR 4 WB On-Ramp/Railroad Ave.



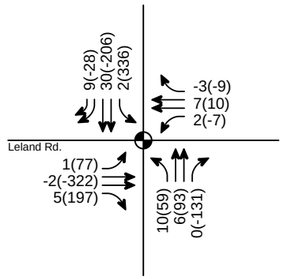
5. SR 4 EB Ramps/Railroad Ave.



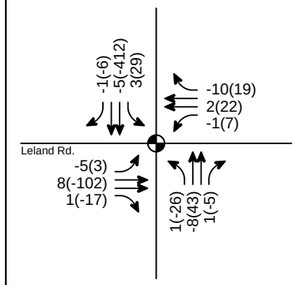
6. Bliss Ave./Railroad Ave.



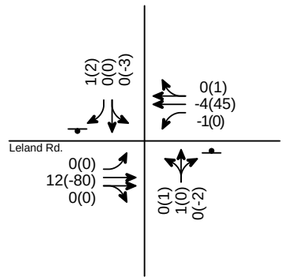
7. Leland Rd./Railroad Ave.



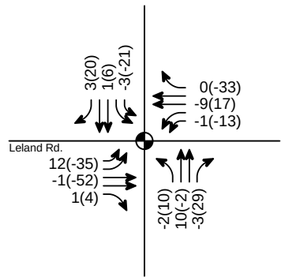
8. Leland Rd./Harbor St.



9. Leland Rd./Freed Ave.



10. Leland Rd./Loveridge Rd.



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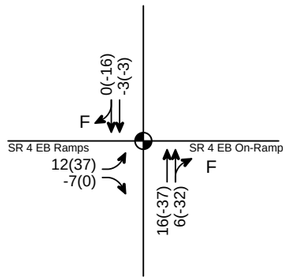
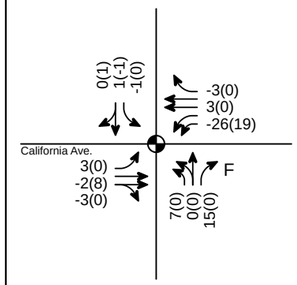


12. California Ave./SR 4 WB Ramps



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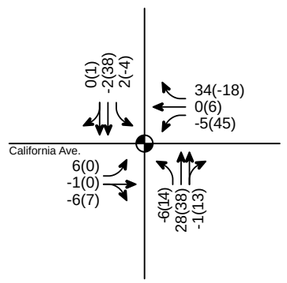

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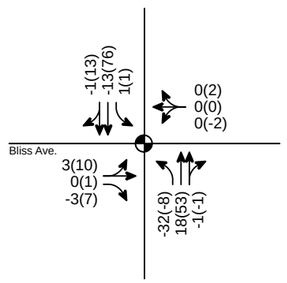

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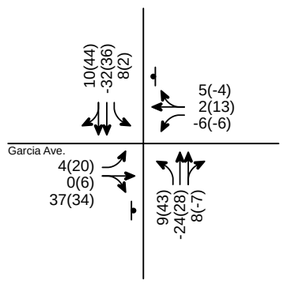
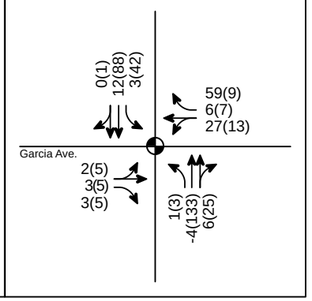


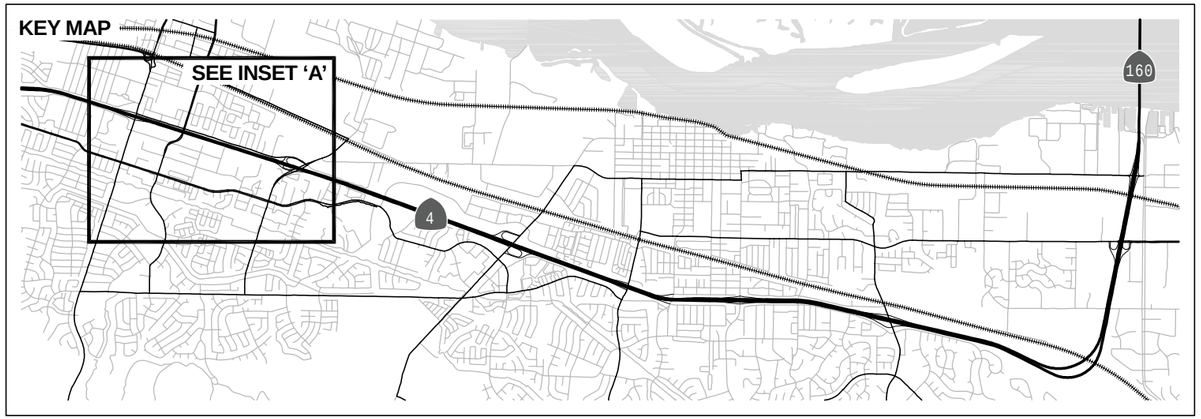
16. Garcia Ave./Railroad Ave.

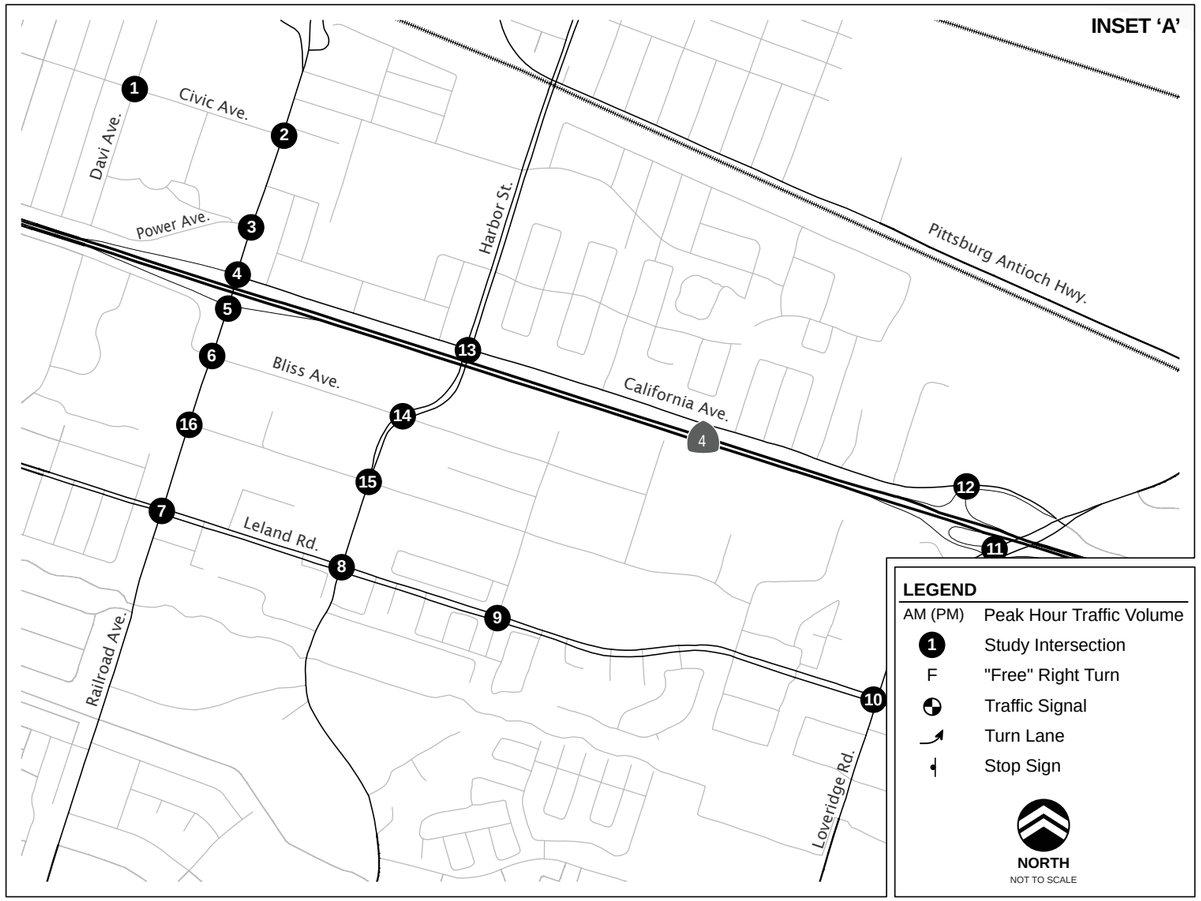


PITTSBURG TRAFFIC STUDY INTERSECTIONS - YEAR 2015 AM (PM) ALT 1 PROJECT TRIPS

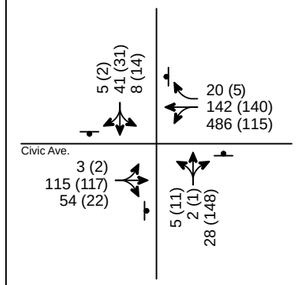
FIGURE 4-5A

WilburSmith ASSOCIATES





1. Civic Ave./Davi Ave.



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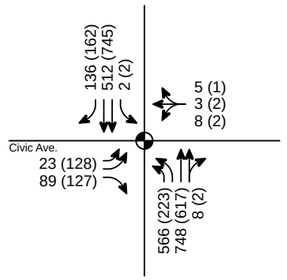
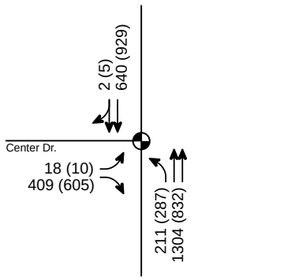


3. Center Dr./Railroad Ave.



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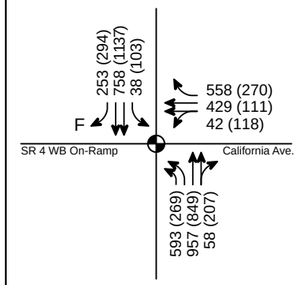

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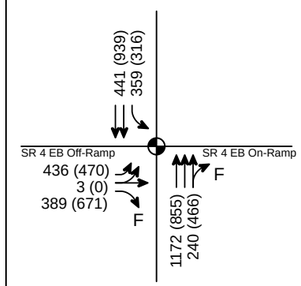
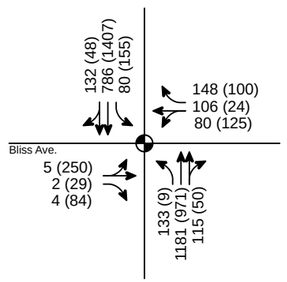


6. Bliss Ave./Railroad Ave.



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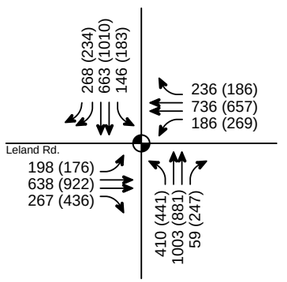

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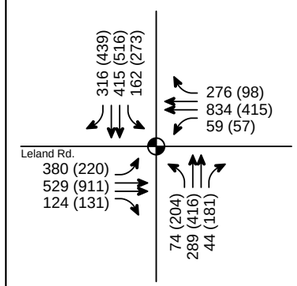

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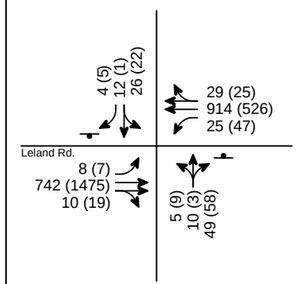

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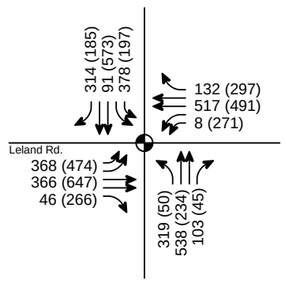

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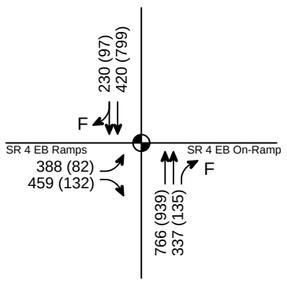

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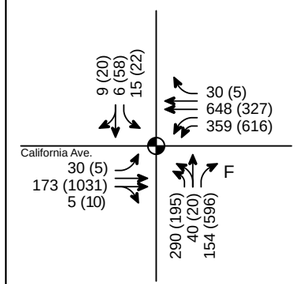

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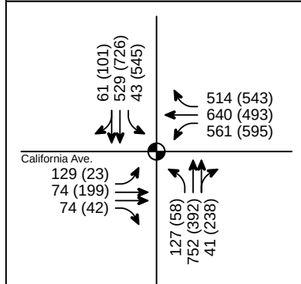

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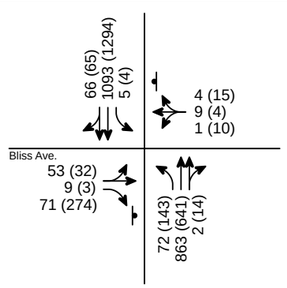

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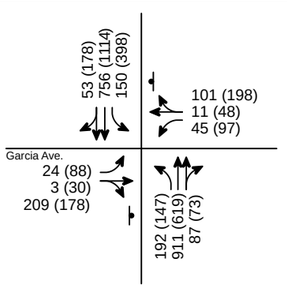
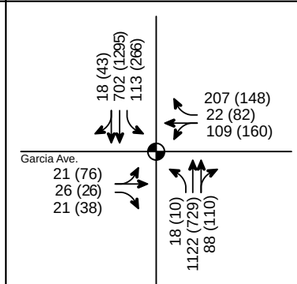


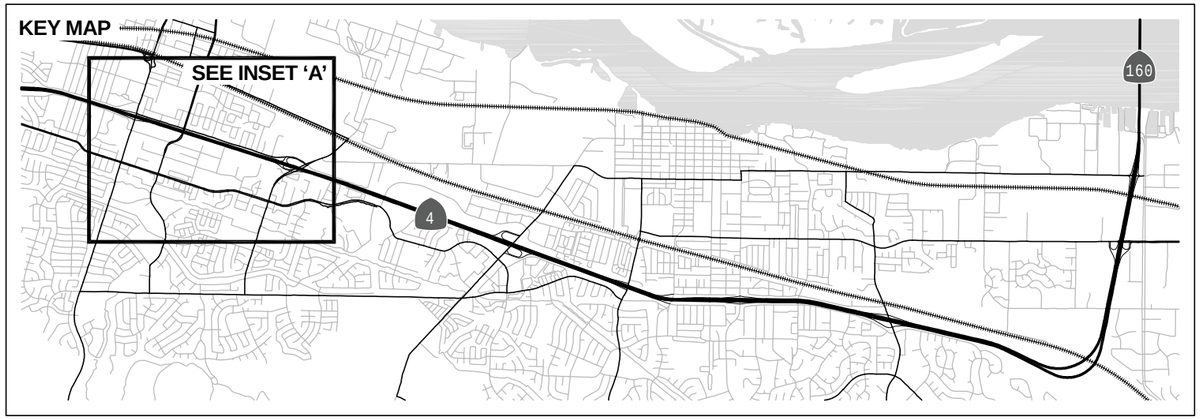
16. Garcia Ave./Railroad Ave.

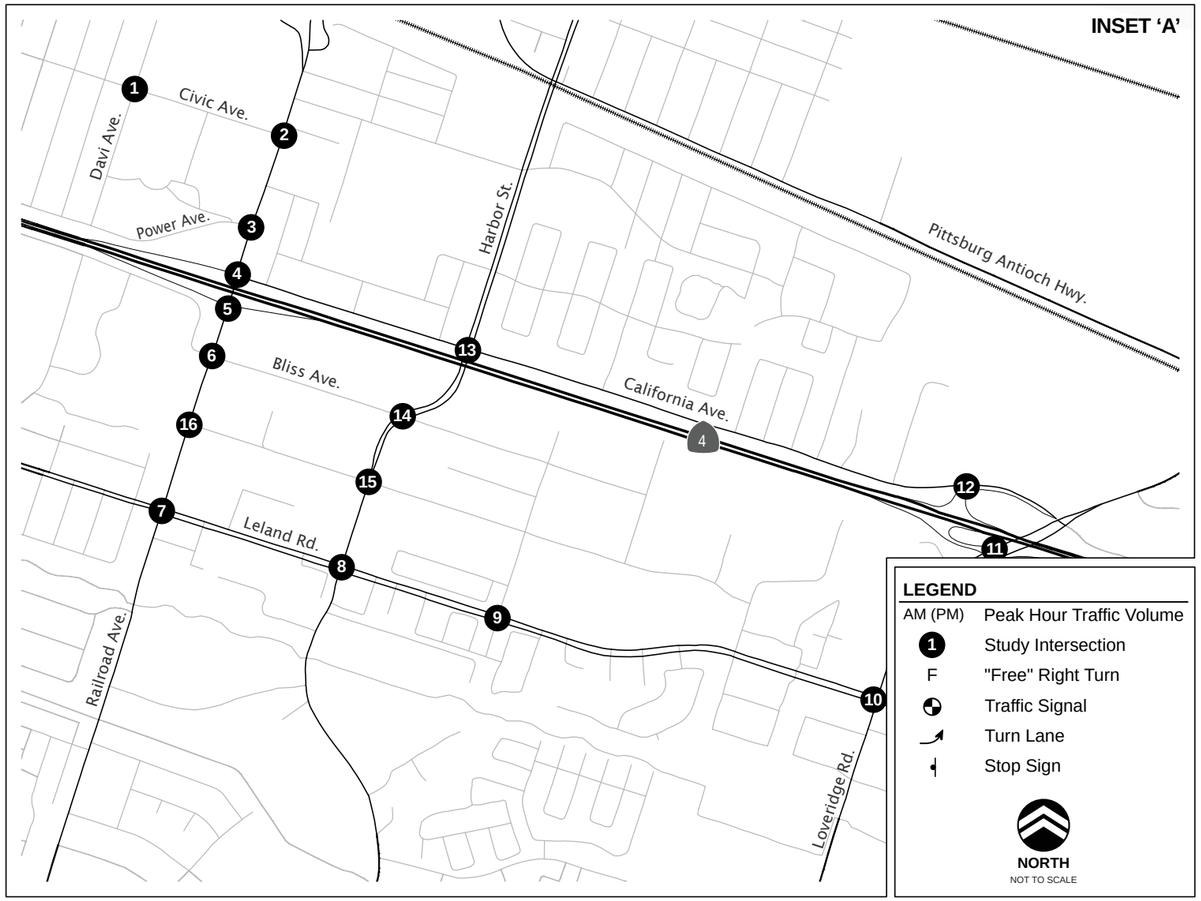


WilburSmith ASSOCIATES

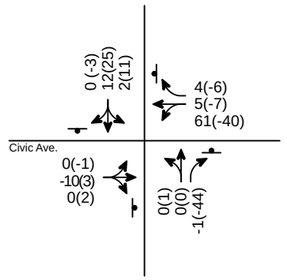
PITTSBURG TRAFFIC STUDY INTERSECTIONS - 2030 PROJECT (ALTERNATIVE 1) BUILD CONDITIONS

FIGURE 4-6





1. Civic Ave./Davi Ave.



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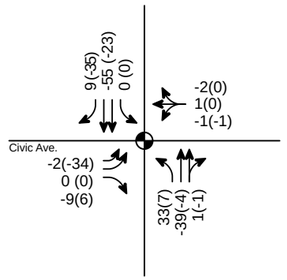
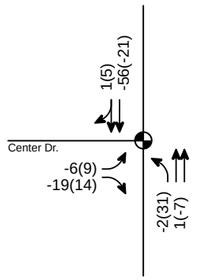


3. Center Dr./Railroad Ave.



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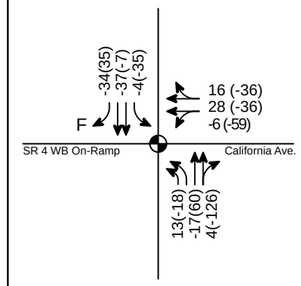
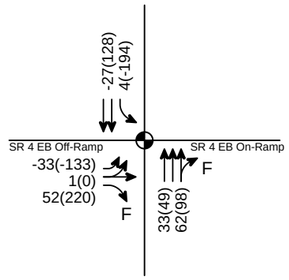
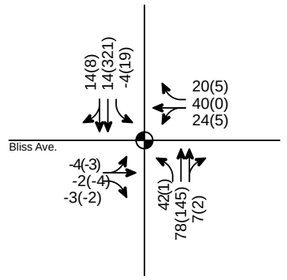


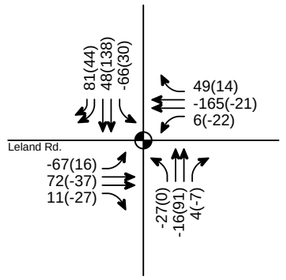
5. SR 4 EB Ramps/Railroad Ave.



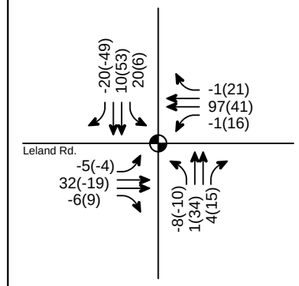
6. Bliss Ave./Railroad Ave.



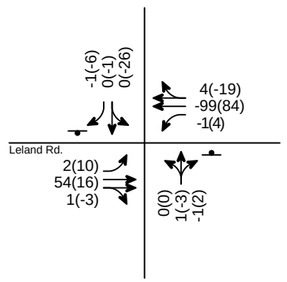
7. Leland Rd./Railroad Ave.



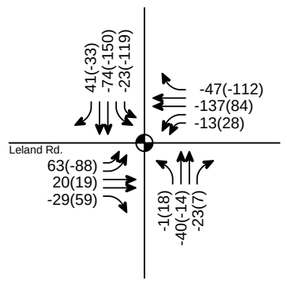
8. Leland Rd./Harbor St.



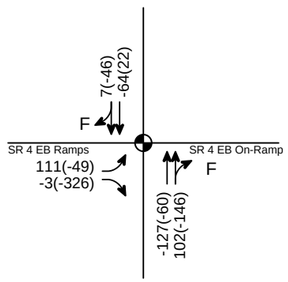
9. Leland Rd./Freed Ave.



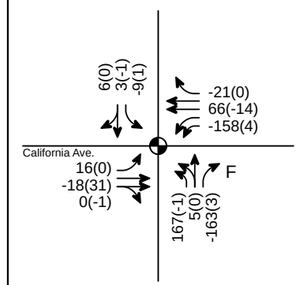
10. Leland Rd./Loveridge Rd.



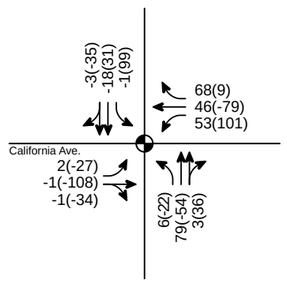
11. SR 4 EB Ramps/Loveridge Rd.



12. California Ave./SR 4 WB Ramps



13. California Ave./Harbor St.



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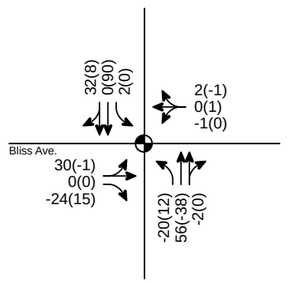
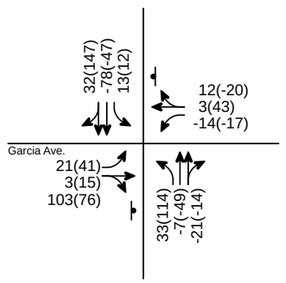
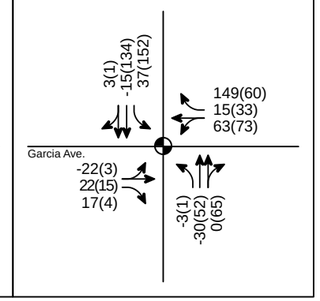


15. Garcia Ave./Harbor St.



16. Garcia Ave./Railroad Ave.



PITTSBURG TRAFFIC STUDY INTERSECTIONS - YEAR 2030 AM (PM) ALT 1 PROJECT TRIPS

FIGURE 4-6A

WilburSmith ASSOCIATES

4.1.8 FREEWAY SEGMENT ANALYSIS

The proposed land uses in the Railroad Avenue Specific Plan were developed to meet BART's minimum ridership thresholds for the extension of BART to eastern Contra Costa County. Since the trips being generated from the Railroad Avenue Specific Plan are less than or equal to that of the *eBART DEIR*, the impacts are also less than or equal to that of the *eBART DEIR*. Therefore it is appropriate to use the *eBART DEIR* freeway operations analysis for segments in the Railroad Avenue Specific Plan Study Area. The following Freeway operating conditions were developed for the *eBART DEIR* opening year (2015) and 2030 conditions for the proposed eBART project.

eBART Freeway Operations.[2] Under the Opening Year "No eBART Project"[3] AM peak hour conditions, two of two freeway study segments would operate at unacceptable levels (i.e., worse than LOS E) in the westbound direction:

- Bailey Road – Railroad Avenue
- Railroad Avenue – Loveridge Road

During the PM peak hour, all segments in the Railroad Avenue Specific Plan study area would operate at acceptable levels in the eastbound direction.

During the 2030 "No eBART Project" AM peak hour, all study area segments would operate at unacceptable levels in the westbound direction:

- Bailey Road – Range Road
- Range Road – Railroad Avenue
- Railroad Avenue – Loveridge Road

During the PM peak hour, all study area segments would operate at unacceptable levels:

- Bailey Road – Range Road
- Range Road – Railroad Avenue
- Railroad Avenue – Loveridge Road

eBART Freeway Impacts. The following beneficial impacts or improvements were projected by the proposed eBART project:[4]

Impact TR-3(eBART): Under 2015 Proposed eBART Project conditions, one of the freeway study segments would operate worse than LOS E during the westbound AM peak hour. However, this segment would operate at an LOS equal to or better than 2015 No eBART Project conditions. Consequently, the Proposed eBART Project would have a beneficial impact on the future baseline conditions in 2015. As such the Proposed Project would be supportive of the Traffic Service Objectives for SR 4 in the East County Action Plan. The reduced traffic due to the project would improve the delay index and would increase transit ridership. (B)

[2] *Page 3.2-51. East Contra Costa BART Extension Draft EIR, September 2008.*

[3] "No Project" in this section indicates the no project alternative for the *eBART DEIR.*

[4] *Pages 3.2-71, 72, and 85. East Contra Costa BART Extension Draft EIR. September2008.*

Freeway segment operating conditions in Year 2015 with and without the Proposed eBART Project are summarized in Table 3.2-20[5] in the *eBART DEIR* for the AM peak hour and in Table 3.2-21[6] for the PM peak hour. During the Opening Year with the Proposed eBART Project, one of the study segments in the westbound direction would operate at unacceptable levels during the AM peak hour:

- Bailey Road – Railroad Avenue

However, this segment operates no worse under Proposed eBART Project conditions than under the No eBART Project scenario. The remaining segments show an improvement in LOS compared to No eBART Project conditions. The improvement in LOS would occur due to trips on SR 4 that would be diverted to the new transit service offered by the Proposed eBART Project. This diversion would be the result of the new transit trips associated with the Proposed eBART Project, as well as trips by existing BART users that would opt to use the Hillcrest Avenue or Railroad Avenue Stations instead of driving to the Pittsburg/Bay Point Station. During the PM peak hour, no segments would operate at unacceptable levels. In the Proposed eBART Project scenario, all segments would perform better than under the No eBART Project scenario. As a result, during the PM peak hour, the Proposed Project would have a beneficial effect on freeway operations.

Impact TR-4(eBART): Under 2030 Proposed eBART Project conditions, three of the freeway study segments would operate worse than LOS E during the westbound AM peak hour, and three segments would operate worse than LOS E during the eastbound PM peak hour. However, all segments would operate at an LOS equal to or better than 2030 No eBART Project conditions. As a result, the Proposed Project would have no impact on freeway operations compared to the No eBART Project conditions in 2030. As such the Proposed Project would be supportive of the Traffic Service Objectives for SR 4 in the East County Action Plan. The reduction in traffic due to the project would improve the delay index and would increase transit ridership. (NI)[7]

Under Proposed eBART Project conditions in Year 2030, the same three segments that operate at unacceptable LOS in the No eBART Project scenario also operate at unacceptable LOS with the Proposed Project in the AM peak hour. During the PM peak hour, three of the segments operate at unacceptable levels under Proposed eBART Project conditions in Year 2030. However, these same three segments would also operate at unacceptable levels under No eBART Project conditions. The freeway segment operating conditions are summarized in Table 3.2-22[8] (AM peak) and Table 3.2-23[9] (PM peak). Based on the standards of significance, the Proposed eBART Project would not result in freeway impacts in the Year 2030, since freeway operations would be the same or better compared to No eBART Project conditions. The impact on freeway

[5] *Page 3.2-81. East Contra Costa BART Extension Draft EIR. September2008.*

[6] *Page 3.2-82. East Contra Costa BART Extension Draft EIR. September2008.*

[7] No impact on freeway segments in Railroad Avenue Study Area for 2030 Proposed eBART Project, however several segments improved under 2030 conditions in the entire *eBART DEIR* study area and as such TR-4 was labeled a beneficial impact for the *eBART DEIR*.

[8] *Page 3.2-83. East Contra Costa BART Extension Draft EIR. September2008.*

[9] *Page 3.2-84. East Contra Costa BART Extension Draft EIR. September2008.*

segment LOS would be avoided (i.e. No Impact) because trips on SR 4 would be diverted to the new transit service offered by the Proposed eBART Project.

4.2 PARKING EVALUATION

This section includes an evaluation of the parking demand based on the land use build out of each project and the projected station access mode splits developed for the *eBART DEIR* beyond the development potential in the *Pittsburg 2020 General Plan* and as evaluated in the *Pittsburg 2020 General Plan EIR*. The Railroad Avenue Specific Plan includes several proposed developments within the study area, ranging from additional BART facilities, and transit-oriented development (TOD) including new commercial, office, public, and recreational uses. The following discussion incorporates the proposed land uses and parking demand estimates defined in the Railroad Avenue Specific Plan. Furthermore, an examination of parking demand, based on the City of Pittsburg Municipal Code will serve as a basis of comparison.

4.2.1 Existing Parking Requirements

Table 4-7 presents the parking requirements according to City of Pittsburg Municipal Code 18.78.040. General off-street parking requirements, based on number of required parking spaces per unit or square feet of development for residential, commercial, office, government, and retail land uses are outlined below.

Table 4-7
City of Pittsburg Municipal Code - Existing Parking Requirements

General Land Use Classification	Off-Street Parking Spaces (per unit or square feet)
Residential	2 spaces per unit, including 1 covered
Government	1 space per 250 square feet
Commercial	1 space per 250 square feet
Restaurant	1 space per 4 seats
Office	1 space per 250 square feet
Retail	1 space per 250 square feet
Industrial	1 space per 500 square feet

Source: City of Pittsburg Municipal Code 18.78.040 for Off-Street Parking Requirements

4.2.2 Proposed Parking Requirements

As discussed in *Chapter 2*, there are two subareas within the boundaries of the Railroad Avenue Specific Plan that encompass the study area (where land use changes in the Railroad Avenue Specific Plan will result in an increase of development beyond that analyzed in the *Pittsburg 2020 General Plan* and as evaluated in the *Pittsburg 2020 General Plan EIR*). The subareas will be served by high frequency transit and a high quality pedestrian and bicycling network facilities that will encourage and support multimodal access to and within the study area. Furthermore

within each subarea, there is a mix of proposed land uses that will generate new multimodal person trips and result a new mix of parking demand. Due to the character of the proposed project, the growth of trips to the study area will be captured over the entire multimodal network including transit (eBART, Tri Delta, and County Connection), bike facilities, pedestrian facilities and the roadways network including parking lots.

In order to provide a realistic projection of future parking demand associated with these additional person trips, the Railroad Avenue Specific Plan has established TOD based parking requirements which take into account the complementary parking demand profiles of the proposed mix of uses, the proximity of high frequency transit and high quality alternative mode (bike and pedestrian) facilities thus supporting reductions from typical parking requirements. The Railroad Avenue Specific Plan TOD parking requirements are listed in Table 4-8.

Table 4-8
Railroad Avenue Specific Plan TOD Parking Requirements per Land Use

Classifications	Parking Requirements
TOD High (TOD-H)	1 space per 333 square feet of commercial
	1.5 spaces per residential unit
TOD Medium (TOD-M)	1 space per 333 square feet of commercial
	1.5 spaces per residential unit
TOD Residential (TOD-R)	1.5 spaces per residential unit
TOD Industrial Park (TOD-IP)	1 space per 500 square feet of development (west of Harbor Street)
	Municipal code requirements for all development east of Harbor Street
TOD Office Commercial (TOD-CO)	1 space per 333 square feet of commercial
	1.5 spaces per residential unit
Public/Institutional (GQ)	Municipal code requirements for all Governmental/Quasi-Public uses

Source: Railroad Avenue Specific Plan; Chapter 4.

Based on the TOD parking requirements, the following parking supply estimates have been determined for both subareas within the study area. Overall, an estimated 6,392 additional parking spaces are proposed to accommodate to future parking demand; 1,433 spaces for the Civic Center subarea developments and 3,561 spaces for the Transit Village subarea, with an additional 1,407 off-street parking spaces. In addition, a total of 2,386 parking spaces for residential use, 2,599 parking spaces for commercial use, and 1,407 spaces within a structure parking facility are proposed, respectively. Table 4-9 and Table 4-10 present the parking supply estimates based on the number of residential dwellings and total square footage of each use proposed in the *Civic Center* and *Transit Village* subareas.

Table 4-9 Proposed Parking Supply – Civic Center Subarea				
Uses[(1)]	Residential Units	Commercial Size (sq.ft.)	Parking Spaces	
			Residential	Commercial
TOD-R	230		345	
TOD-M	24	13,850	36	32
Commercial/Office		147,400		620
Public/Institutional		144,000		400
Parks/Recreation	----	----	----	----
Total	**254**	**305,250**	**381**	**1,052**

Source: Railroad Avenue Specific Plan; Chapter 4.
Notes:
TOD-R: Transit-oriented development residential
TOD-M: Transit-oriented development medium density

Table 4-10 Proposed Parking Supply – Transit Village Subarea				
Uses[(1)]	Residential Units	Commercial Size (sq.ft.)	Parking Spaces	
			Residential	Commercial
TOD-H	830	52,500	1,245	158
TOD-M	247	36,365	371	109
Business/Commercial		223,046		466
Community/Commercial	259	270,949	389	814
Structured Parking				1,407
Parks/Recreation	----	----	----	----
Total	**1,336**	**582,849**	**2,005**	**2,954**

Source: Railroad Avenue Specific Plan; Chapter 4.
Notes:
TOD-H: Transit-oriented development high density
TOD-M: Transit-oriented development medium density

According to the Railroad Avenue Specific Plan, at least 350 additional parking spaces will be dedicated for future BART parking two along Bliss Avenue, and one on the Civic Center sub-area block.[10] Therefore, the estimated total parking supply would be at least 6,742 parking spaces, which includes the parking supply per subarea and the additional parking spaces at the transit station.

In comparing the existing parking requirements (see Table 4-7) and the proposed parking requirements per land use within the Railroad Avenue Specific Plan (see Table 4-8); the parking requirements have been reduced and regulated. For example, the general commercial parking requirement is one space per 250 square feet of development and the proposed requirements under TOD conditions is one space per 333 square feet of development, a 33 percent adjustment in parking requirements, respectively. Overall, parking requirements have been reduced under the Railroad Avenue Specific Plan, ensuring a optimal utilization of land, regulating parking

[10] Refer to Figure 6.9 Parking Structure Locations in the Railroad Avenue Specific Plan, Chapter 6.

supply per land use, and promoting alternative modes of transportation (transit usage, walking, and bicycling) in order to control parking demand, which are important components of implementing TOD.

4.2.3 Railroad Avenue Station Parking Demand

Due to the large parking supply differentials at the Pittsburg Bay Point BART and Hillcrest Avenue eBART Stations the *eBART DEIR* states that the demand for parking at these stations will far exceed that of the demand at the Railroad Avenue eBART Station. According to Table 3.2-15 in the *eBART DEIR* only 40 percent of the entire ridership is projected to access the Railroad Avenue Station via the park and ride lot, resulting in a much lower projected parking demand than the adjacent stations in 2030.[11]

Pittsburg Bay Point BART presently fills to capacity (2,036 spaces) at 7:25 AM and approximately 500 vehicles park in surrounding streets. The unconstrained model developed for the *eBART DEIR* projected demand for 3,500 parking spaces based on a 2030 ridership of 14,600 with no eBART Project indicating a latent demand of approximately 1,000 spaces. When the future eBART stations and associated parking facilities open, the demand at Pittsburg Bay Point will decline as some demand will shift mostly to Hillcrest Station and some to Railroad Avenue Station. While the 2,036 spaces will be sufficient, the unserved latent demand at Pittsburg Bay Point is expected to cause the parking facility to remain highly utilized.[12] The *eBART DEIR* projects the Hillcrest Avenue Station in Antioch will also be in high demand at 92 percent of its capacity (2600 spaces) in 2030.[13] The Railroad Avenue Specific Plan has planned at least 350 spaces for the station and its demand will slightly exceed its projected supply (up to 366 spaces) by 2030 based on the unconstrained travel forecasts conducted for the *eBART DEIR*. It should be noted that the application of standard parking management techniques such as on-street time limits and pricing and satellite parking with complementary shuttles would help further reduce parking demand and direct riders to alternative modes of transportation in the station area.

4.3 TRANSPORTATION CIRCULATION ASSESSMENT & STATION ACCESS

WSA conducted field observations in October 2008 in order to examine and identify circulation patterns throughout the study area and near the proposed station location. As such, a qualitative review of the transportation circulation near the proposed eBART station, specifically for automobile, pedestrian, bicycle, transit facilities, and emergency vehicle access is presented. In addition, a discussion of proposed improvements and future developments near the eBART station are included in this section.

[11] Page 3.2-15. *East Contra Costa BART Extension Draft Environmental Impact Report (2008)* for a detailed access mode split for Future Year 2015 and Year 2030.

[12] Latent parking demand was one factor used to estimate total ridership at Pittsburg Bay Point Station in the *eBART DEIR*.

[13] Refer to Table 3.2-27 in the *East Contra Costa BART Extension Draft EIR, September 2008.*

4.3.1 Station Location

According to the *eBART DEIR*, a new passenger station would be constructed at Railroad Avenue in the City of Pittsburg. The proposed alignment would traverse the median of State Route 4, with a station located specifically at State Route 4 and Railroad Avenue. In addition, the *DEIR* indicates that a significant portion (28 percent) of eBART riders at the Railroad Avenue Station are expected to walk to the station, while only 40 percent of riders would use the park-and-ride lot, partly due to the limited availability of parking.[14] It's estimated that 10 percent of riders will arrive by bus or other transit and 20 percent will be dropped-off by car. The remaining two (2) percent will bike to the station. Additionally greater amounts of (non-station access) bicycle and pedestrian activity along Railroad Avenue are expected as well.[15]

4.3.2 Vehicle Traffic Circulation

With regard to accessibility in and out of the project area, field observations and vehicle travel pattern projections have determined that the majority of vehicles would travel along Railroad Avenue in order to access the station. The main routes for heavy truck traffic are on Railroad Avenue and Leland Road, while the majority of vehicles in the northbound direction would originate on Leland Road and would turn onto Railroad Avenue to access the station. However, proposed BART parking lots are to be located along Bliss Avenue, directly east of the proposed station location. Therefore, vehicles traveling northbound on Railroad Avenue must turn eastbound onto Bliss Avenue to access the parking lots. Vehicles traveling northbound or southbound on Harbor Street would access the station area and parking lots by turning westbound on Bliss Avenue. Vehicles traveling southbound on Railroad Avenue would also turn eastbound onto Bliss Avenue in order access the parking lots. Vehicles may also access the station area from California Avenue, in the westbound direction. These vehicles must turn southbound onto Railroad Avenue to access the station directly or continue southbound on Railroad Avenue and turn eastbound on Bliss Avenue to access the parking lots.[16] In addition, future vehicle demand and intersection operations indicate that there would be minimal traffic impacts along each roadway in the study area; therefore roadway capacity along each roadway would accommodate to future vehicle demand associated with the proposed station.[17]

4.3.3 Transit Circulation

There are several public transit buses operating throughout the study area; however there is only one route that would serve the station directly. Currently, the Tri Delta Route 380 bus service

[14] These rates compare to the proposed Hillcrest Avenue eBART Station with a projected three (3) percent walk access share and a 62 percent park and ride access share.

[15] Refer to Table 3.2-15 in the *East Contra Costa BART Extension Draft Environmental Impact Report (2008)* for a detailed access mode split for Future Year 2015 and Year 2030.

[16] As shown in Table 3.2-15 in the *East Contra Costa BART Extension Draft Environmental Impact Report (2008)*, an estimated 40 percent of patrons of the transit station will be vehicle accessing the park-and-ride lots, and 20 percent of patrons will be dropped-off at the station; the remaining 40 percent will walk, bike, or use transit in order to access the station.

[17] Refer to section 4.1 on pages 4-1 through 4-10. Refer to *Chapter 5* for detailed traffic impacts and mitigation measures.

along Railroad Avenue has a stop near the proposed station and would allow direct access to the station for eBART patrons. As stated in *Chapter 3*, Route 380 is the most productive line in the system, with connection to the existing Pittsburg/Bay Point BART station. According to the DEIR, an estimated 10 percent of eBART patrons would utilize transit service in order to access the station.[18]

The Railroad Avenue Specific Plan encourages modifications to the existing Tri Delta route and proposes implementing a dedicated shuttle service route to connect the Transit Village with Old Town Pittsburg. In parallel with the plans to extend Garcia Avenue to Railroad Avenue, an additional transit route would operate along Garcia Avenue, allowing patrons of the eBART station direct access to proposed park-and-ride lots and access to the station.[19]

Overall, local transit services would not experience decreased service quality or productivity as a result of the proposed station or the implementation of the Railroad Avenue Specific Plan. Feeder routes to the new station would experience an increase in ridership; however Tri Delta is proposing to reconfigure existing routes to accommodate to increased demand. As such, Tri Delta plans to use the buses removed from SR 4 express service to improve bus service to the proposed station at Railroad Avenue. These improvements should result in improved service reliability and schedule adherence as well as increase connectivity between the surrounding neighborhoods and the proposed station area.[20]

4.3.4 Bicycle Circulation

As defined in *Chapter 3*, Crestview Avenue includes a Class II bicycle facility that connects to a Class I multi-use trail that extends east along Frontage Road to Railroad Avenue. Currently, there are no designated bicycle facilities along Railroad Avenue south of State Route 4. Other existing bicycle facilities are located along Harbor Street, from Buchanan Road to East 3rd Street; East Leland Road, from Railroad Avenue to East City Limits. Other proposed bicycle facilities include Power Avenue, from Davi Avenue to west of Case Drive; and Central Avenue, from Railroad Avenue to Columbia Street.[21]

In proximity to the proposed station, field observations indicated a low-to-moderate level of bicycle activity. Bicycle counts conducted by the City of Pittsburg recorded few bicyclists traveling during AM and PM peak hours of observation along Railroad Avenue and along Harbor Street at each intersection with California and Bliss avenues.[22] In regards to accessibility,

[18] Refer to Table 3.2-15 in the *East Contra Costa BART Extension Draft Environmental Impact Report (2008).*

[19] Refer to Figure 6.10 in the Railroad Avenue Specific Plan for an illustration of the proposed transit route and shuttle service.

[20] Refer to *East Contra Costa BART Extension Draft Environmental Impact Report (2008);* pp.3.2-92 in regards to impacts to local transit service associated with the proposed station.

[21] Source: Railroad Avenue eBART Station Area Specific Plan –Existing Conditions Report (November 2006).

[22] Refer to Appendix B for bicycle count inventory provided by the City of Pittsburg (September 2008).

the proposed bicycle route along Railroad Avenue would provide cyclists with direct access to the proposed station.

According to the Railroad Avenue Specific Plan, there are several proposed bicycle lanes within the study area and near the proposed station. For example, Year 2015 roadway improvements include an extension and implementation of Class II bicycle lanes and Class III bicycle routes along Railroad and Central Avenues. Additional bicycle facility extensions are proposed beyond the study area; this will increase connectivity and biking mode share to the station area by extending the bicycle network throughout many neighborhoods in Pittsburg.

4.3.5 Pedestrian Circulation

There are several sidewalks along major roadways throughout the study area. In proximity to the proposed station, there are sidewalks along both sides of Railroad Avenue, ranging from 5 to 10 feet in width, respectively. Pedestrian counts conducted by the City of Pittsburg observed a high amount of pedestrians traveling along and crossing Railroad Avenue, specifically at Civic Avenue and the SR 4 on- and off-ramps during the AM and PM peak hours. A moderate-to-low amount of pedestrian activity was observed Bliss and California avenues as well as along Harbor Street. Field observations have indicated that a high level of pedestrian activity along Railroad Avenue, north of Bliss Avenue is primarily associated with the nearby Pittsburg High School. According to the *East Contra Costa BART Extension Draft Environmental Impact Report (2008)*, the proposed transit station would generate additional walk trips throughout the area. As mentioned above, the *DEIR* estimated 28 percent of patrons would access the proposed station by walking, which is largest percentage of alternative mode access to the station. Total single occupancy vehicle (SOV) access is estimated at 60 percent of all access to the station.[23]

The Railroad Avenue Specific Plan proposes several sidewalk and streetscape improvements throughout the entire network. General improvements include:

- Widening sidewalks in mixed-use and commercial areas to at least 10-feet-wide,
- The installation of planter strips between sidewalks and roadways to serve as buffers for pedestrians and increase safety.
- The provision of clearly marked crosswalks at all controlled intersections and major intersections, and
- Bulb-outs at intersections to increase visibility of pedestrians and to reduce walking distance.

[23] Refer to Table 3.2-15 in the *East Contra Costa BART Extension Draft Environmental Impact Report (2008).*

Finally, the design of the station area recognizes that the sidewalk along the east side of Railroad Avenue overcrossing of SR 4 is five feet in width, and thus would be widened to reduce potential pedestrian impacts near the station area.[24]

4.4 MULTIMODAL LEVEL OF SERVICE – FUTURE CONDITIONS

The following section evaluates the transportation facilities under future conditions based on the Multimodal Level of Service (MMLOS) criteria. The transportation conditions were analyzed under Year 2030 plus Project conditions; therefore the analysis considers roadway network modifications (as discussed in *Chapter 2*) as well as forecasted traffic and proposed transportation network improvements associated with the Railroad Avenue Specific Plan.

4.4.1 Facility 1

Facility 1 operates along Railroad Avenue, from Civic Avenue (to the north) to Leland Road (to the south) with five segments in the northbound and southbound directions. Under future conditions, several transportation improvements have been incorporated into the MMLOS analysis for Facility 1. Road widening to allow an exclusive right-turn lane at Railroad Avenue and SR 4 ramps is proposed and additional eastbound and southbound right-turn lanes at Railroad Avenue and Leland Road are proposed. Roadway widening along California Avenue from Loveridge Road to Railroad Avenue is also proposed, which will increase the need to expand crosswalks for pedestrians and allow additional crossing time. According to the Railroad Specific Plan, an additional left-turn lane on northbound Railroad Avenue at Civic Avenue is proposed as well as sidewalk improvements (construction of 10-foot-wide sidewalks, planter strips for roadway buffers, and provide bulbouts where appropriate) along Railroad Avenue intersecting at California, Bliss, Garcia avenues and Leland Road. A Class II and III Bicycle Facilities from Leland Road to East 10th Street are also planned to operate along Railroad Avenue. Table 4-11 and Figure 4-7 presents the MMLOS for Facility 1 under future conditions.

Northbound Segment 1 seems to exhibit improved northbound Auto LOS in the future conditions. This, in fact, results from the splitting of existing conditions' Segment 1 into two segments in the future conditions analysis, as a result of signalization at the Railroad Avenue/Garcia Avenue intersection. Auto LOS is lower between Garcia Avenue and Bliss Avenue (future Segment 2) than between Leland Avenue and Garcia Avenue (future Segment 1). While existing Segment 1 (Leland Avenue to Bliss Avenue) is LOS F on average, when this larger segment is split into two segments in future conditions, future Segment 1 (Leland Avenue to Garcia Avenue) exhibits an Auto LOS D and future Segment 2 (Garcia Avenue to Bliss Avenue) exhibits an Auto LOS F.

The Northbound Facility 1 average Auto LOS improves in future conditions due to lower traffic volumes between SR-4 and Center Drive (as indicated by the travel demand model), which shifted the distance-weighted average into the next LOS rating.

[24] Refer to *East Contra Costa BART Extension Draft Environmental Impact Report (2008);* pp.3.2-96 in regards to impacts to pedestrian associated with the proposed station.

Table 4-11 Multimodal Level of Service Analysis - Facility 1 Future Conditions				
Segment	**Auto LOS**	**Transit LOS**	**Bicycle LOS**	**Pedestrian LOS**
Northbound				
1	D	C	F	D
2	F	C	F	D
3	F	C	E	E
4	C	C	D	D
5	C	C	F	D
6	B	C	F	D
Facility NB	D	C	F	D
Southbound				
1	B	C	F	E
2	C	C	F	F
3	C	C	D	E
4	E	C	D	E
5	D	C	F	E
6	F (v/c>1)	C	E	F
Facility SB	C	C	E	E

4.4.2 Facility 2

Facility 2 operates along Leland Road, from Railroad Avenue (to the west) to Loveridge Road (to the east) with three segments in the eastbound and westbound directions. Under future conditions, transportation improvements along Leland Road have been incorporated into the MMLOS analysis for Facility 2. As such, an additional northbound right-turn lane is proposed at Leland Road and Loveridge Road. According to the Railroad Avenue Specific Plan, several crosswalk improvements are proposed along Leland Road, specifically at East Leland and Freed avenues, and Harbor Street. Proposed sidewalk improvements, including safety buffers, and bulbouts where appropriate are also planned along Facility 2. Table 4-12 and Figure 4-8 presents the MMLOS for Facility 1 under future conditions.

Westbound Segment 3 (Harbor Street to Railroad Avenue) exhibits improved Auto LOS in the future conditions due to fewer projected stops per vehicle in the travel demand model. Stops per vehicle is a large component of the Auto LOS under the MMLOS methodology, and this improvement shifted the segment score into the next LOS rating.

The Eastbound Facility 2 average Auto LOS improves in future conditions due to lower traffic volumes between Railroad Avenue and Freed Way (as indicated by the travel demand model), which shifted the distance-weighted average into the next LOS rating.

Table 4-12 Multimodal Level of Service Analysis - Facility 2 Future Conditions				
Segment	**Auto LOS**	**Transit LOS**	**Bicycle LOS**	**Pedestrian LOS**
Eastbound				
1	B	A	F	E
2	B	A	F	D
3	B	A	F	E
Facility EB	B	A	F	E
Westbound				
1	B	A	E	D
2	D	F	F	E
3	D	A	F	E
Facility WB	C	A	F	E

4.4.3 Facility 3

Facility 3 operates along California Avenue, from Railroad Avenue (to the west) to State Route 4 Ramps (to the east) with two segments in the eastbound and westbound directions. Under future conditions, several transportation improvements along California Avenue have been incorporated into the MMLOS analysis for Facility 3. At the California Avenue/SR 4 westbound off-ramp intersection, an additional eastbound through lane is proposed. In addition, a three-phase construction plan has been proposed to widen California Avenue from Loveridge Road to Railroad Avenue, thus increasing the need to improve sidewalk, streetscape, and crosswalk conditions and allowing pedestrians enough crossing time at each intersection. Table 4-13 and Figure 4-9 presents the MMLOS for Facility 1 under future conditions.

The westbound Segment 1 Auto LOS improves in future conditions from LOS F to LOS C due to the widening of California Avenue. In existing conditions, the MMLOS model determined that the volume to capacity ratio was greater than one, which automatically results in LOS F; with increased capacity, the model instead determined LOS using other parameters such as average stops per vehicle. The volume to capacity threshold is also responsible for the Facility 1 average Auto LOS improving from LOS F to LOS C in future conditions, as average capacity was increased.

Table 4-13 Multimodal Level of Service Analysis - Facility 3 Future Conditions				
Segment	**Auto LOS**	**Transit LOS**	**Bicycle LOS**	**Pedestrian LOS**
Eastbound				
1	B	F	F	E
2	B	F	D	D
Facility EB	B	F	E	E

Westbound				
1	C	F	E	E
2	B	F	F	E
Facility WB	C	F	F	E

4.4.4 Facility 4

Facility 4 operates along Harbor Street, from California Avenue (to the north) to Leland Road (to the south) with two segments in the northbound and southbound directions. Under future conditions, transportation improvements along Harbor Street have been incorporated into the MMLOS analysis for Facility 4. According to the Railroad Avenue Specific Plan, sidewalk and crosswalk improvements are proposed along Harbor Street, specifically at Garcia and Bliss avenues and Leland Road. These improvements include sidewalk widening and construction of ramps at sidewalks. Signal installation at Harbor Street and Garcia Avenue would provide a mid-segment signalized crossing along Harbor Street, between State Route 4 and Leland Road reducing the current signalized crossing distance for pedestrians almost in half. Table 4-14 and Figure 4-10 presents the MMLOS for Facility 1 under future conditions.

Table 4-14
Multimodal Level of Service Analysis - Facility 4 Future Conditions

Segment	Auto LOS	Transit LOS	Bicycle LOS	Pedestrian LOS
Northbound				
1	B	A	F	D
2	F (v/c>1)	F	F	E
Facility NB	F (v/c>1)	B	F	D
Southbound				
1	B	F	F	E
2	F (v/c>1)	A	F	E
Facility SB	F (v/c>1)	B	F	E

4.4.5 Facility 5

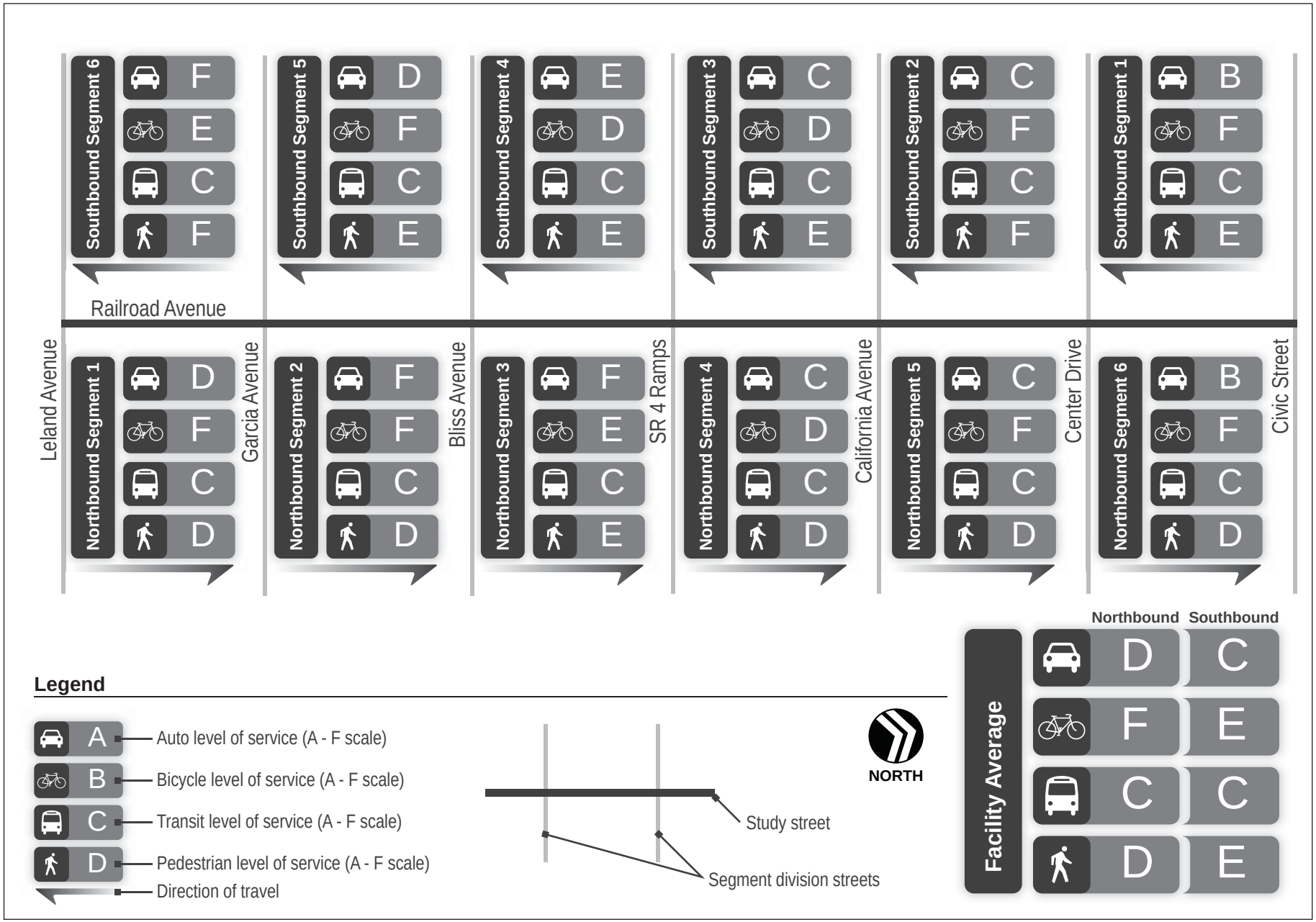
Facility 5 operates along Bliss Avenue, from Railroad Avenue (to the west) to Harbor Street (to the east) with one segment in the eastbound and westbound directions. Under future conditions, transportation improvements along Bliss Avenue have been incorporated into the MMLOS analysis for Facility 5. According to the Railroad Avenue Specific Plan, Bliss Avenue will be converted to a public street that contains two 19-foot deep diagonal parking lanes, two 11-foot wide travel lanes, curbs, and widened, 15-foot sidewalks between Railroad Avenue and Harbor Street. Table 4-14 and Figure 4-11 presents the MMLOS for Facility 1 under future conditions.

The westbound Segment 1 Auto LOS improves in future conditions from LOS F to LOS B due to lower traffic volumes in the future conditions (as indicated by the travel demand model).

Under existing conditions, the MMLOS model determined that the volume to capacity ratio was greater than one, which automatically results in LOS F; with the decreased volumes, the model instead determined LOS both through volume and average stops per vehicle.

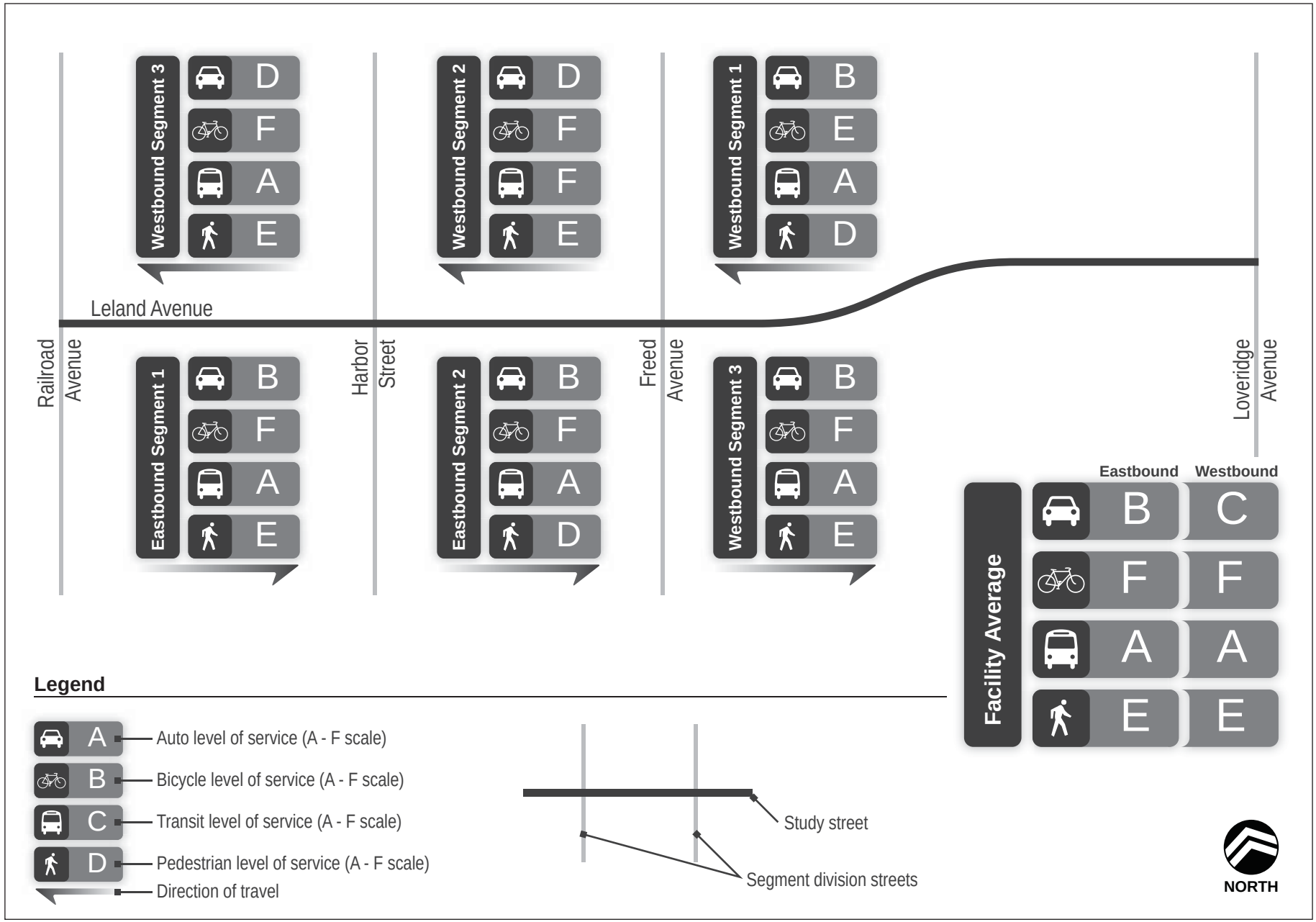
Table 4-15
Multimodal Level of Service Analysis - Facility 5 Future Conditions

Segment	Auto LOS	Transit LOS	Bicycle LOS	Pedestrian LOS
Eastbound				
1	B	F	F	E
Facility EB	B	F	F	E
Westbound				
1	C	F	F	E
Facility WB	C	F	F	E



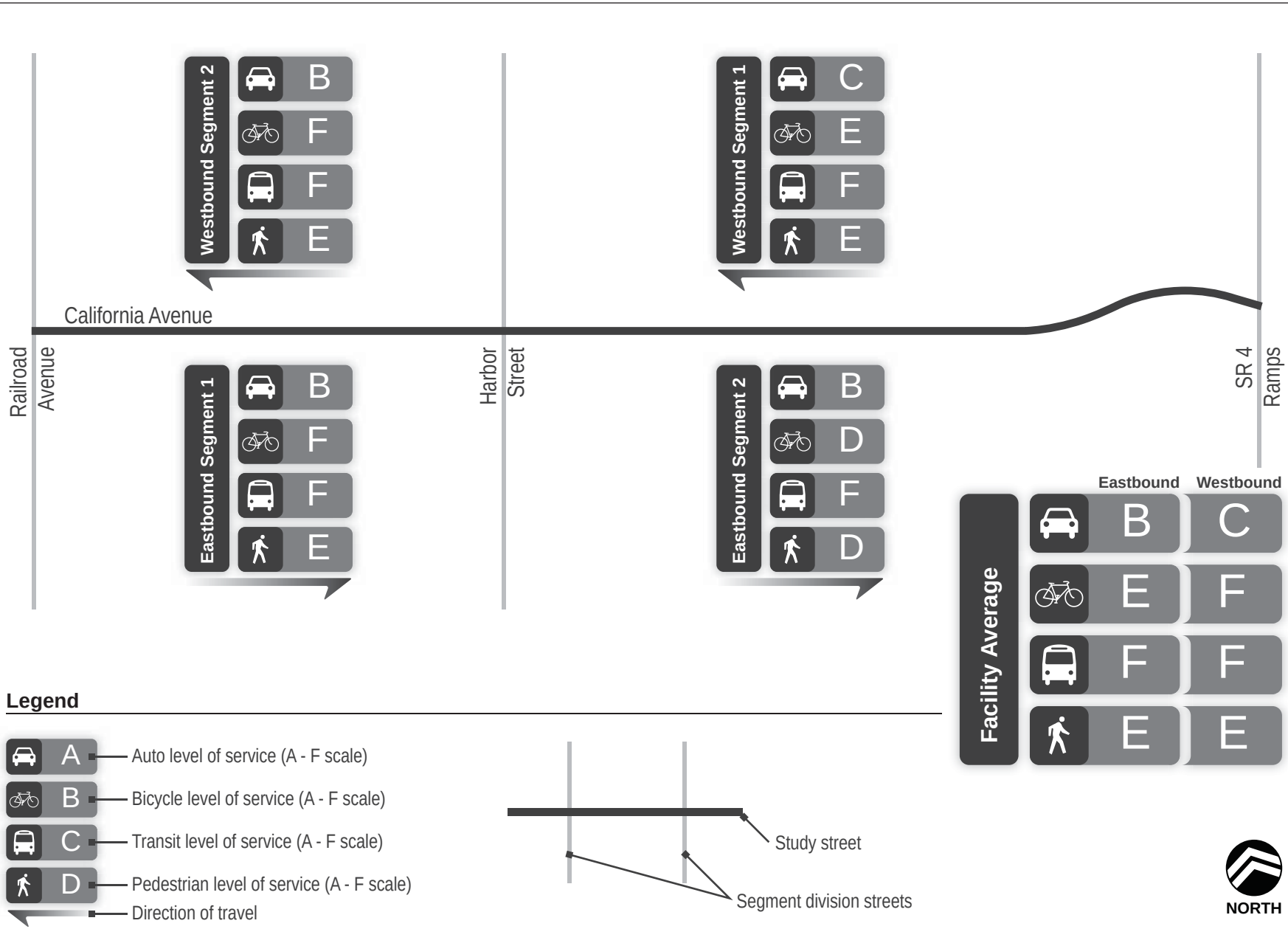
FACILITY 1: RAILROAD AVENUE FUTURE CONDITIONS MMLOS

FIGURE 4-7



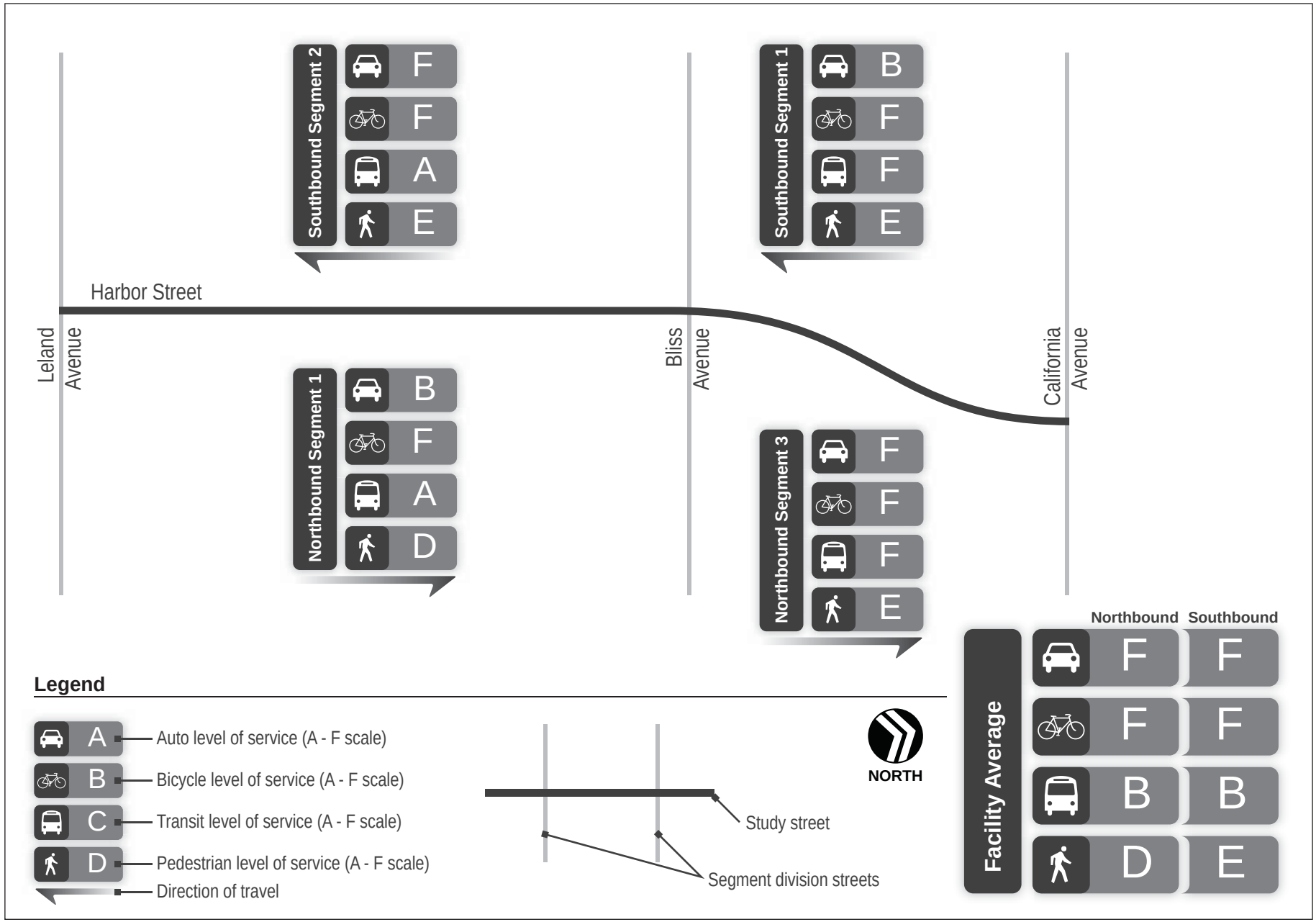
FACILITY 2: LELAND AVENUE FUTURE CONDITIONS MMLOS

FIGURE 4-8



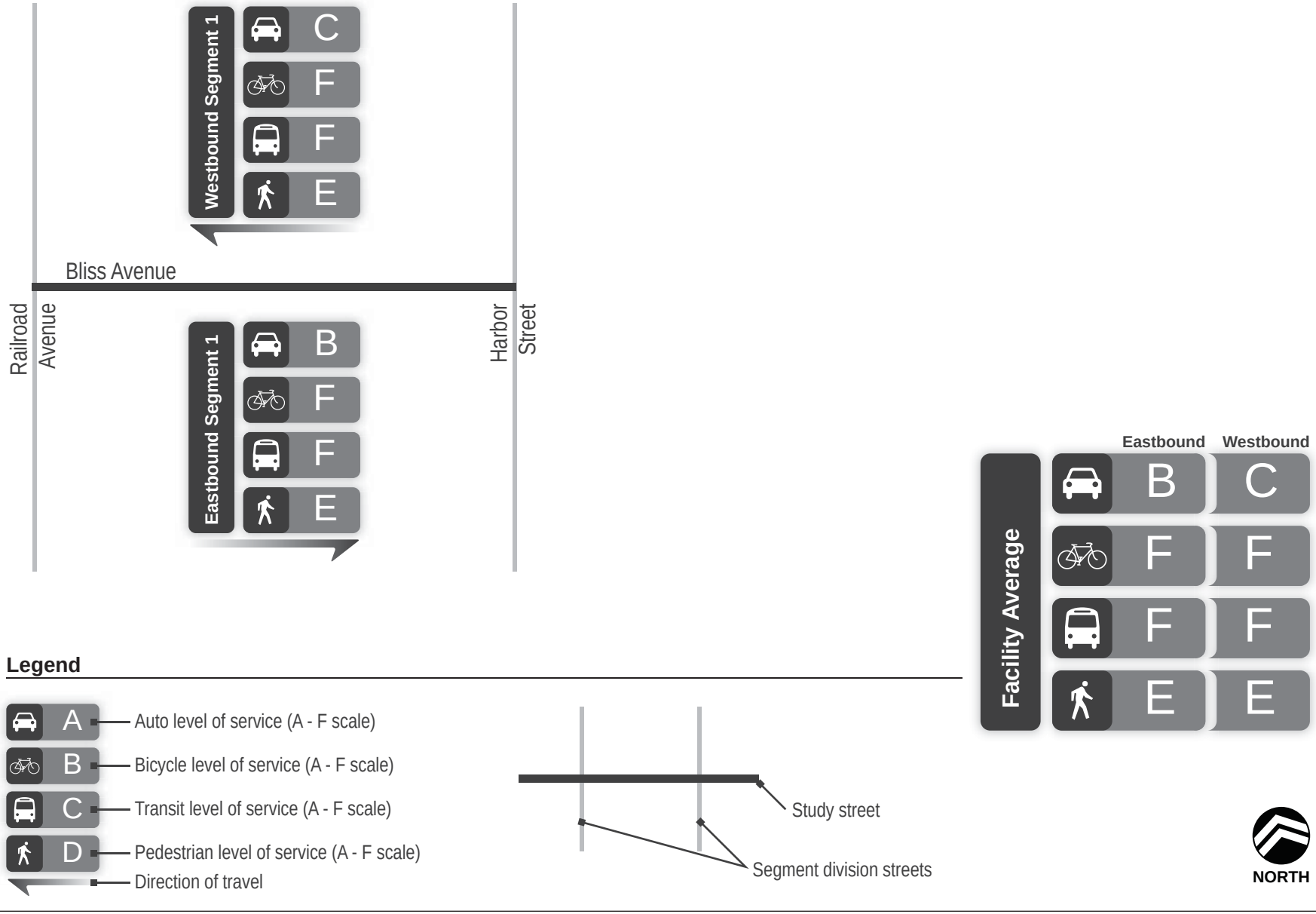
FACILITY 3: CALIFORNIA AVENUE FUTURE CONDITIONS MMLOS

FIGURE 4-9



FACILITY 4: HARBOR STREET FUTURE CONDITIONS MMLOS

FIGURE 4-10



FACILITY 5: BLISS AVENUE FUTURE CONDITIONS MMLOS

FIGURE 4-11

Chapter 5
PROJECT IMPACTS AND MITIGATION MEASURES

This chapter identifies and summarizes the potential transportation impacts on the roadway network due to travel demand generated by land use changes in the Railroad Avenue Specific Plan. Recommended improvements to the surrounding transportation system are proposed at the locations where significant impacts are identified.

5.1 SIGNIFICANT PROJECT IMPACTS & MITIGATION MEASURES

This section documents the significant impacts that were identified in *Chapter 4*, and includes mitigation measures to reduce the level of impact to a less than significant level.[1] Significant impacts for traffic, parking, bicycle, and pedestrian operations under Year 2015 and 2030 plus Project and plus Project (Alternative 1) conditions are also discussed in this section. Mitigation measures are proposed for only one intersection in the study area: Harbor Street and Garcia Avenue. The proposed mitigation measure includes signalization of the intersection in order to improve traffic conditions, which is not anticipated to have any adverse impacts to transit, bicycle, parking, and pedestrian facilities.

TRAFFIC IMPACTS

5.1.1 Year 2015 plus Project Impacts

- **Significant Impact 1:** The intersection of Harbor Street/Garcia Avenue would operate at LOS F, with significant delays along the eastbound and westbound approaches under Year 2015 plus Project conditions during the PM peak hour.

- **Mitigation:** Per the California Manual on Uniform Traffic Control Devices (MUTCD), a signal warrant analysis was conducted to determine the feasibility of signalization of the Harbor Street/Garcia Avenue intersection. As shown in Appendix C, the criteria for signal warrants were satisfied. Therefore, signalization was proposed as the mitigation measure for this intersection.

  It is proposed that the intersection be converted from a two-way stop-controlled (TWSC) intersection to a signalized intersection with a cycle length of 75 seconds. With this improvement, the intersection would operate at LOS A, with 8.4 seconds of average delay. Thus, signalization of the intersection would improve the intersection operations from LOS F to LOS A, and reduce delay significantly for Year 2015 plus Project

[1] Signal warrant analyses are presented in Appendix C and Traffic mitigation outputs are presented in Appendix D.

conditions. Hence, this mitigation measure would reduce impacts of the Proposed Project to a less than significant level. Table 5-1 summarizes the LOS results after this mitigation measure is applied.

Table 5-1
Intersection Level of Service (LOS) and Average Delay Comparison
Year 2015 plus Project Conditions with Mitigation Measures – PM Peak Hour

Intersection		Year 2015 plus Project Conditions		Year 2015 plus Project with Mitigation Measures	
		Average Delay[1]	LOS[2]	Average Delay	LOS
16.	Harbor Street/Garcia Avenue	**>50 (WB)**	**F**	8.4	A

Source: Wilbur Smith Associates, December 2008
NOTES: (1) Delay in seconds per vehicle.
(2) Intersections operating at an unacceptable level of service are highlighted in bold.

5.1.2 Year 2030 plus Project Impacts

- **Significant Impact 2:** The intersection of Harbor Street/Garcia Avenue would operate at LOS F, with significant delays along the eastbound and westbound approaches under Year 2030 plus Project conditions during the AM peak hour.

- **Mitigation:** Per the California Manual on Uniform Traffic Control Devices (MUTCD), a signal warrant analysis was conducted to determine the feasibility of signalization of the Harbor Street/Garcia Avenue intersection. As shown in Appendix C, the criteria for signal warrants were satisfied. Therefore, signalization was proposed as the mitigation measure for this intersection.

  It is proposed that the intersection be converted from a two-way stop-controlled (TWSC) intersection to a signalized intersection with a cycle length of 70 seconds. With this improvement, the intersection would operate at LOS A, with 7.7 seconds of average delay. Signalization of the intersection would improve the intersection operations from LOS F to LOS A and reduce delay significantly for Year 2030 plus Project conditions. Hence, this mitigation measure would reduce impacts of the Proposed Project to a less than significant level. Table 5-2 summarizes the LOS results after this mitigation measure is applied.

Table 5-2
Intersection Level of Service (LOS) and Average Delay Comparison
Year 2030 plus Project Conditions with Mitigation Measures – AM Peak Hour

Intersection		Year 2030 plus Project Conditions		Year 2030 plus Project with Mitigation Measures	
		Average Delay[1]	LOS[2]	Average Delay	LOS
16.	Harbor Street/Garcia Avenue	**>50 (WB)**	**F**	7.7	A

Source: Wilbur Smith Associates, December 2008
NOTES: (1) Delay in seconds per vehicle.
(2) Intersections operating at an unacceptable level of service are highlighted in bold.

- **Significant Impact 3:** The intersection of Harbor Street/Garcia Avenue would operate at LOS F, with significant delays in the eastbound and westbound approaches under Year 2030 plus Project conditions during the PM peak hour.

- **Mitigation:** Per the California Manual on Uniform Traffic Control Devices (MUTCD), a signal warrant analysis was conducted to determine the feasibility of signalization of the Harbor Street/Garcia Avenue intersection. As shown in Appendix C, the criteria for signal warrants were satisfied. Therefore, signalization was proposed as the mitigation measure for this intersection.

  It is proposed that the intersection be converted from a two-way stop-controlled (TWSC) intersection to a signalized intersection (with the application of 80 seconds of cycle length). With this improvement, the intersection would operate at LOS B, with 13 seconds of average delay. Signalization of the intersection would improve the intersection operations from LOS F to LOS B, and reduce delay significantly for Year 2030 plus Project conditions. Hence, this mitigation measure would reduce impacts of the Proposed Project to a less than significant level. Table 5-3 summarizes the LOS results after this mitigation measure is applied.

Table 5-3
Intersection Level of Service (LOS) and Average Delay Comparison
Year 2030 plus Project Conditions with Mitigation Measures – PM Peak Hour

Intersection		Year 2030 plus Project Conditions		Year 2030 plus Project with Mitigation Measures	
		Average Delay[1]	LOS[2]	Average Delay	LOS
16.	Harbor Street/Garcia Avenue	**>50 (WB)**	**F**	13	B

Source: Wilbur Smith Associates, December 2008
NOTES: (1) Delay in seconds per vehicle.
(2) Intersections operating at an unacceptable level of service are highlighted in bold.

5.1.3 Year 2015 plus Project (Alternative 1) Impacts

- **Significant Impact 4:** The intersection of Harbor Street/Garcia Avenue would operate at LOS F, with significant delays in the eastbound and westbound approaches under Year 2015 plus Project (Alternative 1) conditions during the AM peak hour.

- **Mitigation:** Per the California Manual on Uniform Traffic Control Devices (MUTCD), a signal warrant analysis was conducted to determine the feasibility of signalization of the Harbor Street/Garcia Avenue intersection. As shown in Appendix C, the criteria for signal warrants were satisfied. Therefore, signalization was proposed as the mitigation measure for this intersection.

  It is proposed that the intersection be converted from a two-way stop-controlled (TWSC) intersection to a signalized intersection with a cycle length of 100 seconds. With this improvement, the intersection would operate at LOS A, with 9.3 seconds of average delay. Signalization of the intersection would improve the intersection operations from LOS F to LOS A, and reduce delay significantly for Year 2015 plus Project (Alternative 1) conditions. Hence, this mitigation measure would reduce impacts of the Proposed Project to a less than significant level. Table 5-4 summarizes the LOS results after this mitigation measure is applied.

Table 5-4
Intersection Level of Service (LOS) and Average Delay Comparison
Year 2015 plus Project (Alternative 1) Conditions with Mitigation Measures – AM Peak Hour

Intersection		Year 2015 plus Project (Alternative 1) Conditions		Year 2015 plus Project (Alternative 1) with Mitigation Measures	
		Average Delay[1]	LOS[2]	Average Delay	LOS
16.	Harbor Street/Garcia Avenue	**>50 (WB)**	**F**	9.3	A

Source: Wilbur Smith Associates, December 2008
NOTES: (1) Delay in seconds per vehicle.
(2) Intersections operating at an unacceptable level of service are highlighted in bold.

- **Significant Impact 5:** The intersection of Harbor Street/Garcia Avenue would operate at LOS F, with significant delays in the eastbound and westbound approaches under Year 2015 plus Project (Alternative 1) conditions during the PM peak hour.

- **Mitigation:** Per the California Manual on Uniform Traffic Control Devices (MUTCD), a signal warrant analysis was conducted to determine the feasibility of signalization of the Harbor Street/Garcia Avenue intersection. As shown in Appendix C, the criteria for signal warrants were satisfied. Therefore, signalization was proposed as the mitigation measure for this intersection.

It is proposed that the intersection be converted from a two-way stop-controlled (TWSC) intersection to a signalized intersection a cycle length of 80 seconds. With this improvement, the intersection would operate at LOS B, with 11.2 seconds of average delay. Signalization of the intersection would improve intersection operations from LOS F to LOS B, and reduce delay significantly for Year 2015 plus Project (Alternative 1) conditions. Hence, this mitigation measure would reduce impacts of the Proposed Project to a less than significant level. Table 5-5 summarizes the LOS results after this mitigation measure is applied.

Table 5-5
Intersection Level of Service (LOS) and Average Delay Comparison
Year 2015 plus Project (Alternative 1) Conditions with Mitigation Measures – PM Peak Hour

Intersection		Year 2015 plus Project (Alternative 1) Conditions		Year 2015 plus Project (Alternative 1) with Mitigation Measures	
		Average Delay[1]	LOS[2]	Average Delay	LOS
16.	Harbor Street/Garcia Avenue	**>50 (WB)**	**F**	11.2	B

Source: Wilbur Smith Associates, December 2008
NOTES: (1) Delay in seconds per vehicle.
(2) Intersections operating at an unacceptable level of service are highlighted in bold.

5.1.4 Year plus 2030 Project (Alternative 1) Impacts

- **Significant Impact 6:** The intersection of Harbor Street/Garcia Avenue would operate at LOS F, with significant delays in the eastbound and westbound approaches under Year 2030 plus Project (Alternative 1) conditions during the AM peak hour.

- **Mitigation:** Per the California Manual on Uniform Traffic Control Devices (MUTCD), a signal warrant analysis was conducted to determine the feasibility of signalization of the Harbor Street/Garcia Avenue intersection. As shown in Appendix C, the criteria for signal warrants were satisfied. Therefore, signalization was proposed as the mitigation measure for this intersection.

  It is proposed that the intersection be converted from a two-way stop-controlled (TWSC) intersection to a signalized intersection with a cycle length of 90 seconds. With this improvement, the intersection would operate at LOS A, with 9.8 seconds of average delay. Signalization of the intersection would improve intersection operations from LOS F to LOS A, and reduce delay significantly for Year 2030 plus Project (Alternative 1) conditions. Hence, this mitigation measure would reduce impacts of the Proposed Project to a less than significant level. Table 5-6 summarizes the LOS results after this mitigation measure is applied.

Table 5-6
Intersection Level of Service (LOS) and Average Delay Comparison
Year 2030 plus Project (Alternative 1) Conditions with Mitigation Measures – AM Peak Hour

Intersection		Year 2030 plus Project (Alternative 1) Conditions		Year 2030 plus Project (Alternative 1) with Mitigation Measures	
		Average Delay[1]	LOS[2]	Average Delay	LOS
16.	Harbor Street/Garcia Avenue	**>50 (WB)**	**F**	9.8	A

Source: Wilbur Smith Associates, December 2008
NOTES: (1) Delay in seconds per vehicle.
(2) Intersections operating at an unacceptable level of service are highlighted in bold.

- **Significant Impact 7:** The intersection of Harbor Street/Garcia Avenue would operate at LOS F, with significant delays in the eastbound and westbound approaches under Year 2030 plus Project (Alternative 1) conditions during the PM peak hour.

- **Mitigation:** Per the California Manual on Uniform Traffic Control Devices (MUTCD), a signal warrant analysis was conducted to determine the feasibility of signalization of the Harbor Street/Garcia Avenue intersection. As shown in Appendix C, the criteria for signal warrants were satisfied. Therefore, signalization was proposed as the mitigation measure for this intersection.

  It is proposed that the intersection be converted from a two-way stop-controlled (TWSC) intersection to a signalized intersection with a cycle length of 110 seconds. With this improvement, the intersection would operate at LOS C, with 27.2 seconds of average delay. Signalization of the intersection would improve intersection operations from LOS F to LOS C, and reduce delay significantly for Year 2030 plus Project (Alternative 1) conditions. Hence, this mitigation measure would reduce impacts of the Proposed Project to a less than significant level. Table 5-7 summarizes the LOS results after this mitigation measure is applied.

Table 5-7
Intersection Level of Service (LOS) and Average Delay Comparison
Year 2030 plus Project (Alternative 1) Conditions with Mitigation Measures – PM Peak Hour

Intersection		Year 2030 plus Project (Alternative 1) Conditions		Year 2030 plus Project (Alternative 1) with Mitigation Measures	
		Average Delay[1]	LOS[2]	Average Delay	LOS
16.	Harbor Street/Garcia Avenue	**>50 (WB)**	**F**	27.2	C

Source: Wilbur Smith Associates, December 2008
NOTES: (1) Delay in seconds per vehicle.
(2) Intersections operating at an unacceptable level of service are highlighted in bold.

5.1.5 PARKING IMPACTS

As stated in the previous chapters, there is a significant amount of existing off-street parking facilities as well as on-street parking near the proposed station area and within the boundaries of the Railroad Avenue Specific Plan. As presented in *Chapter 4*, the Railroad Avenue Specific Plan proposes 6,722 additional spaces to accommodate growth as well as to provide 350 parking spaces for future transit demand. Furthermore, parking requirements have been reduced to accommodate transit-oriented development near the proposed station area. These modified parking minimum requirements permit developers and the other stakeholders to provide adequate parking while utilizing the maximum benefit of use in the study area. Due to the large parking supply differentials at the Pittsburg Bay Point BART and Hillcrest Avenue eBART Stations the demand for parking at these stations will far exceed that of the demand at the Railroad Avenue eBART Station. Additionally, only 40 percent of the entire ridership from the Railroad Avenue Station is projected to access the Station via the park and ride lot, resulting in a much lower projected parking demand than the adjacent stations in 2030.

- *No significant impacts related to parking conditions were identified as a result of the Proposed Project. Therefore, no mitigation or improvement measures are recommended.*

5.1.6 TRANSIT IMPACTS

Local transit services would not experience decreased service quality or productivity as a result of the proposed station or the implementation of the Railroad Avenue Specific Plan. In order to accommodate to projected ridership growth, local transit agencies, specifically Tri Delta Transit will reconfigure its existing system in order to provide additional access to and from the proposed station as well as perform schedule adjustments and provide shuttle services to enhance performance.

- *No significant impacts related to transit conditions were identified as a result of the Proposed Project. Therefore, no mitigation or improvement measures are recommended.*

5.1.7 PEDESTRIAN IMPACTS

There are several sidewalks along major roadways throughout the study area and near the proposed station. As stated in *Chapter 4*, the Proposed Project would generate a significant number of pedestrian trips to and from the station. In order to accommodate to this projected growth, several sidewalk improvements have been established throughout the study area, specifically increasing the connectivity and sidewalk network near the proposed station area. According the Railroad Avenue Specific Plan, primary improvements to pedestrian facilities will occur along Railroad, Bliss, California avenues as well as along Leland Road and Harbor Street. Secondary improvements, specifically along Civic and Garcia avenues will occur throughout the network as the developments throughout the study area intensify.

- *No significant impacts related to pedestrian conditions were identified as a result of the Proposed Project. Therefore, no mitigation or improvement measures are recommended.*

5.1.8 BICYCLE IMPACTS

Existing bicycle facilities throughout the study area would provide direct access to the proposed station. As discussed in the Railroad Avenue Specific Plan, additional bike lanes, primarily near the proposed station location (along Railroad Avenue, south of SR 4 and along Bliss Avenue), are planned. Geometric changes to several roadways, including lane widening, separated greenways and striping dedicated right-of-way for bike lanes have been proposed.

- *No significant impacts related to bicycle conditions were identified as a result of the Proposed Project. Therefore, no mitigation or improvement measures are recommended.*

Chapter 6
CONCLUSION

To asses the transportation impacts associated with the land use changes in the Railroad Avenue Specific Plan beyond the development potential in the *Pittsburg 2020 General Plan* and as evaluated in the *Pittsburg 2020 General Plan EIR*, a Transportation Impact Analysis (TIA) was conducted. The study incorporated two analyses: a level of service (LOS) analysis of traffic operations at 16 key intersections under Existing and Future Year Conditions during the morning and evening peak hours; and a Multimodal Level of Service (MMLOS) analysis of multiple transportation facilities throughout the study area under Existing and Future Year Conditions.

The Railroad Avenue Specific Plan includes densification and intensification of residential and commercial uses surrounding the proposed eBART station in Pittsburg, California. Land use codes and building standards have been modified in order to accommodate transit-oriented development (TOD) near the station. Additional modifications include the construction of high-intensity mixed-use development while improving existing roadway, pedestrian, transit, and bicycle facilities between the potential eBART station and the surrounding community.

Impacts of the proposed project on the study intersections were evaluated with level of service calculations. The results of the analysis indicate that the land use changes beyond the development potential in the *Pittsburg 2020 General Plan* and as evaluated in the *Pittsburg 2020 General Plan EIR* would result in significant impact to one (1) intersection under Future Year conditions. A signal warrant analysis was conducted for the Harbor Street/Garcia Avenue intersection to determine if the criterion for the peak hour warrant justifying a traffic signal were met under these conditions. It was determined that this location does justify installation of a traffic signal based on the peak hour warrant.

No adverse impacts are envisioned as a result of the project. The proposed projects will strengthen the public transit service in the region and therefore should increase ridership. Bicycle and pedestrian facility improvements throughout the network and near the planned eBART station are proposed, thus decreasing auto trips, and increasing accessibility and connectivity throughout the network. Therefore, the planned developments surrounding the proposed eBART station area would have no adverse impacts and should provide benefits to bicyclists and pedestrians.

The Railroad Avenue Specific Plan has established TOD based parking requirements which take into account the complementary parking demand profiles of the proposed mix of uses, the proximity of high frequency transit and high quality alternative mode (bike and pedestrian) facilities thus supporting reductions from typical parking requirements. However, the Railroad Avenue Specific Plan has planned at least 350 spaces for the station. The projected demand will exceed its projected supply by Year 2030 based on unconstrained travel forecasts by 16 spaces. The application of parking management techniques and transportation demand management

strategies would reduce parking demand and direct riders to alternative modes of transportation in the station area.

APPENDICES

List of Appendices

Appendix A.....LOS Calculation Sheets

Appendix B.....Pedestrian/Bicycle Counts

Appendix C.....Signal Warrant Analysis

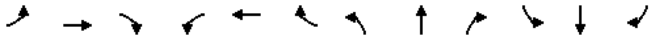
Appendix D.....Traffic Mitigation Outputs

Appendix E.....Multimodal Level of Service (MMLOS) Data

Appendix A
LOS CALCULATION SHEETS

EXISTING CONDITIONS – AM PEAK HOUR

HCM Unsignalized Intersection Capacity Analysis
1: Civic Avenue & Davi Avenue

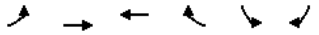


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	10	135	30	23	124	5	11	10	45	9	17	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	147	33	25	135	5	12	11	49	10	18	4

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	190	160	5	72	33
Volume Left (vph)	11	25	0	12	10
Volume Right (vph)	33	0	5	49	4
Hadj (s)	-0.06	0.11	-0.67	-0.34	0.01
Departure Headway (s)	4.4	5.0	4.2	4.4	4.8
Degree Utilization, x	0.23	0.22	0.01	0.09	0.04
Capacity (veh/h)	796	693	819	748	679
Control Delay (s)	8.7	8.2	6.1	7.9	8.1
Approach Delay (s)	8.7	8.2		7.9	8.1
Approach LOS	A	A		A	A

Intersection Summary				
Delay	8.3			
HCM Level of Service	A			
Intersection Capacity Utilization	33.9%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
2: Power Avenue & Davi Avenue



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	52	333	121	21	30	25
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	57	362	132	23	33	27
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	154				618	143
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	154				618	143
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				93	97
cM capacity (veh/h)	1426				435	905

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	418	154	60
Volume Left	57	0	33
Volume Right	0	23	27
cSH	1426	1700	569
Volume to Capacity	0.04	0.09	0.11
Queue Length 95th (ft)	3	0	9
Control Delay (s)	1.4	0.0	12.1
Lane LOS	A		B
Approach Delay (s)	1.4	0.0	12.1
Approach LOS			B

Intersection Summary			
Average Delay	2.0		
Intersection Capacity Utilization	41.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
3: Civic Avenue & Railroad Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	0	120	8	2	6	155	413	0	0	731	107
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	0.97		1.00		1.00		1.00	0.95			0.95	1.00
Frt	1.00		0.85		0.95		1.00	1.00			1.00	0.85
Flt Protected	0.95		1.00		0.98		0.95	1.00			1.00	1.00
Satd. Flow (prot)	3433		1583		1726		1770	3539			3539	1583
Flt Permitted	0.95		1.00		0.98		0.95	1.00			1.00	1.00
Satd. Flow (perm)	3433		1583		1726		1770	3539			3539	1583
Peak-hour factor, PHF	0.72	0.72	0.72	0.56	0.56	0.56	0.77	0.77	0.77	0.92	0.92	0.92
Adj. Flow (vph)	53	0	167	14	4	11	201	536	0	0	795	116
RTOR Reduction (vph)	0	0	153	0	11	0	0	0	0	0	0	34
Lane Group Flow (vph)	53	0	14	0	18	0	201	536	0	0	795	82
Turn Type	Prot		custom	Split			Prot			Perm		Perm
Protected Phases	4		4	8	8		5	2			6	
Permitted Phases										6		6
Actuated Green, G (s)	7.7		7.7		3.2		16.0	67.1			47.1	47.1
Effective Green, g (s)	7.7		7.7		3.2		16.0	67.1			47.1	47.1
Actuated g/C Ratio	0.09		0.09		0.04		0.18	0.75			0.52	0.52
Clearance Time (s)	4.0		4.0		4.0		4.0	4.0			4.0	4.0
Vehicle Extension (s)	3.0		3.0		3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	294		135		61		315	2639			1852	828
v/s Ratio Prot	c0.02		0.01		c0.01		c0.11	0.15			c0.22	
v/s Ratio Perm												0.05
v/c Ratio	0.18		0.11		0.30		0.64	0.20			0.43	0.10
Uniform Delay, d1	38.2		38.0		42.3		34.3	3.4			13.2	10.8
Progression Factor	1.00		1.00		1.00		1.23	2.15			1.00	1.00
Incremental Delay, d2	0.3		0.3		2.8		3.6	0.1			0.7	0.2
Delay (s)	38.5		38.3		45.1		46.0	7.5			13.9	11.0
Level of Service	D		D		D		D	A			B	B
Approach Delay (s)		38.4			45.1			18.0			13.5	
Approach LOS		D			D			B			B	

Intersection Summary				
HCM Average Control Delay	18.6	HCM Level of Service		B
HCM Volume to Capacity ratio	0.44			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		16.0
Intersection Capacity Utilization	46.4%	ICU Level of Service		A
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
4: Center Drive & Railroad Avenue

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	4	328	174	658	962	8
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.87	0.87	0.75	0.75
Hourly flow rate (vph)	4	357	200	756	1283	11
Pedestrians	10				10	
Lane Width (ft)	12.0				12.0	
Walking Speed (ft/s)	4.0				4.0	
Percent Blockage	1				1	
Right turn flare (veh)		4				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				405	794	
pX, platoon unblocked	0.91	0.88	0.88			
vC, conflicting volume	2086	657	1303			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1683	330	1067			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	91	38	65			
cM capacity (veh/h)	49	579	565			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	361	200	378	378	855	438
Volume Left	4	200	0	0	0	0
Volume Right	357	0	0	0	0	11
cSH	586	565	1700	1700	1700	1700
Volume to Capacity	0.62	0.35	0.22	0.22	0.50	0.26
Queue Length 95th (ft)	105	40	0	0	0	0
Control Delay (s)	21.4	14.8	0.0	0.0	0.0	0.0
Lane LOS	C	B				
Approach Delay (s)	21.4	3.1			0.0	
Approach LOS	C					

Intersection Summary				
Average Delay	4.1			
Intersection Capacity Utilization	53.5%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
5: SR-4 WB On-Ramp & Railroad Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	21	605	269	1022	563	42	38	630	622
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor					0.95		0.97	0.95		1.00	0.95	1.00
Frt					0.95		1.00	0.99		1.00	1.00	0.85
Flt Protected					1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)					3376		3433	3502		1770	3539	1583
Flt Permitted					1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)					3376		3433	3502		1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.83	0.83	0.83	0.96	0.96	0.96	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	25	729	324	1065	586	44	39	649	641
RTOR Reduction (vph)	0	0	0	0	51	0	0	6	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	1027	0	1065	624	0	39	649	641
Turn Type				Split			Prot			Prot		Free
Protected Phases				8	8		5	2		1	6	
Permitted Phases												Free
Actuated Green, G (s)					29.4		35.5	43.9		4.7	13.1	90.0
Effective Green, g (s)					29.4		35.5	43.9		4.7	13.1	90.0
Actuated g/C Ratio					0.33		0.39	0.49		0.05	0.15	1.00
Clearance Time (s)					4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)					3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)					1103		1354	1708		92	515	1583
v/s Ratio Prot					c0.30		c0.31	0.18		0.02	c0.18	
v/s Ratio Perm												0.40
v/c Ratio					0.93		0.79	0.37		0.42	1.26	0.40
Uniform Delay, d1					29.3		23.9	14.4		41.3	38.5	0.0
Progression Factor					1.00		1.47	1.57		1.11	0.84	1.00
Incremental Delay, d2					13.6		2.1	0.4		3.1	131.9	0.8
Delay (s)					42.9		37.3	22.9		49.1	164.1	0.8
Level of Service					D		D	C		D	F	A
Approach Delay (s)		0.0			42.9			32.0			81.9	
Approach LOS		A			D			C			F	

Intersection Summary				
HCM Average Control Delay	51.0	HCM Level of Service		D
HCM Volume to Capacity ratio	0.92			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		12.0
Intersection Capacity Utilization	82.5%	ICU Level of Service		E
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
6: SR-4 EB Off-Ramp & Railroad Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	346	1	337	0	0	0	0	1281	176	229	422	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor	0.95	0.91	0.95					0.91		1.00	0.95	
Frt	1.00	0.92	0.85					0.98		1.00	1.00	
Flt Protected	0.95	0.98	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1681	1525	1504					4993		1770	3539	
Flt Permitted	0.95	0.98	1.00					1.00		0.95	1.00	
Satd. Flow (perm)	1681	1525	1504					4993		1770	3539	
Peak-hour factor, PHF	0.88	0.88	0.88	0.92	0.92	0.92	0.89	0.89	0.89	0.90	0.90	0.90
Adj. Flow (vph)	393	1	383	0	0	0	0	1439	198	254	469	0
RTOR Reduction (vph)	0	47	194	0	0	0	0	19	0	0	0	0
Lane Group Flow (vph)	271	214	51	0	0	0	0	1618	0	254	469	0
Turn Type	Split		Prot							Prot		
Protected Phases	4	4	4					2		1	6	
Permitted Phases												
Actuated Green, G (s)	18.9	18.9	18.9					39.1		20.0	63.1	
Effective Green, g (s)	18.9	18.9	18.9					39.1		20.0	63.1	
Actuated g/C Ratio	0.21	0.21	0.21					0.43		0.22	0.70	
Clearance Time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)	353	320	316					2169		393	2481	
v/s Ratio Prot	c0.16	0.14	0.03					c0.32		c0.14	0.13	
v/s Ratio Perm												
v/c Ratio	0.77	0.67	0.16					0.75		0.65	0.19	
Uniform Delay, d1	33.5	32.7	29.1					21.3		31.8	4.6	
Progression Factor	1.00	1.00	1.00					0.69		0.22	0.18	
Incremental Delay, d2	9.6	5.2	0.2					2.0		0.3	0.0	
Delay (s)	43.1	37.9	29.3					16.7		7.4	0.8	
Level of Service	D	D	C					B		A	A	
Approach Delay (s)		37.0			0.0			16.7			3.1	
Approach LOS		D			A			B			A	

Intersection Summary				
HCM Average Control Delay	18.6	HCM Level of Service		B
HCM Volume to Capacity ratio	0.73			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		12.0
Intersection Capacity Utilization	64.4%	ICU Level of Service		C
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
7: Bliss Avenue & Railroad Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	42	12	6	32	13	375	5	958	19	170	716	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	0.99	
Flt Protected		0.96	1.00		0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1793	1583		1799	1583	1770	3529		1770	3512	
Flt Permitted		0.74	1.00		0.77	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1382	1583		1431	1583	1770	3529		1770	3512	
Peak-hour factor, PHF	0.68	0.68	0.68	0.91	0.91	0.91	0.85	0.85	0.85	0.91	0.91	0.91
Adj. Flow (vph)	62	18	9	35	14	412	6	1127	22	187	787	42
RTOR Reduction (vph)	0	0	8	0	0	306	0	1	0	0	3	0
Lane Group Flow (vph)	0	80	1	0	49	106	6	1148	0	187	826	0
Turn Type	Perm		Perm	Perm		Perm	Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		11.9	11.9		11.9	11.9	0.8	52.3		13.8	65.3	
Effective Green, g (s)		11.9	11.9		11.9	11.9	0.8	52.3		13.8	65.3	
Actuated g/C Ratio		0.13	0.13		0.13	0.13	0.01	0.58		0.15	0.73	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		183	209		189	209	16	2051		271	2548	
v/s Ratio Prot							0.00	c0.33		c0.11	0.24	
v/s Ratio Perm		0.06	0.00		0.03	c0.07						
v/c Ratio		0.44	0.01		0.26	0.51	0.38	0.56		0.69	0.32	
Uniform Delay, d1		36.0	33.9		35.1	36.3	44.4	11.7		36.1	4.4	
Progression Factor		1.00	1.00		0.96	1.19	1.00	1.00		0.73	0.81	
Incremental Delay, d2		1.7	0.0		0.7	1.8	14.1	1.1		7.2	0.3	
Delay (s)		37.6	33.9		34.2	44.9	58.5	12.8		33.7	3.9	
Level of Service		D	C		C	D	E	B		C	A	
Approach Delay (s)		37.3			43.7			13.0			9.4	
Approach LOS		D			D			B			A	

Intersection Summary				
HCM Average Control Delay	17.7	HCM Level of Service		B
HCM Volume to Capacity ratio	0.57			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		12.0
Intersection Capacity Utilization	63.6%	ICU Level of Service		B
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: Leland Road & Railroad Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	196	226	98	136	706	295	158	687	61	234	599	189
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3378		1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3378		1770	3539	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	213	246	107	148	767	321	172	747	66	254	651	205
RTOR Reduction (vph)	0	49	0	0	0	48	0	0	31	0	0	46
Lane Group Flow (vph)	213	304	0	148	767	273	172	747	35	254	651	159
Turn Type	Prot			Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases						8			2			6
Actuated Green, G (s)	13.6	26.0		14.0	26.4	42.7	12.0	22.7	36.7	16.3	27.0	40.6
Effective Green, g (s)	14.6	27.0		15.0	27.4	44.7	13.0	24.7	38.7	17.3	29.0	42.6
Actuated g/C Ratio	0.15	0.27		0.15	0.27	0.45	0.13	0.25	0.39	0.17	0.29	0.43
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	6.0	5.0	5.0	6.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	258	912		266	970	771	230	874	613	306	1026	674
v/s Ratio Prot	c0.12	0.09		0.08	c0.22	0.06	0.10	c0.21	0.01	c0.14	0.18	0.03
v/s Ratio Perm						0.11			0.01			0.07
v/c Ratio	0.83	0.33		0.56	0.79	0.35	0.75	0.85	0.06	0.83	0.63	0.24
Uniform Delay, d1	41.5	29.3		39.4	33.6	18.2	41.9	35.9	19.2	39.9	30.9	18.3
Progression Factor	1.00	1.00		0.55	0.47	0.59	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	18.9	1.0		1.9	5.1	0.2	12.5	10.4	0.0	17.1	3.0	0.2
Delay (s)	60.4	30.3		23.8	20.9	11.0	54.4	46.4	19.3	57.0	33.9	18.5
Level of Service	E	C		C	C	B	D	D	B	E	C	B
Approach Delay (s)		41.6			18.7			46.0			36.3	
Approach LOS		D			B			D			D	

Intersection Summary				
HCM Average Control Delay	33.9	HCM Level of Service		C
HCM Volume to Capacity ratio	0.82			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)		16.0
Intersection Capacity Utilization	75.7%	ICU Level of Service		D
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: Leland Road & Harbor Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	103	236	105	141	875	265	179	738	143	113	488	163
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	112	257	114	153	951	288	195	802	155	123	530	177
RTOR Reduction (vph)	0	0	79	0	0	173	0	0	116	0	0	142
Lane Group Flow (vph)	112	257	35	153	951	115	195	802	39	123	530	35
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	8.0	31.1	31.1	17.0	40.1	40.1	13.9	25.0	25.0	8.9	20.0	20.0
Effective Green, g (s)	8.0	32.1	31.1	17.0	41.1	40.1	13.9	26.0	25.0	8.9	21.0	20.0
Actuated g/C Ratio	0.08	0.32	0.31	0.17	0.41	0.40	0.14	0.26	0.25	0.09	0.21	0.20
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	142	1136	492	301	1455	635	246	920	396	158	743	317
v/s Ratio Prot	c0.06	0.07		0.09	c0.27		c0.11	c0.23		0.07	0.15	
v/s Ratio Perm			0.02			0.07			0.02			0.02
v/c Ratio	0.79	0.23	0.07	0.51	0.65	0.18	0.79	0.87	0.10	0.78	0.71	0.11
Uniform Delay, d1	45.2	24.9	24.3	37.7	23.7	19.4	41.7	35.4	28.8	44.6	36.7	32.7
Progression Factor	1.05	0.65	1.17	0.76	0.38	0.18	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	21.6	0.4	0.2	1.1	1.9	0.5	15.9	11.1	0.5	21.1	5.8	0.7
Delay (s)	69.2	16.6	28.7	29.7	10.8	4.1	57.6	46.5	29.3	65.7	42.5	33.4
Level of Service	E	B	C	C	B	A	E	D	C	E	D	C
Approach Delay (s)		31.7			11.5			46.1			44.0	
Approach LOS		C			B			D			D	

Intersection Summary				
HCM Average Control Delay	31.4	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.74			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	69.9%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
10: Leland Road & Freed Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	22	538	6	2	1009	13	13	5	15	9	3	14
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.90	0.90	0.90	0.71	0.71	0.71	0.56	0.56	0.56
Hourly flow rate (vph)	27	656	7	2	1121	14	18	7	21	16	5	25
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												2
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1136			663			1281	1853	332	1539	1850	568
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1136			663			1281	1853	332	1539	1850	568
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			100			83	90	97	76	92	95
cM capacity (veh/h)	611			921			105	70	664	68	70	466

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	27	437	226	2	747	388	46	46
Volume Left	27	0	0	2	0	0	18	16
Volume Right	0	0	7	0	0	14	21	25
cSH	611	1700	1700	921	1700	1700	152	148
Volume to Capacity	0.04	0.26	0.13	0.00	0.44	0.23	0.31	0.31
Queue Length 95th (ft)	3	0	0	0	0	0	30	31
Control Delay (s)	11.2	0.0	0.0	8.9	0.0	0.0	38.9	44.0
Lane LOS	B			A			E	E
Approach Delay (s)	0.4			0.0			38.9	44.0
Approach LOS							E	E

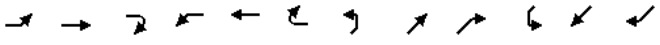
Intersection Summary				
Average Delay	2.2			
Intersection Capacity Utilization	45.0%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
11: Leland Road & Loveridge Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	162	171	192	150	774	265	264	599	121	273	580	162
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95		0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	1770	3450		3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	1770	3450		3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	176	186	209	163	841	288	287	651	132	297	630	176
RTOR Reduction (vph)	0	0	143	0	0	181	0	17	0	0	0	135
Lane Group Flow (vph)	176	186	66	163	841	107	287	766	0	297	630	41
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	8.2	30.8	30.8	5.0	27.6	27.6	22.0	32.6		11.6	22.2	22.2
Effective Green, g (s)	9.2	31.8	31.8	6.0	28.6	28.6	23.0	33.6		12.6	23.2	23.2
Actuated g/C Ratio	0.09	0.32	0.32	0.06	0.29	0.29	0.23	0.34		0.13	0.23	0.23
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	316	1125	503	206	1012	453	407	1159		433	821	367
v/s Ratio Prot	c0.05	0.05		0.05	c0.24		0.16	c0.22		0.09	c0.18	
v/s Ratio Perm			0.04			0.07						0.03
v/c Ratio	0.56	0.17	0.13	0.79	0.83	0.24	0.71	0.66		0.69	0.77	0.11
Uniform Delay, d1	43.4	24.5	24.3	46.4	33.4	27.3	35.4	28.3		41.8	35.9	30.3
Progression Factor	0.80	0.65	0.78	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	2.1	0.1	0.1	18.4	5.9	0.3	5.5	3.0		4.5	6.8	0.6
Delay (s)	37.0	16.0	19.0	64.8	39.3	27.6	40.9	31.3		46.3	42.7	30.9
Level of Service	D	B	B	E	D	C	D	C		D	D	C
Approach Delay (s)		23.6			39.9			33.9			41.8	
Approach LOS		C			D			C			D	

Intersection Summary				
HCM Average Control Delay	36.5	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.72			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	70.0%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
12: SR-4 EB Ramps & Loveridge Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	153	0	436	0	0	0	0	826	260	0	672	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0					4.0			4.0	
Lane Util. Factor	1.00		1.00					0.95			0.95	
Frt	1.00		0.85					0.96			0.97	
Flt Protected	0.95		1.00					1.00			1.00	
Satd. Flow (prot)	1770		1583					3412			3445	
Flt Permitted	0.95		1.00					1.00			1.00	
Satd. Flow (perm)	1770		1583					3412			3445	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	166	0	474	0	0	0	0	898	283	0	730	158
RTOR Reduction (vph)	0	0	103	0	0	0	0	25	0	0	15	0
Lane Group Flow (vph)	166	0	371	0	0	0	0	1156	0	0	873	0
Turn Type	Prot		custom									
Protected Phases	4		4					2			6	
Permitted Phases												
Actuated Green, G (s)	26.7		26.7					55.3			55.3	
Effective Green, g (s)	26.7		26.7					55.3			55.3	
Actuated g/C Ratio	0.30		0.30					0.61			0.61	
Clearance Time (s)	4.0		4.0					4.0			4.0	
Vehicle Extension (s)	3.0		3.0					3.0			3.0	
Lane Grp Cap (vph)	525		470					2096			2117	
v/s Ratio Prot	0.09		c0.23					c0.34			0.25	
v/s Ratio Perm												
v/c Ratio	0.32		0.79					0.55			0.41	
Uniform Delay, d1	24.6		29.1					10.1			9.0	
Progression Factor	1.00		1.00					1.00			1.00	
Incremental Delay, d2	0.3		8.8					1.1			0.6	
Delay (s)	24.9		37.9					11.2			9.6	
Level of Service	C		D					B			A	
Approach Delay (s)		34.5			0.0			11.2			9.6	
Approach LOS		C			A			B			A	

Intersection Summary				
HCM Average Control Delay	16.2	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.63			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	56.9%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
13: California Avenue & SR-4 WB Ramps

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	29	213	9	588	189	7	489	63	306	8	17	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		0.97	1.00	1.00	0.95	0.95	1.00	1.00	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	0.96	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1851		3433	1863	1583	1681	1704	1583	1770	1823	
Flt Permitted	0.63	1.00		0.95	1.00	1.00	0.95	0.76	1.00	0.35	1.00	
Satd. Flow (perm)	1172	1851		3433	1863	1583	1681	1346	1583	655	1823	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	32	232	10	639	205	8	532	68	333	9	18	3
RTOR Reduction (vph)	0	2	0	0	0	4	0	0	179	0	2	0
Lane Group Flow (vph)	32	240	0	639	205	4	298	302	154	9	19	0
Turn Type	Perm			Prot		Perm	Prot		Perm	Perm		
Protected Phases		4		3	8		5	2			6	
Permitted Phases	4					8			2	6		
Actuated Green, G (s)	16.9	16.9		19.4	40.3	40.3	21.0	41.7	41.7	16.7	16.7	
Effective Green, g (s)	16.9	16.9		19.4	40.3	40.3	21.0	41.7	41.7	16.7	16.7	
Actuated g/C Ratio	0.19	0.19		0.22	0.45	0.45	0.23	0.46	0.46	0.19	0.19	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	220	348		740	834	709	392	707	733	122	338	
v/s Ratio Prot		c0.13		c0.19	0.11		c0.18	0.10			0.01	
v/s Ratio Perm	0.03					0.00		c0.10	0.10	0.01		
v/c Ratio	0.15	0.69		0.86	0.25	0.01	0.76	0.43	0.21	0.07	0.05	
Uniform Delay, d1	30.5	34.1		34.0	15.4	13.8	32.2	16.2	14.4	30.3	30.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.3	5.8		10.2	0.2	0.0	8.4	0.4	0.7	1.2	0.3	
Delay (s)	30.8	39.9		44.3	15.6	13.8	40.6	16.6	15.0	31.4	30.5	
Level of Service	C	D		D	B	B	D	B	B	C	C	
Approach Delay (s)		38.9			37.1			23.7			30.8	
Approach LOS		D			D			C			C	

Intersection Summary				
HCM Average Control Delay	31.2	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.70			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	60.4%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
14: California Avenue & Harbor Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	101	68	78	298	448	204	195	656	58	52	535	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.92		1.00	1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1713		1770	1863	1583	1770	3496		1770	3470	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1713		1770	1863	1583	1770	3496		1770	3470	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	110	74	85	324	487	222	212	713	63	57	582	87
RTOR Reduction (vph)	0	49	0	0	0	152	0	6	0	0	13	0
Lane Group Flow (vph)	110	110	0	324	487	70	212	770	0	57	656	0
Turn Type	Prot			Prot		Perm	Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						
Actuated Green, G (s)	6.8	10.5		23.2	26.9	26.9	15.2	30.8		4.8	20.4	
Effective Green, g (s)	6.8	10.5		23.2	26.9	26.9	15.2	30.8		4.8	20.4	
Actuated g/C Ratio	0.08	0.12		0.27	0.32	0.32	0.18	0.36		0.06	0.24	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	141	211		481	588	499	315	1262		100	830	
v/s Ratio Prot	c0.06	0.06		0.18	c0.26		0.12	c0.22		0.03	c0.19	
v/s Ratio Perm						0.04						
v/c Ratio	0.78	0.52		0.67	0.83	0.14	0.67	0.61		0.57	0.79	
Uniform Delay, d1	38.5	35.0		27.7	27.1	20.9	32.7	22.3		39.2	30.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	23.8	2.3		3.7	9.4	0.1	5.6	2.2		7.3	7.6	
Delay (s)	62.3	37.4		31.4	36.4	21.0	38.3	24.5		46.5	38.0	
Level of Service	E	D		C	D	C	D	C		D	D	
Approach Delay (s)		47.6			31.5			27.5			38.7	
Approach LOS		D			C			C			D	

Intersection Summary				
HCM Average Control Delay	33.4	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.74			
Actuated Cycle Length (s)	85.3	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	70.6%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
15: Bliss Avenue & Harbor Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	29	0	120	2	4	2	162	880	0	0	827	84
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0			4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	*0.95			*0.95	
Frt		1.00	0.85		0.97		1.00	1.00			0.99	
Flt Protected		0.95	1.00		0.99		0.95	1.00			1.00	
Satd. Flow (prot)		1770	1583		1778		1770	3539			3490	
Flt Permitted		0.75	1.00		0.95		0.20	1.00			1.00	
Satd. Flow (perm)		1397	1583		1701		381	3539			3490	
Peak-hour factor, PHF	0.90	0.90	0.90	0.67	0.67	0.67	0.81	0.81	0.81	0.73	0.73	0.73
Adj. Flow (vph)	32	0	133	3	6	3	200	1086	0	0	1133	115
RTOR Reduction (vph)	0	0	60	0	4	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	32	73	0	8	0	200	1086	0	0	1244	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		9.6	9.6		9.6		72.4	72.4			72.4	
Effective Green, g (s)		9.6	9.6		9.6		72.4	72.4			72.4	
Actuated g/C Ratio		0.11	0.11		0.11		0.80	0.80			0.80	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0			4.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		149	169		181		306	2847			2808	
v/s Ratio Prot								0.31			0.36	
v/s Ratio Perm		0.02	c0.05		0.00		c0.52					
v/c Ratio		0.21	0.43		0.05		0.65	0.38			0.44	
Uniform Delay, d1		36.8	37.7		36.1		3.6	2.5			2.7	
Progression Factor		0.66	0.83		1.00		1.00	1.00			1.00	
Incremental Delay, d2		0.6	1.5		0.1		10.4	0.4			0.5	
Delay (s)		24.8	32.7		36.2		14.0	2.9			3.2	
Level of Service		C	C		D		B	A			A	
Approach Delay (s)		31.2			36.2			4.6			3.2	
Approach LOS		C			D			A			A	

Intersection Summary				
HCM Average Control Delay	5.7	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.63			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	49.6%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
16: Garcia Ave & Harbor Street

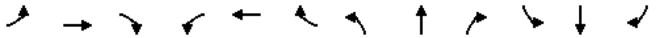
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	11	1	115	35	5	63	130	825	46	61	672	28
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	1	125	38	5	68	141	897	50	66	730	30
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								663			690	
pX, platoon unblocked	0.83	0.83		0.83	0.83	0.83				0.83		
vC, conflicting volume	1680	2108	380	1828	2098	473	761			947		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1409	1924	380	1586	1912	0	761			524		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	79	97	80	2	87	92	83			92		
cM capacity (veh/h)	56	42	617	39	43	899	847			861		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	12	126	38	74	141	598	349	66	487	274
Volume Left	12	0	38	0	141	0	0	66	0	0
Volume Right	0	125	0	68	0	0	50	0	0	30
cSH	56	552	39	364	847	1700	1700	861	1700	1700
Volume to Capacity	0.21	0.23	0.98	0.20	0.17	0.35	0.21	0.08	0.29	0.16
Queue Length 95th (ft)	18	22	93	19	15	0	0	6	0	0
Control Delay (s)	85.5	13.4	296.7	17.4	10.1	0.0	0.0	9.5	0.0	0.0
Lane LOS	F	B	F	C	B			A		
Approach Delay (s)	19.7		112.3		1.3			0.8		
Approach LOS	C		F							

Intersection Summary				
Average Delay	8.0			
Intersection Capacity Utilization	46.3%	ICU Level of Service	A	
Analysis Period (min)	15			

EXISTING CONDITIONS – PM PEAK HOUR

HCM Unsignalized Intersection Capacity Analysis
1: Civic Avenue & Davi Avenue

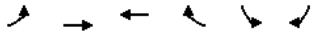


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	5	126	10	45	80	12	34	1	70	10	9	12
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	137	11	49	87	13	37	1	76	11	10	13

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	153	136	13	114	34
Volume Left (vph)	5	49	0	37	11
Volume Right (vph)	11	0	13	76	13
Hadj (s)	0.00	0.21	-0.67	-0.30	-0.13
Departure Headway (s)	4.5	5.2	4.3	4.4	4.6
Degree Utilization, x	0.19	0.20	0.02	0.14	0.04
Capacity (veh/h)	765	665	798	769	712
Control Delay (s)	8.6	8.3	6.2	8.1	7.8
Approach Delay (s)	8.6	8.1		8.1	7.8
Approach LOS	A	A		A	A

Intersection Summary				
Delay	8.2			
HCM Level of Service	A			
Intersection Capacity Utilization	38.0%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
2: Power Avenue & Davi Avenue



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	56	272	301	15	25	30
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	61	296	327	16	27	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	343				753	335
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	343				753	335
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				92	95
cM capacity (veh/h)	1216				359	707

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	357	343	60
Volume Left	61	0	27
Volume Right	0	16	33
cSH	1216	1700	490
Volume to Capacity	0.05	0.20	0.12
Queue Length 95th (ft)	4	0	10
Control Delay (s)	1.8	0.0	13.4
Lane LOS	A		B
Approach Delay (s)	1.8	0.0	13.4
Approach LOS			B

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	47.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
3: Civic Avenue & Railroad Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	110	0	116	2	1	1	166	625	2	2	505	88
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97		1.00		1.00		1.00	0.95		1.00	0.95	1.00
Frt	1.00		0.85		0.97		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95		1.00		0.98		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433		1583		1756		1770	3538		1770	3539	1583
Flt Permitted	0.95		1.00		0.98		0.95	1.00		0.40	1.00	1.00
Satd. Flow (perm)	3433		1583		1756		1770	3538		747	3539	1583
Peak-hour factor, PHF	0.77	0.77	0.77	0.50	0.50	0.50	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	143	0	151	4	2	2	175	658	2	2	549	96
RTOR Reduction (vph)	0	0	135	0	2	0	0	0	0	0	0	42
Lane Group Flow (vph)	143	0	16	0	6	0	175	660	0	2	549	54
Turn Type	Prot		custom	Split			Prot			Perm		Perm
Protected Phases	4		4	8	8		5	2			6	
Permitted Phases										6		6
Actuated Green, G (s)	8.7		8.7		1.4		13.1	57.9		40.8	40.8	40.8
Effective Green, g (s)	8.7		8.7		1.4		13.1	57.9		40.8	40.8	40.8
Actuated g/C Ratio	0.11		0.11		0.02		0.16	0.72		0.51	0.51	0.51
Clearance Time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0		3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	373		172		31		290	2561		381	1805	807
v/s Ratio Prot	c0.04		0.01		c0.00		c0.10	0.19			c0.16	
v/s Ratio Perm										0.00		0.03
v/c Ratio	0.38		0.10		0.19		0.60	0.26		0.01	0.30	0.07
Uniform Delay, d1	33.2		32.1		38.7		31.0	3.8		9.6	11.4	9.9
Progression Factor	1.00		1.00		1.00		0.94	1.01		1.00	1.00	1.00
Incremental Delay, d2	0.7		0.2		3.1		2.8	0.2		0.0	0.4	0.2
Delay (s)	33.8		32.3		41.8		32.0	4.0		9.7	11.8	10.1
Level of Service	C		C		D		C	A		A	B	B
Approach Delay (s)		33.1			41.8			9.8			11.5	
Approach LOS		C			D			A			B	

Intersection Summary				
HCM Average Control Delay	14.4	HCM Level of Service		B
HCM Volume to Capacity ratio	0.37			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)		16.0
Intersection Capacity Utilization	38.7%	ICU Level of Service		A
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
4: Center Drive & Railroad Avenue

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	3	304	310	860	731	2
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.92	0.92	0.91	0.91
Hourly flow rate (vph)	3	338	337	935	803	2
Pedestrians	10				10	
Lane Width (ft)	12.0				12.0	
Walking Speed (ft/s)	4.0				4.0	
Percent Blockage	1				1	
Right turn flare (veh)		4				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				405	794	
pX, platoon unblocked	0.96	0.96	0.96			
vC, conflicting volume	1966	413	815			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1922	302	722			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	90	49	60			
cM capacity (veh/h)	33	660	833			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	341	337	467	467	536	270
Volume Left	3	337	0	0	0	0
Volume Right	338	0	0	0	0	2
cSH	666	833	1700	1700	1700	1700
Volume to Capacity	0.51	0.40	0.27	0.27	0.32	0.16
Queue Length 95th (ft)	73	49	0	0	0	0
Control Delay (s)	17.1	12.2	0.0	0.0	0.0	0.0
Lane LOS	C	B				
Approach Delay (s)	17.1	3.2			0.0	
Approach LOS	C					

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	50.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
5: SR-4 WB On-Ramp & Railroad Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	49	115	262	315	908	257	133	550	352
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor					0.95		0.97	0.95		1.00	0.95	1.00
Frt					0.91		1.00	0.97		1.00	1.00	0.85
Flt Protected					0.99		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)					3195		3433	3422		1770	3539	1583
Flt Permitted					0.99		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)					3195		3433	3422		1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.88	0.88	0.88	0.93	0.93	0.93	0.83	0.83	0.83
Adj. Flow (vph)	0	0	0	56	131	298	339	976	276	160	663	424
RTOR Reduction (vph)	0	0	0	0	259	0	0	27	0	0	0	193
Lane Group Flow (vph)	0	0	0	0	226	0	339	1225	0	160	663	231
Turn Type				Split			Prot			Prot		Prot
Protected Phases				8	8		5	2		1	6	6
Permitted Phases												
Actuated Green, G (s)					10.6		21.7	45.7		11.7	35.7	35.7
Effective Green, g (s)					10.6		21.7	45.7		11.7	35.7	35.7
Actuated g/C Ratio					0.13		0.27	0.57		0.15	0.45	0.45
Clearance Time (s)					4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)					3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)					423		931	1955		259	1579	706
v/s Ratio Prot					c0.07		0.10	c0.36		c0.09	0.19	0.15
v/s Ratio Perm												
v/c Ratio					0.54		0.36	0.63		0.62	0.42	0.33
Uniform Delay, d1					32.4		23.6	11.5		32.1	15.1	14.4
Progression Factor					1.00		0.98	0.61		1.09	0.73	0.34
Incremental Delay, d2					1.3		0.2	1.1		4.3	0.8	1.2
Delay (s)					33.7		23.2	8.1		39.1	11.8	6.1
Level of Service					C		C	A		D	B	A
Approach Delay (s)		0.0			33.7			11.3			13.4	
Approach LOS		A			C			B			B	

Intersection Summary				
HCM Average Control Delay	15.4	HCM Level of Service		B
HCM Volume to Capacity ratio	0.61			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)		12.0
Intersection Capacity Utilization	63.7%	ICU Level of Service		B
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
6: SR-4 EB Off-Ramp & Railroad Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	658	0	1162	0	0	0	0	822	176	56	543	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor	0.95	0.91	0.95					0.91		1.00	0.95	
Frt	1.00	0.87	0.85					0.97		1.00	1.00	
Flt Protected	0.95	0.99	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1681	1460	1504					4951		1770	3539	
Flt Permitted	0.95	0.99	1.00					1.00		0.95	1.00	
Satd. Flow (perm)	1681	1460	1504					4951		1770	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93	0.88	0.88	0.88
Adj. Flow (vph)	715	0	1263	0	0	0	0	884	189	64	617	0
RTOR Reduction (vph)	0	28	28	0	0	0	0	38	0	0	0	0
Lane Group Flow (vph)	643	638	641	0	0	0	0	1035	0	64	617	0
Turn Type	Split		Prot							Prot		
Protected Phases	4	4	4					2		1	6	
Permitted Phases												
Actuated Green, G (s)	44.0	44.0	44.0					20.8		3.2	28.0	
Effective Green, g (s)	44.0	44.0	44.0					20.8		3.2	28.0	
Actuated g/C Ratio	0.55	0.55	0.55					0.26		0.04	0.35	
Clearance Time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)	925	803	827					1287		71	1239	
v/s Ratio Prot	0.38	c0.44	0.43					c0.21		c0.04	0.17	
v/s Ratio Perm												
v/c Ratio	0.70	0.79	0.78					0.80		0.90	0.50	
Uniform Delay, d1	13.1	14.4	14.1					27.7		38.2	20.5	
Progression Factor	1.00	1.00	1.00					0.42		0.55	0.31	
Incremental Delay, d2	2.3	5.5	4.6					3.9		69.6	1.3	
Delay (s)	15.4	19.8	18.7					15.6		90.8	7.6	
Level of Service	B	B	B					B		F	A	
Approach Delay (s)		18.0			0.0			15.6			15.5	
Approach LOS		B			A			B			B	

Intersection Summary				
HCM Average Control Delay	16.8	HCM Level of Service		B
HCM Volume to Capacity ratio	0.80			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)		12.0
Intersection Capacity Utilization	69.6%	ICU Level of Service		C
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
7: Bliss Avenue & Railroad Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	133	28	22	39	51	111	9	754	71	468	1135	102
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.96	1.00		0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1789	1583		1823	1583	1770	3493		1770	3495	
Flt Permitted		0.65	1.00		0.70	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1217	1583		1311	1583	1770	3493		1770	3495	
Peak-hour factor, PHF	0.84	0.84	0.84	0.75	0.75	0.75	0.88	0.88	0.88	0.92	0.92	0.92
Adj. Flow (vph)	158	33	26	52	68	148	10	857	81	509	1234	111
RTOR Reduction (vph)	0	0	21	0	0	120	0	9	0	0	7	0
Lane Group Flow (vph)	0	191	5	0	120	28	10	929	0	509	1338	0
Turn Type	Perm		Perm	Perm		Perm	Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		15.0	15.0		15.0	15.0	0.8	25.8		27.2	52.2	
Effective Green, g (s)		15.0	15.0		15.0	15.0	0.8	25.8		27.2	52.2	
Actuated g/C Ratio		0.19	0.19		0.19	0.19	0.01	0.32		0.34	0.65	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		228	297		246	297	18	1126		602	2280	
v/s Ratio Prot							0.01	c0.27		c0.29	0.38	
v/s Ratio Perm		c0.16	0.00		0.09	0.02						
v/c Ratio		0.84	0.02		0.49	0.09	0.56	0.82		0.85	0.59	
Uniform Delay, d1		31.3	26.5		29.1	26.9	39.4	25.0		24.5	7.8	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.12	1.14	
Incremental Delay, d2		22.6	0.0		1.5	0.1	32.3	6.9		8.3	0.8	
Delay (s)		54.0	26.5		30.6	27.0	71.7	31.9		35.8	9.8	
Level of Service		D	C		C	C	E	C		D	A	
Approach Delay (s)		50.7			28.6			32.3			16.9	
Approach LOS		D			C			C			B	

Intersection Summary				
HCM Average Control Delay	24.5	HCM Level of Service		C
HCM Volume to Capacity ratio	0.84			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)		12.0
Intersection Capacity Utilization	74.5%	ICU Level of Service		D
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: Leland Road & Railroad Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	198	873	211	139	334	223	169	793	187	265	694	171
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3436		1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3436		1770	3539	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	215	949	229	151	363	242	184	862	203	288	754	186
RTOR Reduction (vph)	0	21	0	0	0	86	0	0	55	0	0	84
Lane Group Flow (vph)	215	1157	0	151	363	156	184	862	148	288	754	102
Turn Type	Prot			Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases						8			2			6
Actuated Green, G (s)	20.0	30.0		8.0	18.0	38.0	14.2	23.0	31.0	20.0	28.8	48.8
Effective Green, g (s)	20.0	31.0		8.0	19.0	38.0	14.2	25.0	31.0	20.0	30.8	48.8
Actuated g/C Ratio	0.20	0.31		0.08	0.19	0.38	0.14	0.25	0.31	0.20	0.31	0.49
Clearance Time (s)	4.0	5.0		4.0	5.0	4.0	4.0	6.0	4.0	4.0	6.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	354	1065		142	672	665	251	885	491	354	1090	773
v/s Ratio Prot	0.12	c0.34		c0.09	0.10	0.05	0.10	c0.24	0.02	c0.16	0.21	0.03
v/s Ratio Perm						0.05			0.07			0.04
v/c Ratio	0.61	1.09		1.06	0.54	0.23	0.73	0.97	0.30	0.81	0.69	0.13
Uniform Delay, d1	36.4	34.5		46.0	36.6	21.1	41.1	37.2	26.3	38.2	30.4	14.0
Progression Factor	1.00	1.00		0.66	0.77	0.42	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.9	54.0		90.4	2.9	0.2	10.5	24.6	0.3	13.3	3.6	0.1
Delay (s)	39.4	88.5		120.9	31.0	9.1	51.6	61.8	26.6	51.5	34.0	14.1
Level of Service	D	F		F	C	A	D	E	C	D	C	B
Approach Delay (s)		80.9			41.9			54.6			35.1	
Approach LOS		F			D			D			D	

Intersection Summary				
HCM Average Control Delay	55.3	HCM Level of Service		E
HCM Volume to Capacity ratio	0.99			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)		16.0
Intersection Capacity Utilization	88.5%	ICU Level of Service		E
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: Leland Road & Harbor Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	113	957	208	176	354	110	155	419	342	222	614	148
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	123	1040	226	191	385	120	168	455	372	241	667	161
RTOR Reduction (vph)	0	0	136	0	0	73	0	0	186	0	0	127
Lane Group Flow (vph)	123	1040	90	191	385	47	168	455	186	241	667	34
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	12.0	40.0	40.0	11.0	39.0	39.0	10.0	20.0	20.0	11.0	21.0	21.0
Effective Green, g (s)	12.0	41.0	40.0	11.0	40.0	39.0	10.0	21.0	20.0	11.0	22.0	21.0
Actuated g/C Ratio	0.12	0.41	0.40	0.11	0.40	0.39	0.10	0.21	0.20	0.11	0.22	0.21
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	212	1451	633	195	1416	617	177	743	317	195	779	332
v/s Ratio Prot	0.07	c0.29		c0.11	0.11		0.09	0.13		c0.14	c0.19	
v/s Ratio Perm			0.06			0.03			0.12			0.02
v/c Ratio	0.58	0.72	0.14	0.98	0.27	0.08	0.95	0.61	0.59	1.24	0.86	0.10
Uniform Delay, d1	41.6	24.6	19.1	44.4	20.2	19.2	44.7	35.8	36.2	44.5	37.5	31.9
Progression Factor	0.80	0.38	0.26	0.89	0.34	0.07	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.5	1.1	0.2	55.0	0.4	0.2	52.3	3.7	7.7	142.2	11.7	0.6
Delay (s)	34.8	10.4	5.2	94.5	7.4	1.7	97.0	39.6	43.9	186.7	49.1	32.5
Level of Service	C	B	A	F	A	A	F	D	D	F	D	C
Approach Delay (s)		11.7			30.3			50.9			77.7	
Approach LOS		B			C			D			E	

Intersection Summary				
HCM Average Control Delay	41.2	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.83			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	75.1%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
10: Leland Road & Freed Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	25	1569	22	9	569	14	11	2	13	24	1	30
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.81	0.81	0.81	0.54	0.54	0.54	0.60	0.60	0.60
Hourly flow rate (vph)	27	1687	24	11	702	17	20	4	24	40	2	50
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												2
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	720			1711			2127	2495	855	1657	2498	360
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	720			1711			2127	2495	855	1657	2498	360
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			97			14	86	92	21	94	92
cM capacity (veh/h)	878			367			24	27	301	51	27	637

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	27	1125	586	11	468	251	48	92
Volume Left	27	0	0	11	0	0	20	40
Volume Right	0	0	24	0	0	17	24	50
cSH	878	1700	1700	367	1700	1700	45	106
Volume to Capacity	0.03	0.66	0.34	0.03	0.28	0.15	1.08	0.87
Queue Length 95th (ft)	2	0	0	2	0	0	112	127
Control Delay (s)	9.2	0.0	0.0	15.1	0.0	0.0	301.8	128.8
Lane LOS	A			C			F	F
Approach Delay (s)	0.1			0.2			301.8	128.8
Approach LOS							F	F

Intersection Summary				
Average Delay	10.3			
Intersection Capacity Utilization	58.9%	ICU Level of Service	B	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
11: Leland Road & Loveridge Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	370	891	180	216	416	270	120	597	204	369	496	181
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95		0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	1770	3404		3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	1770	3404		3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	402	968	196	235	452	293	130	649	222	401	539	197
RTOR Reduction (vph)	0	0	124	0	0	235	0	33	0	0	0	136
Lane Group Flow (vph)	402	968	72	235	452	58	130	838	0	401	539	61
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	21.3	31.0	31.0	9.0	18.7	18.7	12.0	26.9		15.1	30.0	30.0
Effective Green, g (s)	21.3	32.0	32.0	9.0	19.7	19.7	12.0	27.9		15.1	31.0	31.0
Actuated g/C Ratio	0.21	0.32	0.32	0.09	0.20	0.20	0.12	0.28		0.15	0.31	0.31
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	731	1132	507	309	697	312	212	950		518	1097	491
v/s Ratio Prot	0.12	c0.27		c0.07	0.13		0.07	c0.25		c0.12	0.15	
v/s Ratio Perm			0.05			0.04						0.04
v/c Ratio	0.55	0.86	0.14	0.76	0.65	0.19	0.61	0.88		0.77	0.49	0.12
Uniform Delay, d1	35.1	31.8	24.2	44.4	37.0	33.5	41.8	34.5		40.8	28.1	24.8
Progression Factor	0.61	0.55	0.31	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.6	4.4	0.1	10.5	2.1	0.3	5.2	11.6		7.1	1.6	0.5
Delay (s)	21.9	22.0	7.6	55.0	39.1	33.7	47.0	46.1		47.9	29.7	25.3
Level of Service	C	C	A	D	D	C	D	D		D	C	C
Approach Delay (s)		20.2			41.3			46.2			35.3	
Approach LOS		C			D			D			D	

Intersection Summary				
HCM Average Control Delay	33.8	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.84			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	77.7%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
12: SR-4 EB Ramps & Loveridge Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	373	0	286	0	0	0	0	672	637	0	772	288
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0					4.0			4.0	
Lane Util. Factor	1.00		1.00					0.95			0.95	
Frt	1.00		0.85					0.93			0.96	
Flt Protected	0.95		1.00					1.00			1.00	
Satd. Flow (prot)	1770		1583					3281			3395	
Flt Permitted	0.95		1.00					1.00			1.00	
Satd. Flow (perm)	1770		1583					3281			3395	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	405	0	311	0	0	0	0	730	692	0	839	313
RTOR Reduction (vph)	0	0	114	0	0	0	0	256	0	0	57	0
Lane Group Flow (vph)	405	0	197	0	0	0	0	1166	0	0	1095	0
Turn Type	Prot		custom									
Protected Phases	4		4					2			6	
Permitted Phases												
Actuated Green, G (s)	17.5		17.5					37.5			37.5	
Effective Green, g (s)	17.5		17.5					37.5			37.5	
Actuated g/C Ratio	0.28		0.28					0.60			0.60	
Clearance Time (s)	4.0		4.0					4.0			4.0	
Vehicle Extension (s)	3.0		3.0					3.0			3.0	
Lane Grp Cap (vph)	492		440					1953			2021	
v/s Ratio Prot	c0.23		0.12					c0.36			0.32	
v/s Ratio Perm												
v/c Ratio	0.82		0.45					0.60			0.54	
Uniform Delay, d1	21.3		18.8					8.0			7.6	
Progression Factor	1.00		1.00					1.00			1.00	
Incremental Delay, d2	10.7		0.7					1.4			1.0	
Delay (s)	32.0		19.5					9.4			8.7	
Level of Service	C		B					A			A	
Approach Delay (s)		26.6			0.0			9.4			8.7	
Approach LOS		C			A			A			A	

Intersection Summary				
HCM Average Control Delay	12.9	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.67			
Actuated Cycle Length (s)	63.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	66.4%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
13: California Avenue & SR-4 WB Ramps

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	732	13	536	395	4	265	20	386	13	60	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		0.97	1.00	1.00	0.95	0.95	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	0.96	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1858		3433	1863	1583	1681	1697	1583	1770	1779	
Flt Permitted	0.51	1.00		0.95	1.00	1.00	0.95	0.57	1.00	0.65	1.00	
Satd. Flow (perm)	955	1858		3433	1863	1583	1681	1010	1583	1219	1779	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	796	14	583	429	4	288	22	420	14	65	28
RTOR Reduction (vph)	0	1	0	0	0	2	0	0	0	0	17	0
Lane Group Flow (vph)	5	809	0	583	429	2	156	154	420	14	76	0
Turn Type	Perm			Prot		Perm	Prot		Free	Perm		
Protected Phases		4		3	8		5	2			6	
Permitted Phases	4					8			Free	6		
Actuated Green, G (s)	35.0	35.0		16.0	55.0	55.0	7.0	27.0	90.0	16.0	16.0	
Effective Green, g (s)	35.0	35.0		16.0	55.0	55.0	7.0	27.0	90.0	16.0	16.0	
Actuated g/C Ratio	0.39	0.39		0.18	0.61	0.61	0.08	0.30	1.00	0.18	0.18	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	371	723		610	1139	967	131	356	1583	217	316	
v/s Ratio Prot		c0.44		c0.17	0.23		c0.09	0.03			0.04	
v/s Ratio Perm	0.01					0.00		c0.10	0.27	0.01		
v/c Ratio	0.01	1.12		0.96	0.38	0.00	1.19	0.43	0.27	0.06	0.24	
Uniform Delay, d1	16.9	27.5		36.6	8.8	6.8	41.5	25.3	0.0	30.8	31.8	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	71.3		25.6	0.2	0.0	138.9	0.8	0.4	0.6	1.8	
Delay (s)	16.9	98.8		62.3	9.1	6.8	180.4	26.2	0.4	31.3	33.6	
Level of Service	B	F		E	A	A	F	C	A	C	C	
Approach Delay (s)		98.3			39.6			44.3			33.3	
Approach LOS		F			D			D			C	

Intersection Summary				
HCM Average Control Delay	58.6	HCM Level of Service	E	
HCM Volume to Capacity ratio	0.91			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	79.1%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
14: California Avenue & Harbor Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	254	82	318	373	209	128	431	242	222	452	89
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.96		1.00	1.00	0.85	1.00	0.95		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1795		1770	1863	1583	1770	3348		1770	3452	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1795		1770	1863	1583	1770	3348		1770	3452	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	36	276	89	346	405	227	139	468	263	241	491	97
RTOR Reduction (vph)	0	13	0	0	0	131	0	86	0	0	18	0
Lane Group Flow (vph)	36	352	0	346	405	96	139	645	0	241	570	0
Turn Type	Prot			Prot		Perm	Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						
Actuated Green, G (s)	3.5	21.7		19.1	37.3	37.3	9.5	18.1		13.7	22.3	
Effective Green, g (s)	3.5	21.7		19.1	37.3	37.3	9.5	18.1		13.7	22.3	
Actuated g/C Ratio	0.04	0.24		0.22	0.42	0.42	0.11	0.20		0.15	0.25	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	70	440		382	784	666	190	684		274	869	
v/s Ratio Prot	0.02	c0.20		c0.20	0.22		0.08	c0.19		c0.14	0.17	
v/s Ratio Perm						0.06						
v/c Ratio	0.51	0.80		0.91	0.52	0.14	0.73	0.94		0.88	0.66	
Uniform Delay, d1	41.7	31.4		33.9	19.0	15.8	38.3	34.7		36.6	29.7	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.2	10.0		24.2	0.6	0.1	13.5	23.0		25.8	3.9	
Delay (s)	48.0	41.4		58.1	19.6	15.9	51.8	57.7		62.4	33.6	
Level of Service	D	D		E	B	B	D	E		E	C	
Approach Delay (s)		42.0			32.3			56.8			41.9	
Approach LOS		D			C			E			D	

Intersection Summary				
HCM Average Control Delay	43.1	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.88			
Actuated Cycle Length (s)	88.6	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	81.3%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
15: Bliss Avenue & Harbor Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	147	8	406	5	3	21	96	633	8	5	769	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85		0.90		1.00	1.00		1.00	0.99	
Flt Protected		0.95	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1778	1583		1666		1770	3533		1770	3490	
Flt Permitted		0.71	1.00		0.96		0.25	1.00		0.34	1.00	
Satd. Flow (perm)		1322	1583		1617		473	3533		638	3490	
Peak-hour factor, PHF	0.86	0.86	0.86	0.78	0.78	0.78	0.89	0.89	0.89	0.90	0.90	0.90
Adj. Flow (vph)	171	9	472	6	4	27	108	711	9	6	854	87
RTOR Reduction (vph)	0	0	93	0	19	0	0	1	0	0	7	0
Lane Group Flow (vph)	0	180	379	0	18	0	108	719	0	6	934	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		26.6	26.6		26.6		55.4	55.4		55.4	55.4	
Effective Green, g (s)		26.6	26.6		26.6		55.4	55.4		55.4	55.4	
Actuated g/C Ratio		0.30	0.30		0.30		0.62	0.62		0.62	0.62	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		391	468		478		291	2175		393	2148	
v/s Ratio Prot								0.20			c0.27	
v/s Ratio Perm		0.14	c0.24		0.01		0.23			0.01		
v/c Ratio		0.46	0.81		0.04		0.37	0.33		0.02	0.43	
Uniform Delay, d1		25.8	29.4		22.6		8.6	8.4		6.7	9.1	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.9	10.0		0.0		3.6	0.4		0.1	0.6	
Delay (s)		26.7	39.3		22.6		12.2	8.8		6.8	9.7	
Level of Service		C	D		C		B	A		A	A	
Approach Delay (s)		35.8			22.6			9.2			9.7	
Approach LOS		D			C			A			A	

Intersection Summary				
HCM Average Control Delay	16.7	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.56			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	62.2%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
16: Garcia Ave & Harbor Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	89	17	117	25	11	141	49	640	42	251	810	65
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	97	18	127	27	12	153	53	696	46	273	880	71
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								663			690	
pX, platoon unblocked	0.91	0.91	0.99	0.91	0.91	0.91	0.99			0.91		
vC, conflicting volume	2075	2309	476	1947	2322	371	951			741		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1959	2215	461	1819	2229	110	939			517		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	29	77	0	53	82	93			71		
cM capacity (veh/h)	14	26	544	11	26	839	721			951		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	97	146	27	165	53	464	278	273	587	364
Volume Left	97	0	27	0	53	0	0	273	0	0
Volume Right	0	127	0	153	0	0	46	0	0	71
cSH	14	154	11	254	721	1700	1700	951	1700	1700
Volume to Capacity	7.13	0.94	2.45	0.65	0.07	0.27	0.16	0.29	0.35	0.21
Queue Length 95th (ft)	Err	171	109	102	6	0	0	30	0	0
Control Delay (s)	Err	115.7	1333.9	42.2	10.4	0.0	0.0	10.3	0.0	0.0
Lane LOS	F	F	F	E	B			B		
Approach Delay (s)	4060.2		224.7		0.7			2.3		
Approach LOS	F		F							

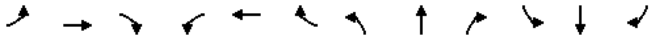
Intersection Summary				
Average Delay	420.2			
Intersection Capacity Utilization	60.5%	ICU Level of Service	B	
Analysis Period (min)	15			

Intersection Sign configuration not allowed in HCM analysis.

FUTURE YEAR 2015 NO PROJECT BUILD CONDITIONS – AM PEAK HOUR

HCM Unsignalized Intersection Capacity Analysis
1: Civic Avenue & Davi Avenue

Year 2015 - No Build AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	13	111	37	73	131	17	2	7	19	5	16	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	14	121	40	79	142	18	2	8	21	5	17	1

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	175	222	18	10	21	24
Volume Left (vph)	14	79	0	2	0	5
Volume Right (vph)	40	0	18	0	21	1
Hadj (s)	-0.09	0.21	-0.67	0.08	-0.57	0.05
Departure Headway (s)	4.3	4.9	4.0	5.0	3.2	4.9
Degree Utilization, x	0.21	0.30	0.02	0.01	0.02	0.03
Capacity (veh/h)	830	716	870	663	1121	672
Control Delay (s)	8.4	8.8	5.9	8.0	6.3	8.1
Approach Delay (s)	8.4	8.6		6.8		8.1
Approach LOS	A	A		A		A

Intersection Summary				
Delay	8.4			
HCM Level of Service	A			
Intersection Capacity Utilization	39.5%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
3: Civic Avenue & Railroad Avenue

Year 2015 - No Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	0	70	6	1	9	211	854	7	1	731	115
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97		1.00		1.00		0.97	0.95		1.00	0.95	1.00
Frt	1.00		0.85		0.93		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95		1.00		0.98		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433		1583		1692		3433	3535		1770	3539	1583
Flt Permitted	0.95		1.00		0.98		0.95	1.00		0.25	1.00	1.00
Satd. Flow (perm)	3433		1583		1692		3433	3535		475	3539	1583
Peak-hour factor, PHF	0.72	0.72	0.72	0.56	0.56	0.56	0.77	0.77	0.77	0.92	0.92	0.92
Adj. Flow (vph)	47	0	97	11	2	16	274	1109	9	1	795	125
RTOR Reduction (vph)	0	0	88	0	15	0	0	0	0	0	0	44
Lane Group Flow (vph)	47	0	9	0	14	0	274	1118	0	1	795	81
Turn Type	Prot		custom	Split			Prot			Perm		Perm
Protected Phases	4		4	8	8		5	2			6	
Permitted Phases										6		6
Actuated Green, G (s)	5.3		5.3		2.5		9.6	38.1		24.5	24.5	24.5
Effective Green, g (s)	5.3		5.3		2.5		9.6	38.1		24.5	24.5	24.5
Actuated g/C Ratio	0.09		0.09		0.04		0.17	0.66		0.42	0.42	0.42
Clearance Time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0		3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	314		145		73		569	2326		201	1498	670
v/s Ratio Prot	c0.01		0.01		c0.01		0.08	c0.32			c0.22	
v/s Ratio Perm										0.00		0.05
v/c Ratio	0.15		0.06		0.19		0.48	0.48		0.00	0.53	0.12
Uniform Delay, d1	24.2		24.0		26.7		21.9	5.0		9.7	12.4	10.2
Progression Factor	1.00		1.00		1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.2		0.2		1.2		0.6	0.7		0.0	1.4	0.4
Delay (s)	24.4		24.2		28.0		22.5	5.7		9.7	13.8	10.5
Level of Service	C		C		C		C	A		A	B	B
Approach Delay (s)		24.3			28.0			9.0			13.3	
Approach LOS		C			C			A			B	

Intersection Summary					
HCM Average Control Delay	11.7	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.47				
Actuated Cycle Length (s)	57.9	Sum of lost time (s)		16.0	
Intersection Capacity Utilization	43.6%	ICU Level of Service		A	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
4: Center Drive & Railroad Avenue

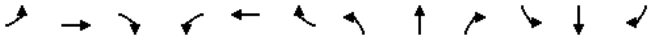
Year 2015 - No Build AM

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	9	386	166	1063	839	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	
Frt	0.86	0.85	1.00	1.00	1.00	
Flt Protected	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1593	1504	1770	3539	3539	
Flt Permitted	1.00	1.00	0.29	1.00	1.00	
Satd. Flow (perm)	1593	1504	543	3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	420	180	1155	912	1
RTOR Reduction (vph)	167	169	0	0	0	0
Lane Group Flow (vph)	49	45	180	1155	913	0
Turn Type		Perm	Perm			
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	7.2	7.2	22.8	22.8	22.8	
Effective Green, g (s)	7.2	7.2	22.8	22.8	22.8	
Actuated g/C Ratio	0.19	0.19	0.60	0.60	0.60	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	302	285	326	2123	2123	
v/s Ratio Prot	c0.03			0.33	0.26	
v/s Ratio Perm		0.03	c0.33			
v/c Ratio	0.16	0.16	0.55	0.54	0.43	
Uniform Delay, d1	12.9	12.9	4.5	4.5	4.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.3	0.3	2.0	0.3	0.1	
Delay (s)	13.1	13.1	6.6	4.8	4.2	
Level of Service	B	B	A	A	A	
Approach Delay (s)	13.1			5.0	4.2	
Approach LOS	B			A	A	

Intersection Summary				
HCM Average Control Delay	6.1	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.46			
Actuated Cycle Length (s)	38.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	50.9%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
5: SR-4 WB On-Ramp & Railroad Avenue

Year 2015 - No Build AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	10	327	379	593	850	42	64	586	575
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor					0.95		0.97	0.95		1.00	0.95	1.00
Frt					0.92		1.00	0.99		1.00	1.00	0.85
Flt Protected					1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)					3256		3433	3514		1770	3539	1583
Flt Permitted					1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)					3256		3433	3514		1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.83	0.83	0.83	0.96	0.96	0.96	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	12	394	457	618	885	44	66	604	593
RTOR Reduction (vph)	0	0	0	0	217	0	0	5	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	646	0	618	924	0	66	604	593
Turn Type				Split			Prot			Prot		Free
Protected Phases				8	8		5	2		1	6	
Permitted Phases												Free
Actuated Green, G (s)					15.4		16.6	29.0		3.6	16.0	60.0
Effective Green, g (s)					15.4		16.6	29.0		3.6	16.0	60.0
Actuated g/C Ratio					0.26		0.28	0.48		0.06	0.27	1.00
Clearance Time (s)					4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)					3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)					836		950	1698		106	944	1583
v/s Ratio Prot					c0.20		c0.18	0.26		0.04	c0.17	
v/s Ratio Perm												0.37
v/c Ratio					0.77		0.65	0.54		0.62	0.64	0.37
Uniform Delay, d1					20.7		19.1	10.9		27.5	19.5	0.0
Progression Factor					1.00		0.45	0.20		1.00	1.00	1.00
Incremental Delay, d2					4.5		1.1	0.8		10.9	3.3	0.7
Delay (s)					25.2		9.7	3.0		38.4	22.8	0.7
Level of Service					C		A	A		D	C	A
Approach Delay (s)		0.0			25.2			5.6			13.2	
Approach LOS		A			C			A			B	

Intersection Summary				
HCM Average Control Delay	12.8	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.69			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	64.6%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
6: SR-4 EB Off-Ramp & Railroad Avenue

Year 2015 - No Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	407	1	361	0	0	0	0	1078	130	195	401	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor	0.95	0.91	0.95					0.91		1.00	0.95	
Frt	1.00	0.93	0.85					0.98		1.00	1.00	
Flt Protected	0.95	0.97	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1681	1537	1504					5003		1770	3539	
Flt Permitted	0.95	0.97	1.00					1.00		0.95	1.00	
Satd. Flow (perm)	1681	1537	1504					5003		1770	3539	
Peak-hour factor, PHF	0.88	0.88	0.88	0.92	0.92	0.92	0.89	0.89	0.89	0.90	0.90	0.90
Adj. Flow (vph)	462	1	410	0	0	0	0	1211	146	217	446	0
RTOR Reduction (vph)	0	53	208	0	0	0	0	24	0	0	0	0
Lane Group Flow (vph)	305	240	67	0	0	0	0	1333	0	217	446	0
Turn Type	Split		Prot							Prot		
Protected Phases	4	4	4					2		1	6	
Permitted Phases												
Actuated Green, G (s)	14.6	14.6	14.6					21.4		12.0	37.4	
Effective Green, g (s)	14.6	14.6	14.6					21.4		12.0	37.4	
Actuated g/C Ratio	0.24	0.24	0.24					0.36		0.20	0.62	
Clearance Time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)	409	374	366					1784		354	2206	
v/s Ratio Prot	c0.18	0.16	0.04					c0.27		c0.12	0.13	
v/s Ratio Perm												
v/c Ratio	0.75	0.64	0.18					0.75		0.61	0.20	
Uniform Delay, d1	21.0	20.4	18.0					16.9		21.9	4.9	
Progression Factor	1.00	1.00	1.00					0.57		0.98	0.10	
Incremental Delay, d2	7.2	3.7	0.2					2.5		2.7	0.2	
Delay (s)	28.2	24.1	18.2					12.2		24.1	0.6	
Level of Service	C	C	B					B		C	A	
Approach Delay (s)		23.7			0.0			12.2			8.3	
Approach LOS		C			A			B			A	

Intersection Summary				
HCM Average Control Delay	14.8	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.71			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	59.5%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
7: Bliss Avenue & Railroad Avenue

Year 2015 - No Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	4	3	46	33	251	17	863	82	132	730	67
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.96	1.00		0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1797	1583		1810	1583	1770	3493		1770	3494	
Flt Permitted		0.80	1.00		0.81	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1484	1583		1511	1583	1770	3493		1770	3494	
Peak-hour factor, PHF	0.68	0.68	0.68	0.91	0.91	0.91	0.85	0.85	0.85	0.91	0.91	0.91
Adj. Flow (vph)	16	6	4	51	36	276	20	1015	96	145	802	74
RTOR Reduction (vph)	0	0	3	0	0	234	0	10	0	0	8	0
Lane Group Flow (vph)	0	22	1	0	87	42	20	1101	0	145	868	0
Turn Type	Perm		Perm	Perm		Perm	Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		9.1	9.1		9.1	9.1	1.3	30.1		8.8	37.6	
Effective Green, g (s)		9.1	9.1		9.1	9.1	1.3	30.1		8.8	37.6	
Actuated g/C Ratio		0.15	0.15		0.15	0.15	0.02	0.50		0.15	0.63	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		225	240		229	240	38	1752		260	2190	
v/s Ratio Prot							0.01	c0.32		c0.08	0.25	
v/s Ratio Perm		0.01	0.00		c0.06	0.03						
v/c Ratio		0.10	0.00		0.38	0.17	0.53	0.63		0.56	0.40	
Uniform Delay, d1		21.9	21.6		22.9	22.2	29.0	10.9		23.8	5.6	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		0.68	0.45	
Incremental Delay, d2		0.2	0.0		1.1	0.3	12.5	1.7		2.5	0.5	
Delay (s)		22.1	21.6		24.0	22.5	41.6	12.6		18.6	3.0	
Level of Service		C	C		C	C	D	B		B	A	
Approach Delay (s)		22.0			22.9			13.1			5.3	
Approach LOS		C			C			B			A	

Intersection Summary				
HCM Average Control Delay	11.4	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.57			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	55.3%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: Leland Road & Railroad Avenue

Year 2015 - No Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	144	236	121	154	795	200	281	794	92	195	593	185
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.88
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	2787
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	157	257	132	167	864	217	305	863	100	212	645	201
RTOR Reduction (vph)	0	0	100	0	0	32	0	0	56	0	0	68
Lane Group Flow (vph)	157	257	32	167	864	185	305	863	44	212	645	133
Turn Type	Prot		Perm	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	7.0	19.3	19.3	9.7	22.0	31.0	14.0	21.0	30.7	9.0	16.0	23.0
Effective Green, g (s)	8.0	20.3	19.3	10.7	23.0	33.0	15.0	23.0	32.7	10.0	18.0	25.0
Actuated g/C Ratio	0.10	0.25	0.24	0.13	0.29	0.41	0.19	0.29	0.41	0.12	0.22	0.31
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.0	5.0	5.0	6.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	177	898	382	237	1017	653	332	1017	647	221	796	871
v/s Ratio Prot	c0.09	0.07		0.09	c0.24	0.04	c0.17	c0.24	0.01	0.12	0.18	0.02
v/s Ratio Perm			0.02			0.08			0.02			0.03
v/c Ratio	0.89	0.29	0.08	0.70	0.85	0.28	0.92	0.85	0.07	0.96	0.81	0.15
Uniform Delay, d1	35.6	24.0	23.5	33.1	26.9	15.6	31.9	26.9	14.4	34.8	29.4	19.9
Progression Factor	1.00	1.00	1.00	0.95	0.45	0.37	1.00	1.00	1.00	1.08	0.89	0.82
Incremental Delay, d2	37.2	0.8	0.4	6.5	6.3	0.2	29.2	8.8	0.0	48.1	8.7	0.1
Delay (s)	72.8	24.8	23.9	37.8	18.5	5.9	61.1	35.6	14.4	85.8	34.8	16.3
Level of Service	E	C	C	D	B	A	E	D	B	F	C	B
Approach Delay (s)		38.4			18.9			40.1			41.5	
Approach LOS		D			B			D			D	

Intersection Summary				
HCM Average Control Delay	33.8	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.85			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	76.0%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: Leland Road & Harbor Street

Year 2015 - No Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	191	203	58	41	710	266	70	307	30	173	485	453
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	208	221	63	45	772	289	76	334	33	188	527	492
RTOR Reduction (vph)	0	0	39	0	0	218	0	0	26	0	0	307
Lane Group Flow (vph)	208	221	24	45	772	71	76	334	7	188	527	185
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	14.6	30.6	30.6	3.6	19.6	19.6	4.8	17.1	17.1	10.7	23.0	23.0
Effective Green, g (s)	14.6	31.6	30.6	3.6	20.6	19.6	4.8	18.1	17.1	10.7	24.0	23.0
Actuated g/C Ratio	0.18	0.40	0.38	0.05	0.26	0.25	0.06	0.23	0.21	0.13	0.30	0.29
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	323	1398	605	80	911	388	106	801	338	237	1062	455
v/s Ratio Prot	c0.12	0.06		0.03	c0.22		c0.04	0.09		c0.11	c0.15	
v/s Ratio Perm			0.02			0.04			0.00			0.12
v/c Ratio	0.64	0.16	0.04	0.56	0.85	0.18	0.72	0.42	0.02	0.79	0.50	0.41
Uniform Delay, d1	30.3	15.6	15.5	37.4	28.2	23.9	36.9	26.4	24.8	33.6	23.0	23.0
Progression Factor	0.50	0.29	0.16	1.14	0.55	0.36	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.8	0.2	0.1	7.9	8.7	0.9	20.5	1.6	0.1	16.5	1.7	2.7
Delay (s)	19.0	4.8	2.5	50.4	24.2	9.4	57.5	28.0	25.0	50.1	24.7	25.7
Level of Service	B	A	A	D	C	A	E	C	C	D	C	C
Approach Delay (s)		10.5			21.4			32.9			29.0	
Approach LOS		B			C			C			C	

Intersection Summary				
HCM Average Control Delay	24.2	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.70			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	62.4%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
10: Leland Road & Freed Avenue

Year 2015 - No Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	6	476	5	12	763	21	4	7	33	20	7	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.90	0.90	0.90	0.71	0.71	0.71	0.56	0.56	0.56
Hourly flow rate (vph)	7	580	6	13	848	23	6	10	46	36	12	7
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												2
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	871			587			1055	1496	293	1242	1487	436
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	871			587			1055	1496	293	1242	1487	436
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			96	92	93	68	90	99
cM capacity (veh/h)	770			984			161	119	703	113	120	569

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	7	387	200	13	565	306	62	55
Volume Left	7	0	0	13	0	0	6	36
Volume Right	0	0	6	0	0	23	46	7
cSH	770	1700	1700	984	1700	1700	337	132
Volume to Capacity	0.01	0.23	0.12	0.01	0.33	0.18	0.18	0.42
Queue Length 95th (ft)	1	0	0	1	0	0	17	46
Control Delay (s)	9.7	0.0	0.0	8.7	0.0	0.0	18.1	51.6
Lane LOS	A			A			C	F
Approach Delay (s)	0.1			0.1			18.1	51.6
Approach LOS							C	F

Intersection Summary				
Average Delay	2.6			
Intersection Capacity Utilization	38.4%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
11: Leland Road & Loveridge Road

Year 2015 - No Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	251	180	62	15	447	129	294	559	77	232	151	237
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	273	196	67	16	486	140	320	608	84	252	164	258
RTOR Reduction (vph)	0	0	50	0	0	112	0	0	79	0	0	200
Lane Group Flow (vph)	273	196	17	16	486	28	320	608	5	252	164	58
Turn Type	Prot		Perm	Prot		Perm	Prot		Over	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	9.4	19.6	19.6	4.7	14.9	14.9	18.8	26.9	4.7	8.8	16.9	16.9
Effective Green, g (s)	10.4	20.6	20.6	5.7	15.9	15.9	19.8	27.9	4.7	9.8	17.9	17.9
Actuated g/C Ratio	0.13	0.26	0.26	0.07	0.20	0.20	0.25	0.35	0.06	0.12	0.22	0.22
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	446	911	408	245	703	315	438	1234	93	421	792	354
v/s Ratio Prot	c0.08	0.06		0.00	c0.14		c0.18	c0.17	0.00	0.07	0.05	
v/s Ratio Perm			0.01			0.02						0.04
v/c Ratio	0.61	0.22	0.04	0.07	0.69	0.09	0.73	0.49	0.05	0.60	0.21	0.16
Uniform Delay, d1	32.9	23.3	22.3	34.7	29.8	26.1	27.6	20.5	35.5	33.2	25.3	25.0
Progression Factor	0.75	0.67	0.61	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.4	0.1	0.0	0.1	2.9	0.1	6.2	1.4	0.2	2.3	0.6	1.0
Delay (s)	27.1	15.8	13.6	34.8	32.7	26.3	33.8	21.9	35.8	35.5	25.9	26.0
Level of Service	C	B	B	C	C	C	C	C	D	D	C	C
Approach Delay (s)		21.3			31.4			26.8			29.5	
Approach LOS		C			C			C			C	

Intersection Summary				
HCM Average Control Delay	27.4	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.65			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	54.9%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
12: SR-4 EB Ramps & Loveridge Road

Year 2015 - No Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	185	0	435	0	0	0	0	787	217	0	294	203
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0					4.0			4.0	
Lane Util. Factor	1.00		1.00					0.95			0.95	
Frt	1.00		0.85					0.97			0.94	
Flt Protected	0.95		1.00					1.00			1.00	
Satd. Flow (prot)	1770		1583					3424			3322	
Flt Permitted	0.95		1.00					1.00			1.00	
Satd. Flow (perm)	1770		1583					3424			3322	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	201	0	473	0	0	0	0	855	236	0	320	221
RTOR Reduction (vph)	0	0	355	0	0	0	0	32	0	0	88	0
Lane Group Flow (vph)	201	0	118	0	0	0	0	1059	0	0	453	0
Turn Type	Prot		custom									
Protected Phases	4		4					2			6	
Permitted Phases												
Actuated Green, G (s)	11.5		11.5					29.2			29.2	
Effective Green, g (s)	11.5		11.5					29.2			29.2	
Actuated g/C Ratio	0.24		0.24					0.60			0.60	
Clearance Time (s)	4.0		4.0					4.0			4.0	
Vehicle Extension (s)	3.0		3.0					3.0			3.0	
Lane Grp Cap (vph)	418		374					2053			1992	
v/s Ratio Prot	c0.11		0.07					c0.31			0.14	
v/s Ratio Perm												
v/c Ratio	0.48		0.31					0.52			0.23	
Uniform Delay, d1	16.0		15.3					5.7			4.5	
Progression Factor	1.00		1.00					1.00			1.00	
Incremental Delay, d2	0.9		0.5					0.9			0.3	
Delay (s)	16.9		15.8					6.6			4.8	
Level of Service	B		B					A			A	
Approach Delay (s)		16.2			0.0			6.6			4.8	
Approach LOS		B			A			A			A	

Intersection Summary					
HCM Average Control Delay	9.0	HCM Level of Service		A	
HCM Volume to Capacity ratio	0.51				
Actuated Cycle Length (s)	48.7	Sum of lost time (s)		8.0	
Intersection Capacity Utilization	48.2%	ICU Level of Service		A	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
13: California Avenue & SR-4 WB Ramps

Year 2015 - No Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	203	4	325	231	31	85	35	142	21	6	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		0.97	0.95	1.00	0.95	0.95	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	0.98	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3530		3433	3539	1583	1681	1733	1583	1770	1779	
Flt Permitted	0.63	1.00		0.95	1.00	1.00	0.95	0.92	1.00	0.71	1.00	
Satd. Flow (perm)	1183	3530		3433	3539	1583	1681	1634	1583	1326	1779	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	221	4	353	251	34	92	38	154	23	7	3
RTOR Reduction (vph)	0	3	0	0	0	20	0	0	93	0	2	0
Lane Group Flow (vph)	37	222	0	353	251	14	64	66	61	23	8	0
Turn Type	Perm			Prot		Perm	Prot		Perm	Perm		
Protected Phases		4		3	8		5	2			6	
Permitted Phases	4					8			2	6		
Actuated Green, G (s)	6.3	6.3		7.8	18.1	18.1	1.8	16.9	16.9	11.1	11.1	
Effective Green, g (s)	6.3	6.3		7.8	18.1	18.1	1.8	16.9	16.9	11.1	11.1	
Actuated g/C Ratio	0.15	0.15		0.18	0.42	0.42	0.04	0.39	0.39	0.26	0.26	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	173	517		623	1490	666	70	646	622	342	459	
v/s Ratio Prot		c0.06		c0.10	0.07		c0.04	0.00			0.00	
v/s Ratio Perm	0.03					0.01		c0.04	0.04	0.02		
v/c Ratio	0.21	0.43		0.57	0.17	0.02	0.91	0.10	0.10	0.07	0.02	
Uniform Delay, d1	16.2	16.7		16.1	7.8	7.3	20.5	8.3	8.2	12.0	11.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.6	0.6		1.2	0.1	0.0	77.8	0.1	0.3	0.4	0.1	
Delay (s)	16.8	17.3		17.2	7.8	7.3	98.3	8.3	8.5	12.4	12.0	
Level of Service	B	B		B	A	A	F	A	A	B	B	
Approach Delay (s)		17.2			13.0			28.7			12.3	
Approach LOS		B			B			C			B	

Intersection Summary					
HCM Average Control Delay	17.6	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.33				
Actuated Cycle Length (s)	43.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	35.0%	ICU Level of Service		A	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
14: California Avenue & Harbor Street

Year 2015 - No Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	91	72	105	588	390	266	101	514	53	44	582	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.91		1.00	1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1697		1770	1863	1583	1770	3489		1770	3506	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1697		1770	1863	1583	1770	3489		1770	3506	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	99	78	114	639	424	289	110	559	58	48	633	42
RTOR Reduction (vph)	0	62	0	0	0	152	0	8	0	0	6	0
Lane Group Flow (vph)	99	130	0	639	424	137	110	609	0	48	669	0
Turn Type	Prot			Prot		Perm	Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						
Actuated Green, G (s)	7.7	11.6		36.5	40.4	40.4	6.8	22.6		3.3	19.1	
Effective Green, g (s)	7.7	11.6		36.5	40.4	40.4	6.8	22.6		3.3	19.1	
Actuated g/C Ratio	0.09	0.13		0.41	0.45	0.45	0.08	0.25		0.04	0.21	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	151	219		718	836	711	134	876		65	744	
v/s Ratio Prot	0.06	c0.08		c0.36	c0.23		0.06	c0.17		0.03	c0.19	
v/s Ratio Perm						0.09						
v/c Ratio	0.66	0.59		0.89	0.51	0.19	0.82	0.69		0.74	0.90	
Uniform Delay, d1	39.9	37.0		24.9	17.7	15.0	41.0	30.6		42.9	34.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00	0.93	0.92		1.00	1.00	
Incremental Delay, d2	9.8	4.3		13.0	0.5	0.1	30.9	4.4		35.1	16.0	
Delay (s)	49.7	41.3		37.9	18.2	15.1	69.1	32.4		78.0	50.6	
Level of Service	D	D		D	B	B	E	C		E	D	
Approach Delay (s)		44.1			26.8			38.0			52.4	
Approach LOS		D			C			D			D	

Intersection Summary				
HCM Average Control Delay	37.0	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.84			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	79.1%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
15: Bliss Avenue & Harbor Street

Year 2015 - No Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	12	8	125	3	7	1	153	655	5	2	1237	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	*0.95		1.00	*0.95	
Frt		1.00	0.85		0.99		1.00	1.00		1.00	1.00	
Flt Protected		0.97	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1809	1583		1822		1770	3535		1770	3524	
Flt Permitted		0.86	1.00		0.94		0.11	1.00		0.34	1.00	
Satd. Flow (perm)		1597	1583		1740		201	3535		627	3524	
Peak-hour factor, PHF	0.90	0.90	0.90	0.67	0.67	0.67	0.81	0.81	0.81	0.73	0.73	0.73
Adj. Flow (vph)	13	9	139	4	10	1	189	809	6	3	1695	49
RTOR Reduction (vph)	0	0	60	0	4	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	22	79	0	11	0	189	815	0	3	1740	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		9.9	9.9		9.9		72.1	72.1		72.1	72.1	
Effective Green, g (s)		9.9	9.9		9.9		72.1	72.1		72.1	72.1	
Actuated g/C Ratio		0.11	0.11		0.11		0.80	0.80		0.80	0.80	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		176	174		191		161	2832		502	2823	
v/s Ratio Prot								0.23			0.49	
v/s Ratio Perm		0.01	c0.05		0.01		c0.94			0.00		
v/c Ratio		0.12	0.46		0.06		1.17	0.29		0.01	0.62	
Uniform Delay, d1		36.1	37.5		35.9		9.0	2.3		1.8	3.5	
Progression Factor		1.00	1.00		1.00		1.00	1.00		0.32	0.27	
Incremental Delay, d2		0.3	1.9		0.1		125.4	0.3		0.0	0.8	
Delay (s)		36.5	39.4		36.0		134.3	2.6		0.6	1.7	
Level of Service		D	D		D		F	A		A	A	
Approach Delay (s)		39.0			36.0			27.4			1.7	
Approach LOS		D			D			C			A	

Intersection Summary				
HCM Average Control Delay	12.7	HCM Level of Service	B	
HCM Volume to Capacity ratio	1.09			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	57.1%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
16: Garcia Ave & Harbor Street

Year 2015 - No Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	7	1	126	60	6	67	145	733	69	105	1079	35
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	1	137	65	7	73	158	797	75	114	1173	38
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								663			696	
pX, platoon unblocked	0.94	0.94	0.93	0.94	0.94	0.99	0.93			0.99		
vC, conflicting volume	2210	2607	605	2102	2589	436	1211			872		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2122	2546	436	2007	2526	417	1084			856		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	35	93	74	0	59	87	74			85		
cM capacity (veh/h)	12	16	531	16	16	580	597			774		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	8	138	65	79	158	531	341	114	782	429
Volume Left	8	0	65	0	158	0	0	114	0	0
Volume Right	0	137	0	73	0	0	75	0	0	38
cSH	12	421	16	149	597	1700	1700	774	1700	1700
Volume to Capacity	0.65	0.33	3.98	0.53	0.26	0.31	0.20	0.15	0.46	0.25
Queue Length 95th (ft)	36	35	Err	66	26	0	0	13	0	0
Control Delay (s)	548.6	17.7	Err	53.7	13.2	0.0	0.0	10.5	0.0	0.0
Lane LOS	F	C	F	F	B			B		
Approach Delay (s)	45.4		4540.3		2.0			0.9		
Approach LOS	E		F							

Intersection Summary				
Average Delay	251.9			
Intersection Capacity Utilization	63.5%	ICU Level of Service	B	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
17: Garcia Ave & Railroad Avenue

Year 2015 - No Build AM

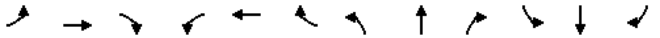
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	12	8	6	41	9	135	9	883	40	108	673	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.97	1.00		0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1809	1583		1790	1583	1770	3516		1770	3524	
Flt Permitted		1.00	1.00		0.96	1.00	0.35	1.00		0.26	1.00	
Satd. Flow (perm)		1863	1583		1790	1583	652	3516		480	3524	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	13	9	7	45	10	147	10	960	43	117	732	21
RTOR Reduction (vph)	0	0	7	0	0	132	0	2	0	0	1	0
Lane Group Flow (vph)	0	22	0	0	55	15	10	1001	0	117	752	0
Turn Type	Perm		Perm	Split		Perm	Perm			Perm		
Protected Phases		4		8	8			2			6	
Permitted Phases	4		4			8	2			6		
Actuated Green, G (s)		3.0	3.0		8.0	8.0	57.0	57.0		57.0	57.0	
Effective Green, g (s)		3.0	3.0		8.0	8.0	57.0	57.0		57.0	57.0	
Actuated g/C Ratio		0.04	0.04		0.10	0.10	0.71	0.71		0.71	0.71	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		70	59		179	158	465	2505		342	2511	
v/s Ratio Prot					c0.03			c0.28			0.21	
v/s Ratio Perm		c0.01	0.00			0.01	0.02			0.24		
v/c Ratio		0.31	0.00		0.31	0.09	0.02	0.40		0.34	0.30	
Uniform Delay, d1		37.5	37.1		33.4	32.7	3.4	4.6		4.4	4.2	
Progression Factor		1.00	1.00		1.00	1.26	0.42	0.33		1.00	1.00	
Incremental Delay, d2		2.6	0.0		0.9	0.2	0.1	0.3		2.7	0.3	
Delay (s)		40.1	37.1		34.3	41.3	1.5	1.8		7.1	4.5	
Level of Service		D	D		C	D	A	A		A	A	
Approach Delay (s)		39.4			39.4			1.8			4.9	
Approach LOS		D			D			A			A	

Intersection Summary						
HCM Average Control Delay	7.2	HCM Level of Service		A		
HCM Volume to Capacity ratio	0.38					
Actuated Cycle Length (s)	80.0	Sum of lost time (s)		12.0		
Intersection Capacity Utilization	51.1%	ICU Level of Service		A		
Analysis Period (min)	15					
c Critical Lane Group						

FUTURE YEAR 2015 NO PROJECT BUILD CONDITIONS – PM PEAK HOUR

HCM Unsignalized Intersection Capacity Analysis
1: Civic Avenue & Davi Avenue

YR2015 No Build - PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	2	88	30	67	132	2	7	2	33	5	21	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	96	33	73	143	2	8	2	36	5	23	2

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	130	216	2	10	36	30
Volume Left (vph)	2	73	0	8	0	5
Volume Right (vph)	33	0	2	0	36	2
Hadj (s)	-0.11	0.20	-0.67	0.19	-0.57	0.03
Departure Headway (s)	4.2	4.9	4.0	4.9	3.2	4.8
Degree Utilization, x	0.15	0.29	0.00	0.01	0.03	0.04
Capacity (veh/h)	834	719	873	672	1121	700
Control Delay (s)	8.0	8.7	5.8	8.0	6.3	8.0
Approach Delay (s)	8.0	8.7		6.7		8.0
Approach LOS	A	A		A		A

Intersection Summary				
Delay	8.2			
HCM Level of Service	A			
Intersection Capacity Utilization	31.8%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
3: Civic Avenue & Railroad Avenue

YR2015 No Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	45	0	95	3	2	1	163	619	2	2	681	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97		1.00		1.00		0.97	0.95		1.00	0.95	1.00
Frt	1.00		0.85		0.98		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95		1.00		0.98		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433		1583		1776		3433	3538		1770	3539	1583
Flt Permitted	0.68		1.00		0.98		0.95	1.00		0.40	1.00	1.00
Satd. Flow (perm)	2450		1583		1776		3433	3538		751	3539	1583
Peak-hour factor, PHF	0.77	0.77	0.77	0.50	0.50	0.50	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	58	0	123	6	4	2	172	652	2	2	740	163
RTOR Reduction (vph)	0	0	111	0	2	0	0	0	0	0	0	58
Lane Group Flow (vph)	58	0	12	0	10	0	172	654	0	2	740	105
Turn Type	custom		custom	Split			Prot			Perm		Perm
Protected Phases				8	8		5	2			6	
Permitted Phases	4		4							6		6
Actuated Green, G (s)	5.9		5.9		1.2		8.1	39.5		27.4	27.4	27.4
Effective Green, g (s)	5.9		5.9		1.2		8.1	39.5		27.4	27.4	27.4
Actuated g/C Ratio	0.10		0.10		0.02		0.14	0.67		0.47	0.47	0.47
Clearance Time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0		3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	247		159		36		475	2385		351	1655	740
v/s Ratio Prot					c0.01		c0.05	0.18			c0.21	
v/s Ratio Perm	c0.02		0.01							0.00		0.07
v/c Ratio	0.23		0.08		0.28		0.36	0.27		0.01	0.45	0.14
Uniform Delay, d1	24.3		23.9		28.3		22.9	3.8		8.3	10.5	8.9
Progression Factor	1.00		1.00		1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.5		0.2		4.2		0.5	0.3		0.0	0.9	0.4
Delay (s)	24.8		24.1		32.5		23.4	4.1		8.4	11.4	9.3
Level of Service	C		C		C		C	A		A	B	A
Approach Delay (s)		24.3			32.5			8.1			11.0	
Approach LOS		C			C			A			B	

Intersection Summary					
HCM Average Control Delay	11.1	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.40				
Actuated Cycle Length (s)	58.6	Sum of lost time (s)		16.0	
Intersection Capacity Utilization	38.0%	ICU Level of Service		A	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
4: Center Drive & Railroad Avenue

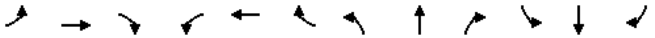
YR2015 No Build - PM

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	2	480	283	782	838	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	
Frt	0.85	0.85	1.00	1.00	1.00	
Flt Protected	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1585	1504	1770	3539	3539	
Flt Permitted	1.00	1.00	0.29	1.00	1.00	
Satd. Flow (perm)	1585	1504	546	3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	522	308	850	911	1
RTOR Reduction (vph)	164	164	0	0	0	0
Lane Group Flow (vph)	99	97	308	850	912	0
Turn Type		Perm	Perm			
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	9.6	9.6	38.6	38.6	38.6	
Effective Green, g (s)	9.6	9.6	38.6	38.6	38.6	
Actuated g/C Ratio	0.17	0.17	0.69	0.69	0.69	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	271	257	375	2431	2431	
v/s Ratio Prot	0.06			0.24	0.26	
v/s Ratio Perm		c0.06	c0.56			
v/c Ratio	0.36	0.38	0.82	0.35	0.38	
Uniform Delay, d1	20.6	20.6	6.3	3.6	3.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.8	0.9	13.5	0.1	0.1	
Delay (s)	21.4	21.6	19.8	3.7	3.8	
Level of Service	C	C	B	A	A	
Approach Delay (s)	21.5			8.0	3.8	
Approach LOS	C			A	A	

Intersection Summary				
HCM Average Control Delay	9.3	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.73			
Actuated Cycle Length (s)	56.2	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	58.9%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
5: SR-4 WB On-Ramp & Railroad Avenue

YR2015 No Build - PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	59	98	258	235	807	121	92	842	384
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor					0.95		0.97	0.95		1.00	0.95	1.00
Frt					0.91		1.00	0.98		1.00	1.00	0.85
Flt Protected					0.99		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)					3186		3433	3470		1770	3539	1583
Flt Permitted					0.99		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)					3186		3433	3470		1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.88	0.88	0.88	0.93	0.93	0.93	0.83	0.83	0.83
Adj. Flow (vph)	0	0	0	67	111	293	253	868	130	111	1014	463
RTOR Reduction (vph)	0	0	0	0	248	0	0	15	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	223	0	253	983	0	111	1014	463
Turn Type				Split			Prot			Prot		Free
Protected Phases				8	8		5	2		1	6	
Permitted Phases												Free
Actuated Green, G (s)					9.3		8.8	31.1		7.6	29.9	60.0
Effective Green, g (s)					9.3		8.8	31.1		7.6	29.9	60.0
Actuated g/C Ratio					0.16		0.15	0.52		0.13	0.50	1.00
Clearance Time (s)					4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)					3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)					494		504	1799		224	1764	1583
v/s Ratio Prot					c0.07		0.07	c0.28		0.06	c0.29	
v/s Ratio Perm												0.29
v/c Ratio					0.45		0.50	0.55		0.50	0.57	0.29
Uniform Delay, d1					23.0		23.6	9.7		24.4	10.6	0.0
Progression Factor					1.00		0.64	0.37		1.00	1.00	1.00
Incremental Delay, d2					0.7		0.5	0.8		1.7	1.4	0.5
Delay (s)					23.7		15.7	4.4		26.1	12.0	0.5
Level of Service					C		B	A		C	B	A
Approach Delay (s)		0.0			23.7			6.7			9.6	
Approach LOS		A			C			A			A	

Intersection Summary				
HCM Average Control Delay	10.5	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.53			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	54.0%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
6: SR-4 EB Off-Ramp & Railroad Avenue

YR2015 No Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	479	0	664	0	0	0	0	684	322	207	694	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor	0.95	0.91	0.95					0.91		1.00	0.95	
Frt	1.00	0.88	0.85					0.95		1.00	1.00	
Flt Protected	0.95	0.99	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1681	1480	1504					4841		1770	3539	
Flt Permitted	0.95	0.99	1.00					1.00		0.95	1.00	
Satd. Flow (perm)	1681	1480	1504					4841		1770	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93	0.88	0.88	0.88
Adj. Flow (vph)	521	0	722	0	0	0	0	735	346	235	789	0
RTOR Reduction (vph)	0	99	99	0	0	0	0	136	0	0	0	0
Lane Group Flow (vph)	432	315	298	0	0	0	0	945	0	235	789	0
Turn Type	Split		Prot							Prot		
Protected Phases	4	4	4					2		1	6	
Permitted Phases												
Actuated Green, G (s)	19.4	19.4	19.4					17.6		11.0	32.6	
Effective Green, g (s)	19.4	19.4	19.4					17.6		11.0	32.6	
Actuated g/C Ratio	0.32	0.32	0.32					0.29		0.18	0.54	
Clearance Time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)	544	479	486					1420		325	1923	
v/s Ratio Prot	c0.26	0.21	0.20					c0.20		c0.13	0.22	
v/s Ratio Perm												
v/c Ratio	0.79	0.66	0.61					0.67		0.72	0.41	
Uniform Delay, d1	18.5	17.4	17.1					18.6		23.1	8.1	
Progression Factor	1.00	1.00	1.00					0.42		1.00	0.72	
Incremental Delay, d2	7.8	3.3	2.3					2.1		6.6	0.5	
Delay (s)	26.3	20.7	19.4					10.0		29.6	6.4	
Level of Service	C	C	B					A		C	A	
Approach Delay (s)		22.3			0.0			10.0			11.7	
Approach LOS		C			A			A			B	

Intersection Summary				
HCM Average Control Delay	15.1	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.73			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	61.9%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
7: Bliss Avenue & Railroad Avenue

YR2015 No Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	101	4	9	80	20	138	3	767	15	179	1112	67
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	0.99	
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1777	1583		1791	1583	1770	3529		1770	3509	
Flt Permitted		0.64	1.00		0.69	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1192	1583		1280	1583	1770	3529		1770	3509	
Peak-hour factor, PHF	0.84	0.84	0.84	0.75	0.75	0.75	0.88	0.88	0.88	0.92	0.92	0.92
Adj. Flow (vph)	120	5	11	107	27	184	3	872	17	195	1209	73
RTOR Reduction (vph)	0	0	9	0	0	149	0	2	0	0	6	0
Lane Group Flow (vph)	0	125	2	0	134	35	3	887	0	195	1276	0
Turn Type	Perm		Perm	Perm		Perm	Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		11.4	11.4		11.4	11.4	0.8	22.4		14.2	35.8	
Effective Green, g (s)		11.4	11.4		11.4	11.4	0.8	22.4		14.2	35.8	
Actuated g/C Ratio		0.19	0.19		0.19	0.19	0.01	0.37		0.24	0.60	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		226	301		243	301	24	1317		419	2094	
v/s Ratio Prot							0.00	c0.25		0.11	c0.36	
v/s Ratio Perm		c0.10	0.00		0.10	0.02						
v/c Ratio		0.55	0.01		0.55	0.12	0.12	0.67		0.47	0.61	
Uniform Delay, d1		22.0	19.7		22.0	20.1	29.3	15.7		19.6	7.7	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		0.68	0.44	
Incremental Delay, d2		2.9	0.0		2.7	0.2	2.3	2.8		0.7	1.1	
Delay (s)		24.9	19.7		24.7	20.3	31.6	18.5		14.0	4.5	
Level of Service		C	B		C	C	C	B		B	A	
Approach Delay (s)		24.5			22.1			18.6			5.7	
Approach LOS		C			C			B			A	

Intersection Summary				
HCM Average Control Delay	12.5	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.61			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	58.7%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: Leland Road & Railroad Avenue

YR2015 No Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	151	866	352	184	298	135	248	794	244	173	818	126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.88
Frt	1.00	0.99	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3370	1441	1770	3539	1583	1770	3539	1583	1770	3539	2787
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3370	1441	1770	3539	1583	1770	3539	1583	1770	3539	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	164	941	383	200	324	147	270	863	265	188	889	137
RTOR Reduction (vph)	0	4	250	0	0	97	0	0	29	0	0	80
Lane Group Flow (vph)	164	975	95	200	324	50	270	863	236	188	889	57
Turn Type	Prot		Perm	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	13.0	22.0	22.0	8.0	17.0	25.0	11.0	21.0	29.0	8.0	18.0	31.0
Effective Green, g (s)	14.0	23.0	22.0	9.0	18.0	27.0	12.0	23.0	31.0	9.0	20.0	33.0
Actuated g/C Ratio	0.18	0.29	0.28	0.11	0.22	0.34	0.15	0.29	0.39	0.11	0.25	0.41
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.0	5.0	5.0	6.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	310	969	396	199	796	534	266	1017	613	199	885	1289
v/s Ratio Prot	0.09	c0.29		c0.11	0.09	0.01	0.15	c0.24	0.04	0.11	c0.25	0.01
v/s Ratio Perm			0.07			0.02			0.11			0.01
v/c Ratio	0.53	1.01	0.24	1.01	0.41	0.09	1.02	0.85	0.39	0.94	1.00	0.04
Uniform Delay, d1	30.0	28.5	22.5	35.5	26.4	18.1	34.0	26.9	17.6	35.3	30.0	14.1
Progression Factor	1.00	1.00	1.00	0.64	0.59	0.74	1.00	1.00	1.00	0.68	0.32	0.00
Incremental Delay, d2	1.6	30.5	1.4	61.8	1.4	0.1	59.1	8.8	0.4	31.0	22.4	0.0
Delay (s)	31.6	59.0	23.9	84.6	17.1	13.4	93.1	35.6	18.0	55.1	31.9	0.0
Level of Service	C	E	C	F	B	B	F	D	B	E	C	A
Approach Delay (s)		47.9			36.4			43.4			31.9	
Approach LOS		D			D			D			C	

Intersection Summary				
HCM Average Control Delay	40.9	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.95			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	87.6%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: Leland Road & Harbor Street

YR2015 No Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	163	945	135	26	155	36	180	369	206	251	806	248
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	177	1027	147	28	168	39	196	401	224	273	876	270
RTOR Reduction (vph)	0	0	95	0	0	32	0	0	147	0	0	199
Lane Group Flow (vph)	177	1027	52	28	168	7	196	401	77	273	876	71
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	16.4	28.4	28.4	1.6	13.6	13.6	11.0	16.9	16.9	15.1	21.0	21.0
Effective Green, g (s)	16.4	29.4	28.4	1.6	14.6	13.6	11.0	17.9	16.9	15.1	22.0	21.0
Actuated g/C Ratio	0.20	0.37	0.35	0.02	0.18	0.17	0.14	0.22	0.21	0.19	0.28	0.26
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	363	1301	562	35	646	269	243	792	334	334	973	416
v/s Ratio Prot	0.10	c0.29		c0.02	0.05		c0.11	0.11		0.15	c0.25	
v/s Ratio Perm			0.03			0.00			0.05			0.04
v/c Ratio	0.49	0.79	0.09	0.80	0.26	0.02	0.81	0.51	0.23	0.82	0.90	0.17
Uniform Delay, d1	28.1	22.5	17.2	39.0	28.1	27.7	33.5	27.2	26.2	31.1	27.9	22.8
Progression Factor	0.65	0.49	0.17	0.61	0.76	0.80	1.00	1.00	1.00	0.81	0.84	0.48
Incremental Delay, d2	0.5	2.3	0.1	75.1	1.0	0.2	17.5	2.3	1.6	14.1	12.8	0.9
Delay (s)	18.7	13.4	3.1	99.1	22.3	22.4	51.0	29.5	27.8	39.3	36.2	11.7
Level of Service	B	B	A	F	C	C	D	C	C	D	D	B
Approach Delay (s)		13.0			31.4			34.1			32.1	
Approach LOS		B			C			C			C	

Intersection Summary				
HCM Average Control Delay	25.8	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.83			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	75.0%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
10: Leland Road & Freed Avenue

YR2015 No Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	20	1402	20	20	176	26	4	4	32	43	1	8
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.81	0.81	0.81	0.54	0.54	0.54	0.60	0.60	0.60
Hourly flow rate (vph)	22	1508	22	25	217	32	7	7	59	72	2	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												2
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	249			1529			1720	1860	765	1142	1855	125
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	249			1529			1720	1860	765	1142	1855	125
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			94			86	89	83	36	98	99
cM capacity (veh/h)	1313			432			53	67	346	111	68	903

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	22	1005	524	25	145	105	74	87
Volume Left	22	0	0	25	0	0	7	72
Volume Right	0	0	22	0	0	32	59	13
cSH	1313	1700	1700	432	1700	1700	175	129
Volume to Capacity	0.02	0.59	0.31	0.06	0.09	0.06	0.42	0.67
Queue Length 95th (ft)	1	0	0	5	0	0	48	91
Control Delay (s)	7.8	0.0	0.0	13.8	0.0	0.0	39.7	76.7
Lane LOS	A			B			E	F
Approach Delay (s)	0.1			1.2			39.7	76.7
Approach LOS							E	F

Intersection Summary					
Average Delay	5.1				
Intersection Capacity Utilization	55.2%	ICU Level of Service		B	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
11: Leland Road & Loveridge Road

YR2015 No Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	472	589	249	184	193	215	35	302	23	213	593	119
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.91	0.91	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	1770	3386	1441	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	1770	3386	1441	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	513	640	271	200	210	234	38	328	25	232	645	129
RTOR Reduction (vph)	0	0	175	0	0	201	0	1	20	0	0	83
Lane Group Flow (vph)	513	640	96	200	210	33	38	330	2	232	645	46
Turn Type	Prot		Perm	Prot		Perm	Prot		Over	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	19.0	20.7	20.7	8.6	10.3	10.3	3.0	21.6	8.6	9.1	27.7	27.7
Effective Green, g (s)	20.0	21.7	21.7	9.6	11.3	11.3	4.0	22.6	8.6	10.1	28.7	28.7
Actuated g/C Ratio	0.25	0.27	0.27	0.12	0.14	0.14	0.05	0.28	0.11	0.13	0.36	0.36
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	858	960	429	412	500	224	89	957	155	433	1270	568
v/s Ratio Prot	c0.15	c0.18		0.06	0.06		0.02	c0.10	0.00	0.07	c0.18	
v/s Ratio Perm			0.06			0.02						0.03
v/c Ratio	0.60	0.67	0.22	0.49	0.42	0.15	0.43	0.35	0.02	0.54	0.51	0.08
Uniform Delay, d1	26.5	25.9	22.6	32.9	31.4	30.1	36.9	22.8	31.9	32.8	20.1	16.9
Progression Factor	0.78	0.70	0.35	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.90	1.10
Incremental Delay, d2	0.9	1.4	0.2	0.9	0.6	0.3	3.3	1.0	0.0	1.2	1.3	0.3
Delay (s)	21.4	19.5	8.1	33.8	31.9	30.4	40.2	23.8	32.0	33.4	19.5	18.9
Level of Service	C	B	A	C	C	C	D	C	C	C	B	B
Approach Delay (s)		18.0			32.0			25.9			22.7	
Approach LOS		B			C			C			C	

Intersection Summary					
HCM Average Control Delay	22.8	HCM Level of Service		C	
HCM Volume to Capacity ratio	0.54				
Actuated Cycle Length (s)	80.0	Sum of lost time (s)		8.0	
Intersection Capacity Utilization	54.6%	ICU Level of Service		A	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
12: SR-4 EB Ramps & Loveridge Road

YR2015 No Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	105	0	196	0	0	0	0	975	83	0	747	158
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0					4.0			4.0	
Lane Util. Factor	1.00		1.00					0.95			0.95	
Frt	1.00		0.85					0.99			0.97	
Flt Protected	0.95		1.00					1.00			1.00	
Satd. Flow (prot)	1770		1583					3498			3446	
Flt Permitted	0.95		1.00					1.00			1.00	
Satd. Flow (perm)	1770		1583					3498			3446	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	114	0	213	0	0	0	0	1060	90	0	812	172
RTOR Reduction (vph)	0	0	131	0	0	0	0	13	0	0	36	0
Lane Group Flow (vph)	114	0	82	0	0	0	0	1137	0	0	948	0
Turn Type	Prot		custom									
Protected Phases	4		4					2			6	
Permitted Phases												
Actuated Green, G (s)	6.7		6.7					25.3			25.3	
Effective Green, g (s)	6.7		6.7					25.3			25.3	
Actuated g/C Ratio	0.17		0.17					0.63			0.63	
Clearance Time (s)	4.0		4.0					4.0			4.0	
Vehicle Extension (s)	3.0		3.0					3.0			3.0	
Lane Grp Cap (vph)	296		265					2212			2180	
v/s Ratio Prot	c0.06		0.05					c0.33			0.27	
v/s Ratio Perm												
v/c Ratio	0.39		0.31					0.51			0.43	
Uniform Delay, d1	14.8		14.6					4.0			3.7	
Progression Factor	1.00		1.00					0.30			1.00	
Incremental Delay, d2	0.8		0.7					0.8			0.6	
Delay (s)	15.7		15.3					2.0			4.4	
Level of Service	B		B					A			A	
Approach Delay (s)		15.4			0.0			2.0			4.4	
Approach LOS		B			A			A			A	

Intersection Summary				
HCM Average Control Delay	4.7	HCM Level of Service		A
HCM Volume to Capacity ratio	0.49			
Actuated Cycle Length (s)	40.0	Sum of lost time (s)		8.0
Intersection Capacity Utilization	44.5%	ICU Level of Service		A
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
13: California Avenue & SR-4 WB Ramps

YR2015 No Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	362	4	565	306	5	189	23	564	20	61	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		0.97	0.95	1.00	0.95	0.95	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	0.96	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3534		3433	3539	1583	1681	1703	1583	1770	1795	
Flt Permitted	0.55	1.00		0.95	1.00	1.00	0.95	0.53	1.00	0.80	1.00	
Satd. Flow (perm)	1026	3534		3433	3539	1583	1681	938	1583	1490	1795	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	393	4	614	333	5	205	25	613	22	66	21
RTOR Reduction (vph)	0	2	0	0	0	2	0	0	377	0	19	0
Lane Group Flow (vph)	2	395	0	614	333	3	115	115	236	22	68	0
Turn Type	Perm			Prot		Perm	Prot		Perm	Perm		
Protected Phases		4		3	8		5	2			6	
Permitted Phases	4					8			2	6		
Actuated Green, G (s)	10.2	10.2		9.1	23.3	23.3	4.0	13.0	13.0	5.0	5.0	
Effective Green, g (s)	10.2	10.2		9.1	23.3	23.3	4.0	13.0	13.0	5.0	5.0	
Actuated g/C Ratio	0.23	0.23		0.21	0.53	0.53	0.09	0.29	0.29	0.11	0.11	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	236	814		705	1861	833	152	344	465	168	203	
v/s Ratio Prot		c0.11		c0.18	0.09		c0.07	0.03			0.04	
v/s Ratio Perm	0.00					0.00		0.07	c0.15	0.01		
v/c Ratio	0.01	0.49		0.87	0.18	0.00	0.76	0.33	0.51	0.13	0.34	
Uniform Delay, d1	13.1	14.8		17.0	5.5	5.0	19.7	12.3	13.0	17.7	18.1	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	0.5		11.4	0.0	0.0	19.1	0.6	3.9	1.6	4.4	
Delay (s)	13.2	15.2		28.4	5.5	5.0	38.8	12.8	16.9	19.3	22.6	
Level of Service	B	B		C	A	A	D	B	B	B	C	
Approach Delay (s)		15.2			20.3			19.4			21.9	
Approach LOS		B			C			B			C	

Intersection Summary				
HCM Average Control Delay	19.2	HCM Level of Service		B
HCM Volume to Capacity ratio	0.61			
Actuated Cycle Length (s)	44.3	Sum of lost time (s)		12.0
Intersection Capacity Utilization	59.4%	ICU Level of Service		B
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
14: California Avenue & Harbor Street

YR2015 No Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	27	97	50	431	433	386	72	388	103	112	360	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.95		1.00	1.00	0.85	1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1768		1770	1863	1583	1770	3428		1770	3463	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1768		1770	1863	1583	1770	3428		1770	3463	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	29	105	54	468	471	420	78	422	112	122	391	66
RTOR Reduction (vph)	0	24	0	0	0	235	0	28	0	0	16	0
Lane Group Flow (vph)	29	135	0	468	471	185	78	506	0	122	441	0
Turn Type	Prot			Prot		Perm	Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						
Actuated Green, G (s)	2.0	13.6		23.7	35.3	35.3	6.6	18.9		7.8	20.1	
Effective Green, g (s)	2.0	13.6		23.7	35.3	35.3	6.6	18.9		7.8	20.1	
Actuated g/C Ratio	0.02	0.17		0.30	0.44	0.44	0.08	0.24		0.10	0.25	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	44	301		524	822	698	146	810		173	870	
v/s Ratio Prot	0.02	0.08		c0.26	c0.25		0.04	c0.15		c0.07	0.13	
v/s Ratio Perm						0.12						
v/c Ratio	0.66	0.45		0.89	0.57	0.27	0.53	0.62		0.71	0.51	
Uniform Delay, d1	38.7	29.8		26.9	16.7	14.1	35.2	27.4		35.0	25.7	
Progression Factor	1.00	1.00		1.00	1.00	1.00	0.83	0.64		1.00	1.00	
Incremental Delay, d2	30.4	1.1		17.4	1.0	0.2	3.7	3.6		12.3	2.1	
Delay (s)	69.0	30.9		44.3	17.7	14.4	33.1	21.0		47.3	27.8	
Level of Service	E	C		D	B	B	C	C		D	C	
Approach Delay (s)		36.8			25.8			22.6			31.9	
Approach LOS		D			C			C			C	

Intersection Summary				
HCM Average Control Delay	27.1	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.70			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	65.6%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
15: Bliss Avenue & Harbor Street

YR2015 No Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	24	3	229	11	4	14	142	525	15	3	796	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85		0.93		1.00	1.00		1.00	0.99	
Flt Protected		0.96	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1782	1583		1708		1770	3524		1770	3512	
Flt Permitted		0.73	1.00		0.89		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1365	1583		1544		1770	3524		1770	3512	
Peak-hour factor, PHF	0.86	0.86	0.86	0.78	0.78	0.78	0.89	0.89	0.89	0.90	0.90	0.90
Adj. Flow (vph)	28	3	266	14	5	18	160	590	17	3	884	47
RTOR Reduction (vph)	0	0	238	0	16	0	0	2	0	0	4	0
Lane Group Flow (vph)	0	31	28	0	21	0	160	605	0	3	927	0
Turn Type	Perm		Perm	Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		8.3	8.3		8.3		15.6	58.5		1.2	44.1	
Effective Green, g (s)		8.3	8.3		8.3		15.6	58.5		1.2	44.1	
Actuated g/C Ratio		0.10	0.10		0.10		0.19	0.73		0.01	0.55	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		142	164		160		345	2577		27	1936	
v/s Ratio Prot							c0.09	0.17		0.00	c0.26	
v/s Ratio Perm		c0.02	0.02		0.01							
v/c Ratio		0.22	0.17		0.13		0.46	0.23		0.11	0.48	
Uniform Delay, d1		32.9	32.7		32.6		28.5	3.5		38.9	10.9	
Progression Factor		1.00	1.00		1.00		0.99	0.83		1.13	0.41	
Incremental Delay, d2		0.8	0.5		0.4		1.0	0.2		1.4	0.7	
Delay (s)		33.7	33.2		32.9		29.0	3.1		45.2	5.1	
Level of Service		C	C		C		C	A		D	A	
Approach Delay (s)		33.2			32.9			8.5			5.3	
Approach LOS		C			C			A			A	

Intersection Summary				
HCM Average Control Delay	11.1	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.44			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	50.9%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
16: Garcia Avenue & Harbor Street

YR2015 No Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	53	29	135	59	26	175	74	496	93	343	760	60
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	58	32	147	64	28	190	80	539	101	373	826	65
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								663			696	
pX, platoon unblocked	0.97	0.97	0.97	0.97	0.97	0.96	0.97			0.96		
vC, conflicting volume	2239	2405	446	2072	2388	320	891			640		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2076	2247	366	1904	2229	195	826			530		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	76	0	0	76	90			62		
cM capacity (veh/h)	0	22	612	0	23	777	777			987		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	58	178	64	218	80	359	281	373	551	341
Volume Left	58	0	64	0	80	0	0	373	0	0
Volume Right	0	147	0	190	0	0	101	0	0	65
cSH	0	108	0	148	777	1700	1700	987	1700	1700
Volume to Capacity	Err	1.65	Err	1.48	0.10	0.21	0.17	0.38	0.32	0.20
Queue Length 95th (ft)	Err	342	Err	362	9	0	0	44	0	0
Control Delay (s)	Err	399.9	Err	302.7	10.2	0.0	0.0	10.8	0.0	0.0
Lane LOS	F	F	F	F	B			B		
Approach Delay (s)	Err		Err		1.1			3.2		
Approach LOS	F		F							

Intersection Summary					
Average Delay	Err				
Intersection Capacity Utilization	64.5%	ICU Level of Service		C	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
17: Garcia Avenue & Railroad Avenue

YR2015 No Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	77	12	22	56	43	90	7	638	45	186	1104	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.96	1.00		0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1785	1583		1812	1583	1770	3504		1770	3514	
Flt Permitted		0.19	1.00		0.97	1.00	0.12	1.00		0.26	1.00	
Satd. Flow (perm)		348	1583		1812	1583	233	3504		489	3514	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	84	13	24	61	47	98	8	693	49	202	1200	60
RTOR Reduction (vph)	0	0	18	0	0	78	0	7	0	0	4	0
Lane Group Flow (vph)	0	97	6	0	108	20	8	735	0	202	1256	0
Turn Type	Perm		Perm	Split		Perm	Perm			Perm		
Protected Phases		4		8	8			2			6	
Permitted Phases	4		4			8	2			6		
Actuated Green, G (s)		20.0	20.0		16.0	16.0	32.0	32.0		32.0	32.0	
Effective Green, g (s)		20.0	20.0		16.0	16.0	32.0	32.0		32.0	32.0	
Actuated g/C Ratio		0.25	0.25		0.20	0.20	0.40	0.40		0.40	0.40	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)		87	396		362	317	93	1402		196	1406	
v/s Ratio Prot					c0.06			0.21			0.36	
v/s Ratio Perm		c0.28	0.00			0.01	0.03			c0.41		
v/c Ratio		1.11	0.02		0.30	0.06	0.09	0.52		1.03	0.89	
Uniform Delay, d1		30.0	22.6		27.2	25.9	14.9	18.2		24.0	22.4	
Progression Factor		1.00	1.00		1.03	1.33	0.95	1.02		1.00	1.00	
Incremental Delay, d2		131.0	0.1		2.0	0.4	1.2	0.9		72.5	9.0	
Delay (s)		161.0	22.7		30.0	34.8	15.4	19.5		96.5	31.4	
Level of Service		F	C		C	C	B	B		F	C	
Approach Delay (s)		133.5			32.3			19.5			40.4	
Approach LOS		F			C			B			D	

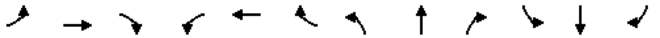
Intersection Summary					
HCM Average Control Delay	38.0	HCM Level of Service		D	
HCM Volume to Capacity ratio	0.88				
Actuated Cycle Length (s)	80.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	57.6%	ICU Level of Service		B	
Analysis Period (min)	15				

c Critical Lane Group

FUTURE YEAR 2030 NO PROJECT BUILD CONDITIONS – AM PEAK HOUR

HCM Unsignalized Intersection Capacity Analysis
1: Civic Avenue & Davi Avenue

Year 2030 - No Build AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	3	125	54	425	137	16	5	2	29	6	29	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	136	59	462	149	17	5	2	32	7	32	5

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	198	611	17	8	32	43
Volume Left (vph)	3	462	0	5	0	7
Volume Right (vph)	59	0	17	0	32	5
Hadj (s)	-0.14	0.41	-0.67	0.18	-0.57	-0.01
Departure Headway (s)	4.8	5.2	4.1	6.2	3.2	5.9
Degree Utilization, x	0.26	0.89	0.02	0.01	0.03	0.07
Capacity (veh/h)	736	684	852	543	1121	572
Control Delay (s)	9.4	33.9	6.0	9.3	6.3	9.4
Approach Delay (s)	9.4	33.2		6.9		9.4
Approach LOS	A	D		A		A

Intersection Summary				
Delay	25.7			
HCM Level of Service	D			
Intersection Capacity Utilization	60.8%	ICU Level of Service	B	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
3: Civic Avenue & Railroad Avenue

Year 2030 - No Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	0	98	9	2	7	533	787	7	2	567	127
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97		1.00		1.00		0.97	0.95		1.00	0.95	1.00
Frt	1.00		0.85		0.95		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95		1.00		0.98		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433		1583		1725		3433	3535		1770	3539	1583
Flt Permitted	0.95		1.00		0.98		0.95	1.00		0.28	1.00	1.00
Satd. Flow (perm)	3433		1583		1725		3433	3535		518	3539	1583
Peak-hour factor, PHF	0.72	0.72	0.72	0.56	0.56	0.56	0.77	0.77	0.77	0.92	0.92	0.92
Adj. Flow (vph)	35	0	136	16	4	12	692	1022	9	2	616	138
RTOR Reduction (vph)	0	0	123	0	11	0	0	0	0	0	0	78
Lane Group Flow (vph)	35	0	13	0	21	0	692	1031	0	2	616	60
Turn Type	Prot		custom	Split			Prot			Perm		Perm
Protected Phases	4		4	8	8		5	2			6	
Permitted Phases										6		6
Actuated Green, G (s)	5.3		5.3		2.5		16.5	37.2		16.7	16.7	16.7
Effective Green, g (s)	5.3		5.3		2.5		16.5	37.2		16.7	16.7	16.7
Actuated g/C Ratio	0.09		0.09		0.04		0.29	0.65		0.29	0.29	0.29
Clearance Time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0		3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	319		147		76		994	2307		152	1037	464
v/s Ratio Prot	c0.01		0.01		c0.01		c0.20	0.29			c0.17	
v/s Ratio Perm										0.00		0.04
v/c Ratio	0.11		0.09		0.27		0.70	0.45		0.01	0.59	0.13
Uniform Delay, d1	23.7		23.6		26.4		18.0	4.9		14.3	17.2	14.8
Progression Factor	1.00		1.00		1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.2		0.3		1.9		2.1	0.6		0.2	2.5	0.6
Delay (s)	23.8		23.9		28.3		20.2	5.5		14.5	19.8	15.4
Level of Service	C		C		C		C	A		B	B	B
Approach Delay (s)		23.9			28.3			11.4			18.9	
Approach LOS		C			C			B			B	

Intersection Summary					
HCM Average Control Delay	14.5	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.55				
Actuated Cycle Length (s)	57.0	Sum of lost time (s)		16.0	
Intersection Capacity Utilization	48.6%	ICU Level of Service		A	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
4: Center Drive & Railroad Avenue

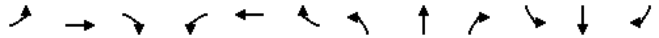
Year 2030 - No Build AM

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	24	428	213	1303	696	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	
Frt	0.87	0.85	1.00	1.00	1.00	
Flt Protected	0.99	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1604	1504	1770	3539	3537	
Flt Permitted	0.99	1.00	0.36	1.00	1.00	
Satd. Flow (perm)	1604	1504	667	3539	3537	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	465	232	1416	757	3
RTOR Reduction (vph)	196	212	0	0	0	0
Lane Group Flow (vph)	53	30	232	1416	760	0
Turn Type		Perm	Perm			
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	8.6	8.6	53.4	53.4	53.4	
Effective Green, g (s)	8.6	8.6	53.4	53.4	53.4	
Actuated g/C Ratio	0.12	0.12	0.76	0.76	0.76	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	197	185	509	2700	2698	
v/s Ratio Prot	c0.03			c0.40	0.21	
v/s Ratio Perm		0.02	0.35			
v/c Ratio	0.27	0.16	0.46	0.52	0.28	
Uniform Delay, d1	27.9	27.5	3.0	3.3	2.5	
Progression Factor	1.00	1.00	0.84	0.84	1.00	
Incremental Delay, d2	0.7	0.4	1.8	0.4	0.3	
Delay (s)	28.6	27.9	4.3	3.2	2.8	
Level of Service	C	C	A	A	A	
Approach Delay (s)	28.2			3.4	2.8	
Approach LOS	C			A	A	

Intersection Summary				
HCM Average Control Delay	7.4	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.49			
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	52.8%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
5: SR-4 WB On-Ramp & Railroad Avenue

Year 2030 - No Build AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	36	401	542	580	974	54	42	795	287
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor					0.95	1.00	0.97	0.95		1.00	0.95	1.00
Frt					1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected					1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)					3525	1583	3433	3511		1770	3539	1583
Flt Permitted					1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)					3525	1583	3433	3511		1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.83	0.83	0.83	0.96	0.96	0.96	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	43	483	653	604	1015	56	43	820	296
RTOR Reduction (vph)	0	0	0	0	0	120	0	6	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	526	533	604	1065	0	43	820	296
Turn Type				Split		Prot	Prot			Prot		Free
Protected Phases				8	8	8	5	2		1	6	
Permitted Phases												Free
Actuated Green, G (s)					24.7	24.7	13.3	30.9		2.4	20.0	70.0
Effective Green, g (s)					24.7	24.7	13.3	30.9		2.4	20.0	70.0
Actuated g/C Ratio					0.35	0.35	0.19	0.44		0.03	0.29	1.00
Clearance Time (s)					4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)					1244	559	652	1550		61	1011	1583
v/s Ratio Prot					0.15	c0.34	c0.18	0.30		0.02	c0.23	
v/s Ratio Perm												0.19
v/c Ratio					0.42	0.95	0.93	0.69		0.70	0.81	0.19
Uniform Delay, d1					17.2	22.1	27.9	15.7		33.4	23.2	0.0
Progression Factor					0.47	0.34	1.00	0.22		0.97	1.02	1.00
Incremental Delay, d2					0.2	21.9	11.1	1.2		29.7	6.8	0.2
Delay (s)					8.3	29.5	39.0	4.6		62.1	30.5	0.2
Level of Service					A	C	D	A		E	C	A
Approach Delay (s)		0.0			20.1			17.0			23.9	
Approach LOS		A			C			B			C	

Intersection Summary				
HCM Average Control Delay	19.9	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.90			
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	68.9%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
6: SR-4 EB Off-Ramp & Railroad Avenue

Year 2030 - No Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	469	2	337	0	0	0	0	1139	178	363	468	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor	0.95	0.91	0.95					0.91		1.00	0.95	
Frt	1.00	0.95	0.85					0.98		1.00	1.00	
Flt Protected	0.95	0.97	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1681	1563	1504					4982		1770	3539	
Flt Permitted	0.95	0.97	1.00					1.00		0.95	1.00	
Satd. Flow (perm)	1681	1563	1504					4982		1770	3539	
Peak-hour factor, PHF	0.88	0.88	0.88	0.92	0.92	0.92	0.89	0.89	0.89	0.90	0.90	0.90
Adj. Flow (vph)	533	2	383	0	0	0	0	1280	200	403	520	0
RTOR Reduction (vph)	0	23	224	0	0	0	0	30	0	0	0	0
Lane Group Flow (vph)	320	288	63	0	0	0	0	1450	0	403	520	0
Turn Type	Split		Prot							Prot		
Protected Phases	4	4	4					2		1	6	
Permitted Phases												
Actuated Green, G (s)	15.4	15.4	15.4					23.6		19.0	46.6	
Effective Green, g (s)	15.4	15.4	15.4					23.6		19.0	46.6	
Actuated g/C Ratio	0.22	0.22	0.22					0.34		0.27	0.67	
Clearance Time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)	370	344	331					1680		480	2356	
v/s Ratio Prot	c0.19	0.18	0.04					c0.29		c0.23	0.15	
v/s Ratio Perm												
v/c Ratio	0.86	0.84	0.19					0.86		0.84	0.22	
Uniform Delay, d1	26.3	26.1	22.2					21.7		24.1	4.6	
Progression Factor	1.00	1.00	1.00					0.53		0.19	0.25	
Incremental Delay, d2	18.5	16.0	0.3					4.8		8.4	0.1	
Delay (s)	44.8	42.1	22.5					16.3		13.0	1.3	
Level of Service	D	D	C					B		B	A	
Approach Delay (s)		36.9			0.0			16.3			6.4	
Approach LOS		D			A			B			A	

Intersection Summary				
HCM Average Control Delay	19.2	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.86			
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	72.6%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
7: Bliss Avenue & Railroad Avenue

Year 2030 - No Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	2	4	56	66	128	91	1103	108	84	772	118
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected		0.97	1.00		0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1800	1583		1821	1583	1770	3492		1770	3469	
Flt Permitted		0.83	1.00		0.85	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1551	1583		1586	1583	1770	3492		1770	3469	
Peak-hour factor, PHF	0.68	0.68	0.68	0.91	0.91	0.91	0.85	0.85	0.85	0.91	0.91	0.91
Adj. Flow (vph)	7	3	6	62	73	141	107	1298	127	92	848	130
RTOR Reduction (vph)	0	0	5	0	0	118	0	9	0	0	14	0
Lane Group Flow (vph)	0	10	1	0	135	23	107	1416	0	92	964	0
Turn Type	Perm		Perm	Perm		Perm	Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		11.2	11.2		11.2	11.2	7.3	40.0		6.8	39.5	
Effective Green, g (s)		11.2	11.2		11.2	11.2	7.3	40.0		6.8	39.5	
Actuated g/C Ratio		0.16	0.16		0.16	0.16	0.10	0.57		0.10	0.56	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		248	253		254	253	185	1995		172	1958	
v/s Ratio Prot							0.06	c0.41		0.05	c0.28	
v/s Ratio Perm		0.01	0.00		c0.09	0.01						
v/c Ratio		0.04	0.00		0.53	0.09	0.58	0.71		0.53	0.49	
Uniform Delay, d1		24.9	24.7		27.0	25.1	29.9	10.8		30.1	9.2	
Progression Factor		1.00	1.00		0.96	0.96	1.00	1.00		1.15	0.55	
Incremental Delay, d2		0.1	0.0		2.1	0.1	4.3	2.2		3.1	0.9	
Delay (s)		24.9	24.7		27.9	24.2	34.2	13.0		37.6	5.9	
Level of Service		C	C		C	C	C	B		D	A	
Approach Delay (s)		24.8			26.0			14.5			8.6	
Approach LOS		C			C			B			A	

Intersection Summary				
HCM Average Control Delay	13.5	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.66			
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	61.8%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: Leland Road & Railroad Avenue

Year 2030 - No Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	265	566	278	180	901	187	437	1019	155	212	615	187
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.88
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	2787
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	288	615	302	196	979	203	475	1108	168	230	668	203
RTOR Reduction (vph)	0	0	228	0	0	16	0	0	34	0	0	41
Lane Group Flow (vph)	288	615	74	196	979	187	475	1108	134	230	668	162
Turn Type	Prot		Perm	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	11.0	22.0	22.0	12.0	23.0	33.0	19.0	25.0	37.0	10.0	16.0	27.0
Effective Green, g (s)	12.0	23.0	22.0	13.0	24.0	35.0	20.0	27.0	39.0	11.0	18.0	29.0
Actuated g/C Ratio	0.13	0.26	0.24	0.14	0.27	0.39	0.22	0.30	0.43	0.12	0.20	0.32
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.0	5.0	5.0	6.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	236	904	387	256	944	686	393	1062	686	216	708	898
v/s Ratio Prot	c0.16	0.17		0.11	c0.28	0.03	c0.27	0.31	0.03	0.13	c0.19	0.02
v/s Ratio Perm			0.05			0.08			0.06			0.03
v/c Ratio	1.22	0.68	0.19	0.77	1.04	0.27	1.21	1.04	0.20	1.06	0.94	0.18
Uniform Delay, d1	39.0	30.2	26.9	37.0	33.0	18.8	35.0	31.5	15.8	39.5	35.5	21.9
Progression Factor	1.00	1.00	1.00	0.59	0.53	0.39	1.00	1.00	1.00	0.90	0.92	1.09
Incremental Delay, d2	131.1	4.1	1.1	7.7	32.5	0.1	115.5	39.6	0.1	79.0	22.3	0.1
Delay (s)	170.1	34.3	28.0	29.6	49.9	7.4	150.5	71.1	15.9	114.6	54.8	24.0
Level of Service	F	C	C	C	D	A	F	E	B	F	D	C
Approach Delay (s)		65.2			40.7			87.3			61.6	
Approach LOS		E			D			F			E	

Intersection Summary				
HCM Average Control Delay	65.4	HCM Level of Service	E	
HCM Volume to Capacity ratio	1.09			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	94.1%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: Leland Road & Harbor Street

Year 2030 - No Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	294	441	130	60	931	277	82	288	40	142	405	336
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	320	479	141	65	1012	301	89	313	43	154	440	365
RTOR Reduction (vph)	0	0	80	0	0	211	0	0	35	0	0	279
Lane Group Flow (vph)	320	479	61	65	1012	90	89	313	8	154	440	86
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	18.3	38.8	38.8	6.4	26.9	26.9	5.6	16.0	16.0	10.8	21.2	21.2
Effective Green, g (s)	18.3	39.8	38.8	6.4	27.9	26.9	5.6	17.0	16.0	10.8	22.2	21.2
Actuated g/C Ratio	0.20	0.44	0.43	0.07	0.31	0.30	0.06	0.19	0.18	0.12	0.25	0.24
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	360	1565	682	126	1097	473	110	668	281	212	873	373
v/s Ratio Prot	c0.18	0.14		0.04	c0.29		c0.05	c0.09		c0.09	0.12	
v/s Ratio Perm			0.04			0.06			0.00			0.05
v/c Ratio	0.89	0.31	0.09	0.52	0.92	0.19	0.81	0.47	0.03	0.73	0.50	0.23
Uniform Delay, d1	34.9	16.2	15.1	40.3	30.0	23.5	41.7	32.5	30.6	38.2	29.2	27.8
Progression Factor	0.63	0.66	0.78	0.62	0.50	0.27	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	17.1	0.4	0.2	2.8	11.5	0.7	33.8	2.4	0.2	11.7	2.1	1.4
Delay (s)	39.1	11.0	12.0	27.7	26.4	7.0	75.5	34.8	30.7	49.9	31.2	29.2
Level of Service	D	B	B	C	C	A	E	C	C	D	C	C
Approach Delay (s)		20.7			22.2			42.6			33.5	
Approach LOS		C			C			D			C	

Intersection Summary				
HCM Average Control Delay	27.2	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.80			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	71.2%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
10: Leland Road & Freed Avenue

Year 2030 - No Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	6	688	9	26	1013	25	5	9	50	26	12	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.90	0.90	0.90	0.71	0.71	0.71	0.56	0.56	0.56
Hourly flow rate (vph)	7	839	11	29	1126	28	7	13	70	46	21	9
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												2
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1153			850			1490	2070	425	1708	2062	577
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1153			850			1490	2070	425	1708	2062	577
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			96			87	75	88	0	58	98
cM capacity (veh/h)	602			784			55	51	578	40	51	460

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	7	559	291	29	750	403	90	77
Volume Left	7	0	0	29	0	0	7	46
Volume Right	0	0	11	0	0	28	70	9
cSH	602	1700	1700	784	1700	1700	180	49
Volume to Capacity	0.01	0.33	0.17	0.04	0.44	0.24	0.50	1.58
Queue Length 95th (ft)	1	0	0	3	0	0	62	185
Control Delay (s)	11.1	0.0	0.0	9.8	0.0	0.0	43.4	474.5
Lane LOS	B			A			E	F
Approach Delay (s)	0.1			0.2			43.4	474.5
Approach LOS							E	F

Intersection Summary					
Average Delay	18.4				
Intersection Capacity Utilization	46.0%	ICU Level of Service		A	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
11: Leland Road & Loveridge Road

Year 2030 - No Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	305	346	75	21	654	179	320	578	126	401	165	273
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	332	376	82	23	711	195	348	628	137	436	179	297
RTOR Reduction (vph)	0	0	60	0	0	150	0	0	126	0	0	234
Lane Group Flow (vph)	332	376	22	23	711	45	348	628	11	436	179	63
Turn Type	Prot		Perm	Prot		Perm	Prot		Over	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	10.1	22.8	22.8	7.0	19.7	19.7	22.0	25.2	7.0	15.0	18.2	18.2
Effective Green, g (s)	11.1	23.8	23.8	8.0	20.7	20.7	23.0	26.2	7.0	16.0	19.2	19.2
Actuated g/C Ratio	0.12	0.26	0.26	0.09	0.23	0.23	0.26	0.29	0.08	0.18	0.21	0.21
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	423	936	419	305	814	364	452	1030	123	610	755	338
v/s Ratio Prot	c0.10	0.11		0.01	c0.20		c0.20	c0.18	0.01	c0.13	0.05	
v/s Ratio Perm			0.01			0.03						0.04
v/c Ratio	0.78	0.40	0.05	0.08	0.87	0.12	0.77	0.61	0.09	0.71	0.24	0.19
Uniform Delay, d1	38.3	27.2	24.7	37.6	33.4	27.5	31.0	27.5	38.5	34.9	29.3	29.0
Progression Factor	0.71	0.59	0.34	1.00	1.00	1.00	1.00	1.00	1.00	0.94	0.95	1.11
Incremental Delay, d2	9.0	0.3	0.1	0.1	10.2	0.2	7.7	2.7	0.3	3.4	0.6	1.0
Delay (s)	36.3	16.4	8.4	37.7	43.6	27.6	38.8	30.2	38.8	36.2	28.5	33.2
Level of Service	D	B	A	D	D	C	D	C	D	D	C	C
Approach Delay (s)		23.9			40.1			33.9			33.7	
Approach LOS		C			D			C			C	

Intersection Summary					
HCM Average Control Delay	33.3	HCM Level of Service		C	
HCM Volume to Capacity ratio	0.80				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		20.0	
Intersection Capacity Utilization	67.5%	ICU Level of Service		C	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
12: SR-4 EB Ramps & Loveridge Road

Year 2030 - No Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	277	0	462	0	0	0	0	893	235	0	484	213
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0					4.0	4.0		4.0	
Lane Util. Factor	1.00		1.00					0.95	1.00		0.95	
Frt	1.00		0.85					1.00	0.85		0.95	
Flt Protected	0.95		1.00					1.00	1.00		1.00	
Satd. Flow (prot)	1770		1583					3539	1583		3377	
Flt Permitted	0.95		1.00					1.00	1.00		1.00	
Satd. Flow (perm)	1770		1583					3539	1583		3377	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	301	0	502	0	0	0	0	971	255	0	526	232
RTOR Reduction (vph)	0	0	146	0	0	0	0	0	126	0	95	0
Lane Group Flow (vph)	301	0	356	0	0	0	0	971	129	0	663	0
Turn Type	Prot		custom						Perm			
Protected Phases	4		4					2			6	
Permitted Phases									2			
Actuated Green, G (s)	14.3		14.3					22.7	22.7		22.7	
Effective Green, g (s)	14.3		14.3					22.7	22.7		22.7	
Actuated g/C Ratio	0.32		0.32					0.50	0.50		0.50	
Clearance Time (s)	4.0		4.0					4.0	4.0		4.0	
Vehicle Extension (s)	3.0		3.0					3.0	3.0		3.0	
Lane Grp Cap (vph)	562		503					1785	799		1704	
v/s Ratio Prot	0.17		c0.22					c0.27			0.20	
v/s Ratio Perm									0.08			
v/c Ratio	0.54		0.71					0.54	0.16		0.39	
Uniform Delay, d1	12.6		13.5					7.6	6.0		6.9	
Progression Factor	1.00		1.00					0.28	0.03		1.00	
Incremental Delay, d2	1.0		4.5					1.0	0.4		0.7	
Delay (s)	13.6		18.0					3.1	0.6		7.5	
Level of Service	B		B					A	A		A	
Approach Delay (s)		16.4			0.0			2.6			7.5	
Approach LOS		B			A			A			A	

Intersection Summary				
HCM Average Control Delay	7.9	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.61			
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	55.5%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
13: California Avenue & SR-4 WB Ramps

Year 2030 - No Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	191	5	517	582	51	123	35	317	24	3	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		0.97	0.95	1.00	0.95	0.95	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3527		3433	3539	1583	1681	1722	1583	1770	1723	
Flt Permitted	0.66	1.00		0.95	1.00	1.00	0.95	0.86	1.00	0.70	1.00	
Satd. Flow (perm)	1221	3527		3433	3539	1583	1681	1527	1583	1301	1723	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	15	208	5	562	633	55	134	38	345	26	3	3
RTOR Reduction (vph)	0	4	0	0	0	29	0	0	229	0	2	0
Lane Group Flow (vph)	15	209	0	562	633	26	86	86	116	26	4	0
Turn Type	Perm			Prot		Perm	Prot		Perm	Perm		
Protected Phases		4		3	8		5	2			6	
Permitted Phases	4					8			2	6		
Actuated Green, G (s)	6.1	6.1		9.8	19.9	19.9	2.2	14.1	14.1	7.9	7.9	
Effective Green, g (s)	6.1	6.1		9.8	19.9	19.9	2.2	14.1	14.1	7.9	7.9	
Actuated g/C Ratio	0.15	0.15		0.23	0.47	0.47	0.05	0.34	0.34	0.19	0.19	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	177	512		801	1677	750	88	523	531	245	324	
v/s Ratio Prot		0.06		c0.16	c0.18		c0.05	0.01			0.00	
v/s Ratio Perm	0.01					0.02		0.05	c0.07	0.02		
v/c Ratio	0.08	0.41		0.70	0.38	0.03	0.98	0.16	0.22	0.11	0.01	
Uniform Delay, d1	15.5	16.3		14.8	7.1	5.9	19.9	9.8	10.0	14.1	13.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	0.5		2.8	0.1	0.0	87.6	0.1	0.9	0.9	0.1	
Delay (s)	15.7	16.8		17.6	7.2	5.9	107.4	10.0	10.9	15.0	13.9	
Level of Service	B	B		B	A	A	F	A	B	B	B	
Approach Delay (s)		16.8			11.8			26.8			14.8	
Approach LOS		B			B			C			B	

Intersection Summary				
HCM Average Control Delay	16.2	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.47			
Actuated Cycle Length (s)	42.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	41.2%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
14: California Avenue & Harbor Street

Year 2030 - No Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	127	55	75	508	594	446	121	673	38	44	547	64
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	1863	1583	1770	3511		1770	3483	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3539	1583	1770	1863	1583	1770	3511		1770	3483	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	138	60	82	552	646	485	132	732	41	48	595	70
RTOR Reduction (vph)	0	0	75	0	0	149	0	5	0	0	14	0
Lane Group Flow (vph)	138	60	7	552	646	336	132	768	0	48	651	0
Turn Type	Prot		Over	Prot		Perm	Prot			Prot		
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases						8						
Actuated Green, G (s)	8.6	4.3	5.6	31.3	27.0	27.0	5.6	16.0		2.4	12.8	
Effective Green, g (s)	8.6	4.3	5.6	31.3	27.0	27.0	5.6	16.0		2.4	12.8	
Actuated g/C Ratio	0.12	0.06	0.08	0.45	0.39	0.39	0.08	0.23		0.03	0.18	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	217	217	127	791	719	611	142	803		61	637	
v/s Ratio Prot	0.08	0.02	0.00	c0.31	c0.35		0.07	c0.22		0.03	c0.19	
v/s Ratio Perm						0.21						
v/c Ratio	0.64	0.28	0.05	0.70	0.90	0.55	0.93	0.96		0.79	1.02	
Uniform Delay, d1	29.2	31.4	29.7	15.5	20.2	16.8	32.0	26.7		33.5	28.6	
Progression Factor	0.94	1.04	1.25	1.00	1.00	1.00	0.99	0.99		1.00	1.00	
Incremental Delay, d2	5.9	0.7	0.2	2.7	14.0	1.1	52.5	22.0		47.5	41.4	
Delay (s)	33.4	33.2	37.4	18.3	34.2	17.8	84.2	48.4		81.1	70.0	
Level of Service	C	C	D	B	C	B	F	D		F	E	
Approach Delay (s)		34.5			24.3			53.6			70.7	
Approach LOS		C			C			D			E	

Intersection Summary				
HCM Average Control Delay	41.7	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.85			
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	75.5%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
15: Bliss Avenue & Harbor Street

Year 2030 - No Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	9	95	2	9	2	92	807	4	3	1093	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	*0.95		1.00	*0.95	
Frt		1.00	0.85		0.98		1.00	1.00		1.00	1.00	
Flt Protected		0.97	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1798	1583		1809		1770	3537		1770	3523	
Flt Permitted		0.77	1.00		0.95		0.14	1.00		0.28	1.00	
Satd. Flow (perm)		1442	1583		1738		264	3537		513	3523	
Peak-hour factor, PHF	0.90	0.90	0.90	0.67	0.67	0.67	0.81	0.81	0.81	0.73	0.73	0.73
Adj. Flow (vph)	26	10	106	3	13	3	114	996	5	4	1497	47
RTOR Reduction (vph)	0	0	61	0	4	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	36	45	0	15	0	114	1001	0	4	1540	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		6.7	6.7		6.7		55.3	55.3		55.3	55.3	
Effective Green, g (s)		6.7	6.7		6.7		55.3	55.3		55.3	55.3	
Actuated g/C Ratio		0.10	0.10		0.10		0.79	0.79		0.79	0.79	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		138	152		166		209	2794		405	2783	
v/s Ratio Prot								0.28			c0.44	
v/s Ratio Perm		0.02	c0.03		0.01		0.43			0.01		
v/c Ratio		0.26	0.30		0.09		0.55	0.36		0.01	0.55	
Uniform Delay, d1		29.4	29.5		28.9		2.7	2.2		1.6	2.7	
Progression Factor		0.97	1.07		1.00		1.00	1.00		0.41	0.62	
Incremental Delay, d2		0.8	0.9		0.2		9.9	0.4		0.0	0.6	
Delay (s)		29.3	32.3		29.1		12.6	2.5		0.7	2.3	
Level of Service		C	C		C		B	A		A	A	
Approach Delay (s)		31.5			29.1			3.5			2.3	
Approach LOS		C			C			A			A	

Intersection Summary				
HCM Average Control Delay	4.5	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.53			
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	52.4%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
16: Garcia Ave & Harbor Street

Year 2030 - No Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	12	2	136	53	10	91	166	783	91	156	844	46
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	2	148	58	11	99	180	851	99	170	917	50
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								663			696	
pX, platoon unblocked	0.98	0.98		0.98	0.98	0.98				0.98		
vC, conflicting volume	2172	2592	484	2208	2568	475	967			950		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2159	2586	484	2196	2561	435	967			918		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	85	72	0	25	82	75			77		
cM capacity (veh/h)	6	14	529	11	15	560	708			728		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	13	150	58	110	180	567	383	170	612	356
Volume Left	13	0	58	0	180	0	0	170	0	0
Volume Right	0	148	0	99	0	0	99	0	0	50
cSH	6	345	11	119	708	1700	1700	728	1700	1700
Volume to Capacity	2.18	0.43	5.48	0.92	0.25	0.33	0.23	0.23	0.36	0.21
Queue Length 95th (ft)	67	53	Err	147	25	0	0	22	0	0
Control Delay (s)	1682.8	23.2	Err	131.2	11.8	0.0	0.0	11.4	0.0	0.0
Lane LOS	F	C	F	F	B			B		
Approach Delay (s)	156.0		3527.3		1.9			1.7		
Approach LOS	F		F							

Intersection Summary				
Average Delay	238.6			
Intersection Capacity Utilization	59.2%	ICU Level of Service	B	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
17: Garcia Ave & Railroad Avenue

Year 2030 - No Build AM

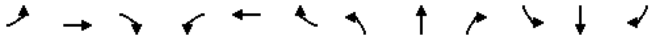
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	43	4	4	46	7	58	21	1152	88	76	717	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.96	1.00		0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1781	1583		1786	1583	1770	3501		1770	3529	
Flt Permitted		0.50	1.00		0.96	1.00	0.33	1.00		0.16	1.00	
Satd. Flow (perm)		930	1583		1786	1583	611	3501		296	3529	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	47	4	4	50	8	63	23	1252	96	83	779	16
RTOR Reduction (vph)	0	0	4	0	0	58	0	4	0	0	1	0
Lane Group Flow (vph)	0	51	0	0	58	5	23	1344	0	83	794	0
Turn Type	Perm		Perm	Split		Perm	Perm			Perm		
Protected Phases		4		8	8			2			6	
Permitted Phases	4		4			8	2			6		
Actuated Green, G (s)		7.7	7.7		7.2	7.2	63.1	63.1		63.1	63.1	
Effective Green, g (s)		7.7	7.7		7.2	7.2	63.1	63.1		63.1	63.1	
Actuated g/C Ratio		0.09	0.09		0.08	0.08	0.70	0.70		0.70	0.70	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		80	135		143	127	428	2455		208	2474	
v/s Ratio Prot					c0.03			c0.38			0.23	
v/s Ratio Perm		c0.05	0.00			0.00	0.04			0.28		
v/c Ratio		0.64	0.00		0.41	0.04	0.05	0.55		0.40	0.32	
Uniform Delay, d1		39.8	37.6		39.4	38.2	4.2	6.5		5.6	5.2	
Progression Factor		1.00	1.00		0.99	1.20	0.19	0.40		1.00	1.00	
Incremental Delay, d2		15.5	0.0		1.8	0.1	0.1	0.2		5.6	0.3	
Delay (s)		55.3	37.6		40.8	45.8	0.9	2.9		11.2	5.5	
Level of Service		E	D		D	D	A	A		B	A	
Approach Delay (s)		54.0			43.4			2.8			6.1	
Approach LOS		D			D			A			A	

Intersection Summary					
HCM Average Control Delay	7.2	HCM Level of Service		A	
HCM Volume to Capacity ratio	0.54				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	58.4%	ICU Level of Service		B	
Analysis Period (min)	15				
c Critical Lane Group					

FUTURE YEAR 2030 NO PROJECT BUILD CONDITIONS – PM PEAK HOUR

HCM Unsignalized Intersection Capacity Analysis
1: Civic Avenue & Davi Avenue

YR2030 NO Build - PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	3	114	20	155	147	11	10	1	192	3	6	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	124	22	168	160	12	11	1	209	3	7	5

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	149	328	12	12	209	15
Volume Left (vph)	3	168	0	11	0	3
Volume Right (vph)	22	0	12	0	209	5
Hadj (s)	-0.05	0.29	-0.67	0.22	-0.57	-0.14
Departure Headway (s)	4.4	5.0	4.0	5.3	3.2	4.9
Degree Utilization, x	0.18	0.45	0.01	0.02	0.19	0.02
Capacity (veh/h)	803	713	879	617	1121	658
Control Delay (s)	8.4	10.8	5.9	8.4	6.9	8.0
Approach Delay (s)	8.4	10.6		7.0		8.0
Approach LOS	A	B		A		A

Intersection Summary				
Delay	9.0			
HCM Level of Service	A			
Intersection Capacity Utilization	41.9%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
3: Civic Avenue & Railroad Avenue

YR2030 NO Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	162	0	121	3	2	1	216	621	3	2	768	197
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97		1.00		1.00		0.97	0.95		1.00	0.95	1.00
Frt	1.00		0.85		0.98		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95		1.00		0.98		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433		1583		1776		3433	3537		1770	3539	1583
Flt Permitted	0.51		1.00		0.98		0.95	1.00		0.40	1.00	1.00
Satd. Flow (perm)	1841		1583		1776		3433	3537		749	3539	1583
Peak-hour factor, PHF	0.77	0.77	0.77	0.50	0.50	0.50	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	210	0	157	6	4	2	227	654	3	2	835	214
RTOR Reduction (vph)	0	0	127	0	2	0	0	0	0	0	0	78
Lane Group Flow (vph)	210	0	30	0	10	0	227	657	0	2	835	136
Turn Type	custom		custom	Split			Prot			Perm		Perm
Protected Phases				8	8		5	2			6	
Permitted Phases	4		4							6		6
Actuated Green, G (s)	11.5		11.5		1.1		9.2	36.4		23.2	23.2	23.2
Effective Green, g (s)	11.5		11.5		1.1		9.2	36.4		23.2	23.2	23.2
Actuated g/C Ratio	0.19		0.19		0.02		0.15	0.60		0.38	0.38	0.38
Clearance Time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0		3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	347		298		32		518	2111		285	1346	602
v/s Ratio Prot					c0.01		c0.07	0.19			c0.24	
v/s Ratio Perm	c0.11		0.02							0.00		0.09
v/c Ratio	0.61		0.10		0.31		0.44	0.31		0.01	0.62	0.23
Uniform Delay, d1	22.7		20.5		29.6		23.6	6.1		11.7	15.3	12.8
Progression Factor	1.00		1.00		1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	3.0		0.1		5.6		0.6	0.4		0.0	2.2	0.9
Delay (s)	25.6		20.6		35.1		24.1	6.5		11.8	17.5	13.7
Level of Service	C		C		D		C	A		B	B	B
Approach Delay (s)		23.5			35.1			11.0			16.7	
Approach LOS		C			D			B			B	

Intersection Summary					
HCM Average Control Delay	15.7	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.57				
Actuated Cycle Length (s)	61.0	Sum of lost time (s)		16.0	
Intersection Capacity Utilization	45.5%	ICU Level of Service		A	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
4: Center Drive & Railroad Avenue

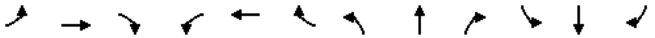
YR2030 NO Build - PM

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	1	591	256	839	950	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	
Frt	0.85	0.85	1.00	1.00	1.00	
Flt Protected	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1584	1504	1770	3539	3539	
Flt Permitted	1.00	1.00	0.25	1.00	1.00	
Satd. Flow (perm)	1584	1504	464	3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	642	278	912	1033	0
RTOR Reduction (vph)	150	150	0	0	0	0
Lane Group Flow (vph)	172	171	278	912	1033	0
Turn Type		Perm	Perm			
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	13.2	13.2	50.7	50.7	50.7	
Effective Green, g (s)	13.2	13.2	50.7	50.7	50.7	
Actuated g/C Ratio	0.18	0.18	0.71	0.71	0.71	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	291	276	327	2496	2496	
v/s Ratio Prot	0.11			0.26	0.29	
v/s Ratio Perm		c0.11	c0.60			
v/c Ratio	0.59	0.62	0.85	0.37	0.41	
Uniform Delay, d1	26.9	27.0	7.8	4.2	4.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.2	4.1	18.6	0.1	0.1	
Delay (s)	30.1	31.1	26.4	4.3	4.5	
Level of Service	C	C	C	A	A	
Approach Delay (s)	30.6			9.5	4.5	
Approach LOS	C			A	A	

Intersection Summary				
HCM Average Control Delay	12.4	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.80			
Actuated Cycle Length (s)	71.9	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	62.7%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
5: SR-4 WB On-Ramp & Railroad Avenue

YR2030 NO Build - PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	177	147	306	287	789	333	138	1144	259
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor					0.95	1.00	0.97	0.95		1.00	0.95	1.00
Frt					1.00	0.85	1.00	0.96		1.00	1.00	0.85
Flt Protected					0.97	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)					3445	1583	3433	3382		1770	3539	1583
Flt Permitted					0.97	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)					3445	1583	3433	3382		1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.88	0.88	0.88	0.93	0.93	0.93	0.83	0.83	0.83
Adj. Flow (vph)	0	0	0	201	167	348	309	848	358	166	1378	312
RTOR Reduction (vph)	0	0	0	0	0	282	0	62	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	368	66	309	1144	0	166	1378	312
Turn Type				Split		Prot	Prot			Prot		Free
Protected Phases				8	8	8	5	2		1	6	
Permitted Phases												Free
Actuated Green, G (s)					13.2	13.2	9.7	33.8		11.0	35.1	70.0
Effective Green, g (s)					13.2	13.2	9.7	33.8		11.0	35.1	70.0
Actuated g/C Ratio					0.19	0.19	0.14	0.48		0.16	0.50	1.00
Clearance Time (s)					4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)					650	299	476	1633		278	1775	1583
v/s Ratio Prot					c0.11	0.04	0.09	c0.34		0.09	c0.39	
v/s Ratio Perm												0.20
v/c Ratio					0.57	0.22	0.65	0.70		0.60	0.78	0.20
Uniform Delay, d1					25.8	24.0	28.5	14.1		27.4	14.2	0.0
Progression Factor					1.00	1.00	0.96	0.16		1.00	1.00	1.00
Incremental Delay, d2					1.1	0.4	0.9	0.7		3.4	3.4	0.3
Delay (s)					26.9	24.4	28.4	3.0		30.9	17.7	0.3
Level of Service					C	C	C	A		C	B	A
Approach Delay (s)		0.0			25.7			8.2			15.9	
Approach LOS		A			C			A			B	

Intersection Summary				
HCM Average Control Delay	14.8	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.73			
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	59.9%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
6: SR-4 EB Off-Ramp & Railroad Avenue

YR2030 NO Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	603	0	451	0	0	0	0	806	368	510	811	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor	0.95	0.91	0.95					0.91		1.00	0.95	
Frt	1.00	0.95	0.85					0.95		1.00	1.00	
Flt Protected	0.95	0.97	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1681	1557	1504					4846		1770	3539	
Flt Permitted	0.95	0.97	1.00					1.00		0.95	1.00	
Satd. Flow (perm)	1681	1557	1504					4846		1770	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93	0.88	0.88	0.88
Adj. Flow (vph)	655	0	490	0	0	0	0	867	396	580	922	0
RTOR Reduction (vph)	0	27	126	0	0	0	0	117	0	0	0	0
Lane Group Flow (vph)	400	361	232	0	0	0	0	1146	0	580	922	0
Turn Type	Split		Prot							Prot		
Protected Phases	4	4	4					2		1	6	
Permitted Phases												
Actuated Green, G (s)	17.0	17.0	17.0					17.1		23.9	45.0	
Effective Green, g (s)	17.0	17.0	17.0					17.1		23.9	45.0	
Actuated g/C Ratio	0.24	0.24	0.24					0.24		0.34	0.64	
Clearance Time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)	408	378	365					1184		604	2275	
v/s Ratio Prot	c0.24	0.23	0.15					c0.24		c0.33	0.26	
v/s Ratio Perm												
v/c Ratio	0.98	0.95	0.64					0.97		0.96	0.41	
Uniform Delay, d1	26.3	26.1	23.7					26.2		22.6	6.0	
Progression Factor	1.00	1.00	1.00					0.59		0.56	0.47	
Incremental Delay, d2	39.2	34.2	3.6					14.7		20.6	0.4	
Delay (s)	65.6	60.3	27.3					30.1		33.2	3.2	
Level of Service	E	E	C					C		C	A	
Approach Delay (s)		51.8			0.0			30.1			14.8	
Approach LOS		D			A			C			B	

Intersection Summary				
HCM Average Control Delay	30.6	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.97			
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	83.3%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
7: Bliss Avenue & Railroad Avenue

YR2030 NO Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	253	33	86	120	24	95	8	826	48	136	1086	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.96	1.00		0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1784	1583		1788	1583	1770	3510		1770	3521	
Flt Permitted		0.58	1.00		0.41	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1090	1583		764	1583	1770	3510		1770	3521	
Peak-hour factor, PHF	0.84	0.84	0.84	0.75	0.75	0.75	0.88	0.88	0.88	0.92	0.92	0.92
Adj. Flow (vph)	301	39	102	160	32	127	9	939	55	148	1180	43
RTOR Reduction (vph)	0	0	67	0	0	83	0	6	0	0	3	0
Lane Group Flow (vph)	0	340	35	0	192	44	9	988	0	148	1220	0
Turn Type	Perm		Perm	Perm		Perm	Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		24.2	24.2		24.2	24.2	0.8	25.1		8.7	33.0	
Effective Green, g (s)		24.2	24.2		24.2	24.2	0.8	25.1		8.7	33.0	
Actuated g/C Ratio		0.35	0.35		0.35	0.35	0.01	0.36		0.12	0.47	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		377	547		264	547	20	1259		220	1660	
v/s Ratio Prot							0.01	c0.28		0.08	c0.35	
v/s Ratio Perm		c0.31	0.02		0.25	0.03						
v/c Ratio		0.90	0.06		0.73	0.08	0.45	0.78		0.67	0.73	
Uniform Delay, d1		21.8	15.3		20.0	15.4	34.4	20.0		29.3	15.0	
Progression Factor		1.00	1.00		1.00	1.00	0.71	0.56		1.26	0.60	
Incremental Delay, d2		23.9	0.0		9.6	0.1	13.2	4.3		6.7	2.5	
Delay (s)		45.7	15.4		29.6	15.5	37.5	15.5		43.7	11.4	
Level of Service		D	B		C	B	D	B		D	B	
Approach Delay (s)		38.7			24.0			15.7			14.9	
Approach LOS		D			C			B			B	

Intersection Summary				
HCM Average Control Delay	19.4	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.85			
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	67.0%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: Leland Road & Railroad Avenue

YR2030 NO Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	160	959	463	291	678	172	441	790	254	153	872	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.88
Frt	1.00	0.99	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3367	1441	1770	3539	1583	1770	3539	1583	1770	3539	2787
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3367	1441	1770	3539	1583	1770	3539	1583	1770	3539	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	174	1042	503	316	737	187	479	859	276	166	948	207
RTOR Reduction (vph)	0	4	326	0	0	38	0	0	37	0	0	45
Lane Group Flow (vph)	174	1088	127	316	737	149	479	859	239	166	948	162
Turn Type	Prot		Perm	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	10.9	28.0	28.0	12.0	29.1	41.1	18.0	27.0	39.0	12.0	21.0	31.9
Effective Green, g (s)	11.9	29.0	28.0	13.0	30.1	43.1	19.0	29.0	41.0	13.0	23.0	33.9
Actuated g/C Ratio	0.12	0.29	0.28	0.13	0.30	0.43	0.19	0.29	0.41	0.13	0.23	0.34
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.0	5.0	5.0	6.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	211	976	403	230	1065	682	336	1026	649	230	814	945
v/s Ratio Prot	0.10	c0.32		c0.18	0.21	0.03	c0.27	0.24	0.05	0.09	c0.27	0.02
v/s Ratio Perm			0.09			0.07			0.10			0.04
v/c Ratio	0.82	1.12	0.31	1.37	0.69	0.22	1.43	0.84	0.37	0.72	1.16	0.17
Uniform Delay, d1	43.0	35.5	28.4	43.5	30.9	17.9	40.5	33.3	20.5	41.8	38.5	23.2
Progression Factor	1.00	1.00	1.00	0.92	1.01	0.86	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	22.3	65.9	2.0	188.2	2.9	0.1	208.0	8.1	0.4	10.6	87.3	0.1
Delay (s)	65.3	101.4	30.5	228.3	34.2	15.6	248.5	41.4	20.9	52.4	125.8	23.3
Level of Service	E	F	C	F	C	B	F	D	C	D	F	C
Approach Delay (s)		79.0			80.8			99.4			100.5	
Approach LOS		E			F			F			F	

Intersection Summary				
HCM Average Control Delay	89.8	HCM Level of Service	F	
HCM Volume to Capacity ratio	1.24			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	109.4%	ICU Level of Service	H	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: Leland Road & Harbor Street

YR2030 NO Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	214	968	132	41	374	77	214	382	166	267	463	488
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	233	1052	143	45	407	84	233	415	180	290	503	530
RTOR Reduction (vph)	0	0	90	0	0	68	0	0	118	0	0	324
Lane Group Flow (vph)	233	1052	53	45	407	16	233	415	62	290	503	206
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	21.2	37.2	37.2	3.2	19.2	19.2	16.5	21.6	21.6	20.0	25.1	25.1
Effective Green, g (s)	21.2	38.2	37.2	3.2	20.2	19.2	16.5	22.6	21.6	20.0	26.1	25.1
Actuated g/C Ratio	0.21	0.38	0.37	0.03	0.20	0.19	0.16	0.23	0.22	0.20	0.26	0.25
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	375	1352	589	57	715	304	292	800	342	354	924	397
v/s Ratio Prot	c0.13	c0.30		0.03	0.11		c0.13	c0.12		c0.16	0.14	
v/s Ratio Perm			0.03			0.01			0.04			0.13
v/c Ratio	0.62	0.78	0.09	0.79	0.57	0.05	0.80	0.52	0.18	0.82	0.54	0.52
Uniform Delay, d1	35.8	27.2	20.4	48.1	36.0	33.0	40.1	33.9	32.0	38.3	31.8	32.2
Progression Factor	0.55	0.37	0.08	0.86	0.44	0.11	1.00	1.00	1.00	0.77	0.73	0.71
Incremental Delay, d2	1.1	1.6	0.1	48.0	3.1	0.3	14.0	2.4	1.2	12.5	2.1	4.3
Delay (s)	21.0	11.7	1.7	89.2	18.8	4.0	54.2	36.3	33.2	41.8	25.2	27.2
Level of Service	C	B	A	F	B	A	D	D	C	D	C	C
Approach Delay (s)		12.2			22.4			40.7			29.6	
Approach LOS		B			C			D			C	

Intersection Summary				
HCM Average Control Delay	24.9	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.74			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	68.8%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
10: Leland Road & Freed Avenue

YR2030 NO Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	17	1459	22	43	442	44	9	6	56	48	2	11
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.81	0.81	0.81	0.54	0.54	0.54	0.60	0.60	0.60
Hourly flow rate (vph)	18	1569	24	53	546	54	17	11	104	80	3	18
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												2
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	600			1592			1998	2323	796	1609	2308	300
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	600			1592			1998	2323	796	1609	2308	300
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			87			41	65	69	0	90	97
cM capacity (veh/h)	973			408			28	31	330	31	32	696

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	18	1046	547	53	364	236	131	102
Volume Left	18	0	0	53	0	0	17	80
Volume Right	0	0	24	0	0	54	104	18
cSH	973	1700	1700	408	1700	1700	105	38
Volume to Capacity	0.02	0.62	0.32	0.13	0.21	0.14	1.26	2.70
Queue Length 95th (ft)	1	0	0	11	0	0	222	284
Control Delay (s)	8.8	0.0	0.0	15.1	0.0	0.0	248.3	996.9
Lane LOS	A			C			F	F
Approach Delay (s)	0.1			1.2			248.3	996.9
Approach LOS							F	F

Intersection Summary				
Average Delay	54.0			
Intersection Capacity Utilization	58.6%	ICU Level of Service	B	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
11: Leland Road & Loveridge Road

YR2030 NO Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	562	628	207	243	407	409	32	248	38	316	687	218
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.91	0.91	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	1770	3383	1441	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	1770	3383	1441	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	611	683	225	264	442	445	35	270	41	343	747	237
RTOR Reduction (vph)	0	0	107	0	0	292	0	1	33	0	0	148
Lane Group Flow (vph)	611	683	118	264	442	153	35	273	4	343	747	89
Turn Type	Prot		Perm	Prot		Perm	Prot		Over	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	22.1	29.8	29.8	11.4	19.1	19.1	2.4	25.0	11.4	13.8	36.4	36.4
Effective Green, g (s)	23.1	30.8	30.8	12.4	20.1	20.1	3.4	26.0	11.4	14.8	37.4	37.4
Actuated g/C Ratio	0.23	0.31	0.31	0.12	0.20	0.20	0.03	0.26	0.11	0.15	0.37	0.37
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	793	1090	488	426	711	318	60	880	164	508	1324	592
v/s Ratio Prot	c0.18	0.19		0.08	c0.12		c0.02	0.08	0.00	c0.10	c0.21	
v/s Ratio Perm			0.07			0.10						0.06
v/c Ratio	0.77	0.63	0.24	0.62	0.62	0.48	0.58	0.31	0.03	0.68	0.56	0.15
Uniform Delay, d1	36.0	29.7	25.9	41.6	36.5	35.3	47.6	29.8	39.4	40.3	24.8	20.8
Progression Factor	0.62	0.54	0.24	1.00	1.00	1.00	1.00	1.00	1.00	0.96	1.02	1.55
Incremental Delay, d2	3.7	0.9	0.2	2.7	1.7	1.1	13.6	0.9	0.1	2.7	1.3	0.4
Delay (s)	26.0	17.0	6.5	44.2	38.2	36.5	61.2	30.7	39.4	41.6	26.7	32.7
Level of Service	C	B	A	D	D	D	E	C	D	D	C	C
Approach Delay (s)		19.0			38.9			34.7			31.6	
Approach LOS		B			D			C			C	

Intersection Summary						
HCM Average Control Delay	29.4	HCM Level of Service		C		
HCM Volume to Capacity ratio	0.64					
Actuated Cycle Length (s)	100.0	Sum of lost time (s)		16.0		
Intersection Capacity Utilization	62.9%	ICU Level of Service		B		
Analysis Period (min)	15					
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
12: SR-4 EB Ramps & Loveridge Road

YR2030 NO Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	131	0	458	0	0	0	0	999	281	0	777	143
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0					4.0	4.0		4.0	
Lane Util. Factor	1.00		1.00					0.95	1.00		0.95	
Frt	1.00		0.85					1.00	0.85		0.98	
Flt Protected	0.95		1.00					1.00	1.00		1.00	
Satd. Flow (prot)	1770		1583					3539	1583		3457	
Flt Permitted	0.95		1.00					1.00	1.00		1.00	
Satd. Flow (perm)	1770		1583					3539	1583		3457	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	142	0	498	0	0	0	0	1086	305	0	845	155
RTOR Reduction (vph)	0	0	55	0	0	0	0	0	155	0	27	0
Lane Group Flow (vph)	142	0	443	0	0	0	0	1086	150	0	973	0
Turn Type	Prot		custom						Perm			
Protected Phases	4		4					2			6	
Permitted Phases									2			
Actuated Green, G (s)	17.4		17.4					24.6	24.6		24.6	
Effective Green, g (s)	17.4		17.4					24.6	24.6		24.6	
Actuated g/C Ratio	0.35		0.35					0.49	0.49		0.49	
Clearance Time (s)	4.0		4.0					4.0	4.0		4.0	
Vehicle Extension (s)	3.0		3.0					3.0	3.0		3.0	
Lane Grp Cap (vph)	616		551					1741	779		1701	
v/s Ratio Prot	0.08		c0.28					c0.31			0.28	
v/s Ratio Perm									0.09			
v/c Ratio	0.23		0.80					0.62	0.19		0.57	
Uniform Delay, d1	11.6		14.8					9.3	7.1		9.0	
Progression Factor	1.00		1.00					0.61	0.66		1.00	
Incremental Delay, d2	0.2		8.3					1.4	0.4		1.4	
Delay (s)	11.7		23.0					7.0	5.1		10.4	
Level of Service	B		C					A	A		B	
Approach Delay (s)		20.5			0.0			6.6			10.4	
Approach LOS		C			A			A			B	

Intersection Summary				
HCM Average Control Delay	10.8	HCM Level of Service		B
HCM Volume to Capacity ratio	0.70			
Actuated Cycle Length (s)	50.0	Sum of lost time (s)		8.0
Intersection Capacity Utilization	61.1%	ICU Level of Service		B
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
13: California Avenue & SR-4 WB Ramps

YR2030 NO Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	1000	11	612	341	5	196	20	593	21	59	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		0.97	0.95	1.00	0.95	0.95	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	0.96	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3533		3433	3539	1583	1681	1700	1583	1770	1791	
Flt Permitted	0.53	1.00		0.95	1.00	1.00	0.95	0.75	1.00	0.63	1.00	
Satd. Flow (perm)	989	3533		3433	3539	1583	1681	1321	1583	1175	1791	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	1087	12	665	371	5	213	22	645	23	64	22
RTOR Reduction (vph)	0	1	0	0	0	2	0	0	304	0	12	0
Lane Group Flow (vph)	5	1098	0	665	371	3	117	118	341	23	74	0
Turn Type	Perm			Prot		Perm	Prot		Perm	Perm		
Protected Phases		4		3	8		5	2			6	
Permitted Phases	4					8			2	6		
Actuated Green, G (s)	33.7	33.7		22.2	59.9	59.9	13.0	32.1	32.1	15.1	15.1	
Effective Green, g (s)	33.7	33.7		22.2	59.9	59.9	13.0	32.1	32.1	15.1	15.1	
Actuated g/C Ratio	0.34	0.34		0.22	0.60	0.60	0.13	0.32	0.32	0.15	0.15	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	333	1191		762	2120	948	219	473	508	177	270	
v/s Ratio Prot		c0.31		c0.19	0.10		0.07	0.03			0.04	
v/s Ratio Perm	0.01					0.00		0.05	c0.22	0.02		
v/c Ratio	0.02	0.92		0.87	0.17	0.00	0.53	0.25	0.67	0.13	0.27	
Uniform Delay, d1	22.1	31.9		37.5	9.0	8.1	40.7	25.1	29.4	36.8	37.6	
Progression Factor	0.32	0.37		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	5.2		10.8	0.0	0.0	2.5	0.3	6.9	1.5	2.5	
Delay (s)	7.2	17.0		48.3	9.0	8.1	43.2	25.3	36.3	38.3	40.1	
Level of Service	A	B		D	A	A	D	C	D	D	D	
Approach Delay (s)		16.9			34.1			35.7			39.7	
Approach LOS		B			C			D			D	

Intersection Summary				
HCM Average Control Delay	28.7	HCM Level of Service		C
HCM Volume to Capacity ratio	0.82			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)		12.0
Intersection Capacity Utilization	79.0%	ICU Level of Service		D
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
14: California Avenue & Harbor Street

YR2030 NO Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	50	307	76	494	572	534	80	446	202	446	695	136
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.91	0.91	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3378	1441	1770	1863	1583	1770	3374		1770	3452	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3378	1441	1770	1863	1583	1770	3374		1770	3452	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	334	83	537	622	580	87	485	220	485	755	148
RTOR Reduction (vph)	0	2	70	0	0	333	0	53	0	0	17	0
Lane Group Flow (vph)	54	340	5	537	622	247	87	652	0	485	886	0
Turn Type	Prot		Over	Prot		Perm	Prot			Prot		
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases						8						
Actuated Green, G (s)	3.2	14.4	7.0	29.4	40.6	40.6	7.0	16.2		24.0	33.2	
Effective Green, g (s)	3.2	14.4	7.0	29.4	40.6	40.6	7.0	16.2		24.0	33.2	
Actuated g/C Ratio	0.03	0.14	0.07	0.29	0.41	0.41	0.07	0.16		0.24	0.33	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	57	486	101	520	756	643	124	547		425	1146	
v/s Ratio Prot	0.03	c0.10	0.00	c0.30	c0.33		0.05	c0.19		c0.27	0.26	
v/s Ratio Perm						0.16						
v/c Ratio	0.95	0.70	0.05	1.03	0.82	0.38	0.70	1.19		1.14	0.77	
Uniform Delay, d1	48.3	40.7	43.4	35.3	26.5	20.9	45.5	41.9		38.0	30.0	
Progression Factor	1.00	1.00	1.00	1.01	1.02	1.71	1.04	0.78		1.00	1.00	
Incremental Delay, d2	99.1	4.5	0.2	48.1	7.2	0.4	16.1	103.3		88.2	5.1	
Delay (s)	147.4	45.3	43.6	83.7	34.3	36.2	63.5	135.9		126.2	35.1	
Level of Service	F	D	D	F	C	D	E	F		F	D	
Approach Delay (s)		56.7			50.2			128.0			66.9	
Approach LOS		E			D			F			E	

Intersection Summary				
HCM Average Control Delay	70.2	HCM Level of Service	E	
HCM Volume to Capacity ratio	1.09			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	20.0	
Intersection Capacity Utilization	93.5%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
15: Bliss Avenue & Harbor Street

YR2030 NO Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	3	259	10	3	16	131	679	14	4	1204	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85		0.93		1.00	1.00		1.00	0.99	
Flt Protected		0.96	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1780	1583		1695		1770	3528		1770	3515	
Flt Permitted		0.83	1.00		0.90		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1542	1583		1549		1770	3528		1770	3515	
Peak-hour factor, PHF	0.86	0.86	0.86	0.78	0.78	0.78	0.89	0.89	0.89	0.90	0.90	0.90
Adj. Flow (vph)	38	3	301	13	4	21	147	763	16	4	1338	63
RTOR Reduction (vph)	0	0	256	0	19	0	0	1	0	0	3	0
Lane Group Flow (vph)	0	41	45	0	19	0	147	778	0	4	1398	0
Turn Type	Perm		Perm	Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		9.6	9.6		9.6		16.0	77.1		1.3	62.4	
Effective Green, g (s)		9.6	9.6		9.6		16.0	77.1		1.3	62.4	
Actuated g/C Ratio		0.10	0.10		0.10		0.16	0.77		0.01	0.62	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		148	152		149		283	2720		23	2193	
v/s Ratio Prot							c0.08	0.22		0.00	c0.40	
v/s Ratio Perm		0.03	c0.03		0.01							
v/c Ratio		0.28	0.30		0.13		0.52	0.29		0.17	0.64	
Uniform Delay, d1		42.0	42.1		41.4		38.5	3.4		48.8	11.7	
Progression Factor		1.00	1.00		1.00		0.90	0.96		1.15	0.37	
Incremental Delay, d2		1.0	1.1		0.4		1.6	0.3		1.9	0.7	
Delay (s)		43.0	43.2		41.8		36.1	3.5		58.2	5.1	
Level of Service		D	D		D		D	A		E	A	
Approach Delay (s)		43.1			41.8			8.7			5.2	
Approach LOS		D			D			A			A	

Intersection Summary				
HCM Average Control Delay	11.7	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.58			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	64.5%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
16: Garcia Avenue & Harbor Street

YR2030 NO Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	56	24	153	81	34	223	88	590	89	386	1141	85
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	61	26	166	88	37	242	96	641	97	420	1240	92
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								663			696	
pX, platoon unblocked	0.85	0.85	0.81	0.85	0.85	0.93	0.81			0.93		
vC, conflicting volume	2898	3055	666	2520	3053	369	1333			738		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2534	2719	135	2087	2717	186	953			581		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	77	0	0	69	84			55		
cM capacity (veh/h)	0	8	724	0	8	771	584			925		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	61	192	88	279	96	428	311	420	827	506
Volume Left	61	0	88	0	96	0	0	420	0	0
Volume Right	0	166	0	242	0	0	97	0	0	92
cSH	0	55	0	56	584	1700	1700	925	1700	1700
Volume to Capacity	Err	3.53	Err	4.97	0.16	0.25	0.18	0.45	0.49	0.30
Queue Length 95th (ft)	Err	Err	Err	Err	15	0	0	60	0	0
Control Delay (s)	Err	Err	Err	Err	12.4	0.0	0.0	12.1	0.0	0.0
Lane LOS	F	F	F	F	B			B		
Approach Delay (s)	Err		Err		1.4			2.9		
Approach LOS	F		F							

Intersection Summary					
Average Delay	Err				
Intersection Capacity Utilization	72.7%	ICU Level of Service		C	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
17: Garcia Avenue & Railroad Avenue

YR2030 NO Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	73	11	34	87	49	88	9	675	45	114	1161	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.96	1.00		0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1785	1583		1805	1583	1770	3506		1770	3521	
Flt Permitted		0.23	1.00		0.97	1.00	0.15	1.00		0.23	1.00	
Satd. Flow (perm)		435	1583		1805	1583	287	3506		431	3521	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	79	12	37	95	53	96	10	734	49	124	1262	46
RTOR Reduction (vph)	0	0	29	0	0	74	0	7	0	0	4	0
Lane Group Flow (vph)	0	91	8	0	148	22	10	776	0	124	1304	0
Turn Type	Perm		Perm	Split		Perm	Perm			Perm		
Protected Phases		4		8	8			2			6	
Permitted Phases	4		4			8	2			6		
Actuated Green, G (s)		16.0	16.0		16.0	16.0	26.0	26.0		26.0	26.0	
Effective Green, g (s)		16.0	16.0		16.0	16.0	26.0	26.0		26.0	26.0	
Actuated g/C Ratio		0.23	0.23		0.23	0.23	0.37	0.37		0.37	0.37	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)		99	362		413	362	107	1302		160	1308	
v/s Ratio Prot					c0.08			0.22			c0.37	
v/s Ratio Perm		c0.21	0.01			0.01	0.03			0.29		
v/c Ratio		0.92	0.02		0.36	0.06	0.09	0.60		0.78	1.00	
Uniform Delay, d1		26.4	20.9		22.7	21.1	14.3	17.8		19.4	22.0	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		0.62	0.58	
Incremental Delay, d2		70.4	0.1		2.4	0.3	1.7	2.0		24.1	21.2	
Delay (s)		96.8	21.1		25.1	21.4	16.1	19.8		36.2	33.9	
Level of Service		F	C		C	C	B	B		D	C	
Approach Delay (s)		74.9			23.7			19.7			34.1	
Approach LOS		E			C			B			C	

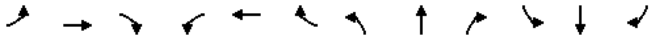
Intersection Summary					
HCM Average Control Delay	30.7	HCM Level of Service		C	
HCM Volume to Capacity ratio	0.80				
Actuated Cycle Length (s)	70.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	60.8%	ICU Level of Service		B	
Analysis Period (min)	15				

c Critical Lane Group

FUTURE YEAR 2015 PROJECT BUILD CONDITIONS – AM PEAK HOUR

HCM Unsignalized Intersection Capacity Analysis
1: Civic Avenue & Davi Avenue

Year 2015 - Build AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	13	110	36	98	130	24	2	7	19	5	16	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	14	120	39	107	141	26	2	8	21	5	17	1

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	173	248	26	10	21	24
Volume Left (vph)	14	107	0	2	0	5
Volume Right (vph)	39	0	26	0	21	1
Hadj (s)	-0.09	0.25	-0.67	0.08	-0.57	0.05
Departure Headway (s)	4.3	5.0	4.0	5.0	3.2	5.0
Degree Utilization, x	0.21	0.34	0.03	0.01	0.02	0.03
Capacity (veh/h)	822	712	871	650	1121	659
Control Delay (s)	8.4	9.3	6.0	8.1	6.3	8.2
Approach Delay (s)	8.4	9.0		6.9		8.2
Approach LOS	A	A		A		A

Intersection Summary				
Delay	8.6			
HCM Level of Service	A			
Intersection Capacity Utilization	40.3%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
3: Civic Avenue & Railroad Avenue

Year 2015 - Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	32	0	72	8	2	8	231	816	7	2	709	119
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97		1.00		1.00		0.97	0.95		1.00	0.95	1.00
Frt	1.00		0.85		0.94		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95		1.00		0.98		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433		1583		1715		3433	3535		1770	3539	1583
Flt Permitted	0.95		1.00		0.98		0.95	1.00		0.27	1.00	1.00
Satd. Flow (perm)	3433		1583		1715		3433	3535		498	3539	1583
Peak-hour factor, PHF	0.72	0.72	0.72	0.56	0.56	0.56	0.77	0.77	0.77	0.92	0.92	0.92
Adj. Flow (vph)	44	0	100	14	4	14	300	1060	9	2	771	129
RTOR Reduction (vph)	0	0	91	0	13	0	0	0	0	0	0	48
Lane Group Flow (vph)	44	0	9	0	19	0	300	1069	0	2	771	81
Turn Type	Prot		custom	Split			Prot			Perm		Perm
Protected Phases	4		4	8	8		5	2			6	
Permitted Phases										6		6
Actuated Green, G (s)	5.3		5.3		2.5		9.9	37.8		23.9	23.9	23.9
Effective Green, g (s)	5.3		5.3		2.5		9.9	37.8		23.9	23.9	23.9
Actuated g/C Ratio	0.09		0.09		0.04		0.17	0.66		0.41	0.41	0.41
Clearance Time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0		3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	316		146		74		590	2320		207	1468	657
v/s Ratio Prot	c0.01		0.01		c0.01		0.09	c0.30			c0.22	
v/s Ratio Perm										0.00		0.05
v/c Ratio	0.14		0.06		0.25		0.51	0.46		0.01	0.53	0.12
Uniform Delay, d1	24.1		23.9		26.6		21.6	4.9		9.9	12.6	10.4
Progression Factor	1.00		1.00		1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.2		0.2		1.8		0.7	0.7		0.1	1.3	0.4
Delay (s)	24.3		24.1		28.4		22.3	5.5		10.0	14.0	10.8
Level of Service	C		C		C		C	A		A	B	B
Approach Delay (s)		24.1			28.4			9.2			13.5	
Approach LOS		C			C			A			B	

Intersection Summary					
HCM Average Control Delay	11.9	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.46				
Actuated Cycle Length (s)	57.6	Sum of lost time (s)		16.0	
Intersection Capacity Utilization	43.9%	ICU Level of Service		A	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
4: Center Drive & Railroad Avenue

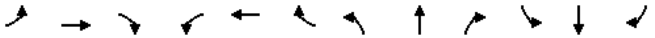
Year 2015 - Build AM

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	12	405	180	1042	819	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	
Frt	0.86	0.85	1.00	1.00	1.00	
Flt Protected	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1595	1504	1770	3539	3538	
Flt Permitted	1.00	1.00	0.30	1.00	1.00	
Satd. Flow (perm)	1595	1504	558	3539	3538	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	13	440	196	1133	890	2
RTOR Reduction (vph)	175	177	0	0	0	0
Lane Group Flow (vph)	54	47	196	1133	892	0
Turn Type		Perm	Perm			
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	7.4	7.4	23.5	23.5	23.5	
Effective Green, g (s)	7.4	7.4	23.5	23.5	23.5	
Actuated g/C Ratio	0.19	0.19	0.60	0.60	0.60	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	303	286	337	2138	2137	
v/s Ratio Prot	c0.03			0.32	0.25	
v/s Ratio Perm		0.03	c0.35			
v/c Ratio	0.18	0.17	0.58	0.53	0.42	
Uniform Delay, d1	13.2	13.2	4.7	4.5	4.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.3	0.3	2.5	0.2	0.1	
Delay (s)	13.5	13.4	7.2	4.7	4.2	
Level of Service	B	B	A	A	A	
Approach Delay (s)	13.5			5.1	4.2	
Approach LOS	B			A	A	

Intersection Summary				
HCM Average Control Delay	6.2	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.48			
Actuated Cycle Length (s)	38.9	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	51.7%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
5: SR-4 WB On-Ramp & Railroad Avenue

Year 2015 - Build AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	11	324	378	584	844	43	63	602	559
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor					0.95		0.97	0.95		1.00	0.95	1.00
Frt					0.92		1.00	0.99		1.00	1.00	0.85
Flt Protected					1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)					3255		3433	3513		1770	3539	1583
Flt Permitted					1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)					3255		3433	3513		1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.83	0.83	0.83	0.96	0.96	0.96	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	13	390	455	608	879	45	65	621	576
RTOR Reduction (vph)	0	0	0	0	219	0	0	6	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	639	0	608	918	0	65	621	576
Turn Type				Split			Prot			Prot		Free
Protected Phases				8	8		5	2		1	6	
Permitted Phases												Free
Actuated Green, G (s)					14.9		16.6	29.5		3.6	16.5	60.0
Effective Green, g (s)					14.9		16.6	29.5		3.6	16.5	60.0
Actuated g/C Ratio					0.25		0.28	0.49		0.06	0.28	1.00
Clearance Time (s)					4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)					3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)					808		950	1727		106	973	1583
v/s Ratio Prot					c0.20		c0.18	0.26		0.04	c0.18	
v/s Ratio Perm												0.36
v/c Ratio					0.79		0.64	0.53		0.61	0.64	0.36
Uniform Delay, d1					21.1		19.1	10.5		27.5	19.1	0.0
Progression Factor					1.00		0.45	0.19		1.00	1.00	1.00
Incremental Delay, d2					5.3		1.0	0.8		10.1	3.2	0.6
Delay (s)					26.4		9.6	2.8		37.6	22.3	0.6
Level of Service					C		A	A		D	C	A
Approach Delay (s)		0.0			26.4			5.5			13.2	
Approach LOS		A			C			A			B	

Intersection Summary				
HCM Average Control Delay	13.1	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.69			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	64.7%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
6: SR-4 EB Off-Ramp & Railroad Avenue

Year 2015 - Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	405	1	377	0	0	0	0	1066	143	208	405	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor	0.95	0.91	0.95					0.91		1.00	0.95	
Frt	1.00	0.93	0.85					0.98		1.00	1.00	
Flt Protected	0.95	0.98	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1681	1532	1504					4995		1770	3539	
Flt Permitted	0.95	0.98	1.00					1.00		0.95	1.00	
Satd. Flow (perm)	1681	1532	1504					4995		1770	3539	
Peak-hour factor, PHF	0.88	0.88	0.88	0.92	0.92	0.92	0.89	0.89	0.89	0.90	0.90	0.90
Adj. Flow (vph)	460	1	428	0	0	0	0	1198	161	231	450	0
RTOR Reduction (vph)	0	59	213	0	0	0	0	28	0	0	0	0
Lane Group Flow (vph)	308	240	69	0	0	0	0	1331	0	231	450	0
Turn Type	Split		Prot							Prot		
Protected Phases	4	4	4					2		1	6	
Permitted Phases												
Actuated Green, G (s)	14.6	14.6	14.6					21.4		12.0	37.4	
Effective Green, g (s)	14.6	14.6	14.6					21.4		12.0	37.4	
Actuated g/C Ratio	0.24	0.24	0.24					0.36		0.20	0.62	
Clearance Time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)	409	373	366					1782		354	2206	
v/s Ratio Prot	c0.18	0.16	0.05					c0.27		c0.13	0.13	
v/s Ratio Perm												
v/c Ratio	0.75	0.64	0.19					0.75		0.65	0.20	
Uniform Delay, d1	21.0	20.4	18.0					16.9		22.1	4.9	
Progression Factor	1.00	1.00	1.00					0.56		1.01	0.10	
Incremental Delay, d2	7.7	3.8	0.2					2.5		3.6	0.2	
Delay (s)	28.7	24.1	18.2					12.0		25.9	0.7	
Level of Service	C	C	B					B		C	A	
Approach Delay (s)		23.8			0.0			12.0			9.2	
Approach LOS		C			A			B			A	

Intersection Summary				
HCM Average Control Delay	14.9	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.73			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	60.4%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
7: Bliss Avenue & Railroad Avenue

Year 2015 - Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	3	3	59	37	218	11	895	87	129	738	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.96	1.00		0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1788	1583		1807	1583	1770	3492		1770	3491	
Flt Permitted		0.76	1.00		0.80	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1412	1583		1487	1583	1770	3492		1770	3491	
Peak-hour factor, PHF	0.68	0.68	0.68	0.91	0.91	0.91	0.85	0.85	0.85	0.91	0.91	0.91
Adj. Flow (vph)	21	4	4	65	41	240	13	1053	102	142	811	81
RTOR Reduction (vph)	0	0	3	0	0	202	0	10	0	0	9	0
Lane Group Flow (vph)	0	25	1	0	106	38	13	1145	0	142	883	0
Turn Type	Perm		Perm	Perm		Perm	Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		9.6	9.6		9.6	9.6	1.3	30.4		8.0	37.1	
Effective Green, g (s)		9.6	9.6		9.6	9.6	1.3	30.4		8.0	37.1	
Actuated g/C Ratio		0.16	0.16		0.16	0.16	0.02	0.51		0.13	0.62	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		226	253		238	253	38	1769		236	2159	
v/s Ratio Prot							0.01	c0.33		c0.08	0.25	
v/s Ratio Perm		0.02	0.00		c0.07	0.02						
v/c Ratio		0.11	0.00		0.45	0.15	0.34	0.65		0.60	0.41	
Uniform Delay, d1		21.5	21.2		22.8	21.7	28.9	10.9		24.5	5.8	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		0.70	0.45	
Incremental Delay, d2		0.2	0.0		1.3	0.3	5.3	1.8		4.1	0.6	
Delay (s)		21.8	21.2		24.1	22.0	34.3	12.7		21.2	3.2	
Level of Service		C	C		C	C	C	B		C	A	
Approach Delay (s)		21.7			22.6			12.9			5.7	
Approach LOS		C			C			B			A	

Intersection Summary				
HCM Average Control Delay	11.4	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.60			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	56.5%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: Leland Road & Railroad Avenue

Year 2015 - Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	143	235	123	157	837	199	290	773	90	199	616	199
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.88
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	2787
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	155	255	134	171	910	216	315	840	98	216	670	216
RTOR Reduction (vph)	0	0	102	0	0	33	0	0	56	0	0	71
Lane Group Flow (vph)	155	255	32	171	910	183	315	840	42	216	670	145
Turn Type	Prot		Perm	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	7.0	19.0	19.0	10.0	22.0	31.0	14.0	21.0	31.0	9.0	16.0	23.0
Effective Green, g (s)	8.0	20.0	19.0	11.0	23.0	33.0	15.0	23.0	33.0	10.0	18.0	25.0
Actuated g/C Ratio	0.10	0.25	0.24	0.14	0.29	0.41	0.19	0.29	0.41	0.12	0.22	0.31
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.0	5.0	5.0	6.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	177	885	376	243	1017	732	332	1017	732	221	796	871
v/s Ratio Prot	0.09	0.07		c0.10	c0.26	0.03	c0.18	c0.24	0.01	0.12	c0.19	0.02
v/s Ratio Perm			0.02			0.08			0.02			0.04
v/c Ratio	0.88	0.29	0.08	0.70	0.89	0.25	0.95	0.83	0.06	0.98	0.84	0.17
Uniform Delay, d1	35.5	24.2	23.7	32.9	27.3	15.4	32.1	26.6	14.1	34.9	29.6	19.9
Progression Factor	1.00	1.00	1.00	0.76	0.52	0.37	1.00	1.00	1.00	0.87	0.85	0.86
Incremental Delay, d2	34.9	0.8	0.4	6.3	8.8	0.1	35.7	7.7	0.0	53.1	10.3	0.1
Delay (s)	70.4	25.1	24.2	31.3	23.1	5.8	67.8	34.3	14.2	83.5	35.7	17.2
Level of Service	E	C	C	C	C	A	E	C	B	F	D	B
Approach Delay (s)		37.8			21.3			41.1			41.4	
Approach LOS		D			C			D			D	

Intersection Summary				
HCM Average Control Delay	34.6	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.84			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	77.5%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: Leland Road & Harbor Street

Year 2015 - Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	184	211	611	43	749	262	75	307	33	172	481	446
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	200	229	664	47	814	285	82	334	36	187	523	485
RTOR Reduction (vph)	0	0	190	0	0	204	0	0	28	0	0	304
Lane Group Flow (vph)	200	229	474	47	814	81	82	334	8	187	523	181
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	11.5	31.8	31.8	2.4	22.7	22.7	4.8	17.1	17.1	10.7	23.0	23.0
Effective Green, g (s)	11.5	32.8	31.8	2.4	23.7	22.7	4.8	18.1	17.1	10.7	24.0	23.0
Actuated g/C Ratio	0.14	0.41	0.40	0.03	0.30	0.28	0.06	0.23	0.21	0.13	0.30	0.29
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	254	1451	629	53	1048	449	106	801	338	237	1062	455
v/s Ratio Prot	0.11	0.06		0.03	c0.23		c0.05	0.09		c0.11	c0.15	
v/s Ratio Perm			c0.30			0.05			0.00			0.11
v/c Ratio	0.79	0.16	0.75	0.89	0.78	0.18	0.77	0.42	0.02	0.79	0.49	0.40
Uniform Delay, d1	33.1	14.9	20.7	38.7	25.7	21.6	37.1	26.4	24.8	33.6	23.0	22.9
Progression Factor	0.90	0.62	0.47	0.68	0.54	0.32	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	14.5	0.2	7.9	75.9	5.0	0.8	28.8	1.6	0.1	15.9	1.6	2.6
Delay (s)	44.2	9.5	17.6	102.3	19.0	7.7	65.9	28.0	25.0	49.4	24.6	25.5
Level of Service	D	A	B	F	B	A	E	C	C	D	C	C
Approach Delay (s)		20.8			19.6			34.7			28.9	
Approach LOS		C			B			C			C	

Intersection Summary				
HCM Average Control Delay	24.5	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.73			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	17.0	
Intersection Capacity Utilization	65.3%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
10: Leland Road & Freed Avenue

Year 2015 - Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	6	485	4	11	802	22	4	8	33	20	7	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.90	0.90	0.90	0.71	0.71	0.71	0.56	0.56	0.56
Hourly flow rate (vph)	7	591	5	12	891	24	6	11	46	36	12	9
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												2
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	916			596			1085	1549	298	1290	1539	458
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	916			596			1085	1549	298	1290	1539	458
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			96	90	93	65	89	98
cM capacity (veh/h)	741			976			151	110	698	102	112	550

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	7	394	202	12	594	321	63	57
Volume Left	7	0	0	12	0	0	6	36
Volume Right	0	0	5	0	0	24	46	9
cSH	741	1700	1700	976	1700	1700	308	124
Volume to Capacity	0.01	0.23	0.12	0.01	0.35	0.19	0.21	0.46
Queue Length 95th (ft)	1	0	0	1	0	0	19	51
Control Delay (s)	9.9	0.0	0.0	8.7	0.0	0.0	19.7	57.4
Lane LOS	A			A			C	F
Approach Delay (s)	0.1			0.1			19.7	57.4
Approach LOS							C	F

Intersection Summary					
Average Delay	2.8				
Intersection Capacity Utilization	39.5%	ICU Level of Service		A	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
11: Leland Road & Loveridge Road

Year 2015 - Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	262	179	62	14	457	128	301	557	73	235	153	259
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	285	195	67	15	497	139	327	605	79	255	166	282
RTOR Reduction (vph)	0	0	55	0	0	111	0	0	68	0	0	210
Lane Group Flow (vph)	285	195	12	15	497	28	327	605	11	255	166	72
Turn Type	Prot		Perm	Prot		Perm	Prot		Over	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	9.5	13.5	13.5	10.9	14.9	14.9	19.0	26.0	10.9	9.6	16.6	16.6
Effective Green, g (s)	10.5	14.5	14.5	11.9	15.9	15.9	20.0	27.0	10.9	10.6	17.6	17.6
Actuated g/C Ratio	0.13	0.18	0.18	0.15	0.20	0.20	0.25	0.34	0.14	0.13	0.22	0.22
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	451	641	287	511	703	315	443	1194	216	455	779	348
v/s Ratio Prot	c0.08	0.06		0.00	c0.14		c0.18	c0.17	0.01	c0.07	0.05	
v/s Ratio Perm			0.01			0.02						0.05
v/c Ratio	0.63	0.30	0.04	0.03	0.71	0.09	0.74	0.51	0.05	0.56	0.21	0.21
Uniform Delay, d1	32.9	28.4	27.0	29.1	29.9	26.1	27.6	21.2	30.0	32.5	25.5	25.5
Progression Factor	1.18	0.87	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.03	0.95	0.83
Incremental Delay, d2	2.8	0.3	0.1	0.0	3.3	0.1	6.3	1.5	0.1	1.4	0.6	1.2
Delay (s)	41.5	24.9	26.7	29.1	33.1	26.3	33.9	22.7	30.1	34.8	24.8	22.3
Level of Service	D	C	C	C	C	C	C	C	C	C	C	C
Approach Delay (s)		33.8			31.6			26.9			27.4	
Approach LOS		C			C			C			C	

Intersection Summary					
HCM Average Control Delay	29.4	HCM Level of Service		C	
HCM Volume to Capacity ratio	0.68				
Actuated Cycle Length (s)	80.0	Sum of lost time (s)		20.0	
Intersection Capacity Utilization	55.5%	ICU Level of Service		B	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
12: SR-4 EB Ramps & Loveridge Road

Year 2015 - Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	185	0	439	0	0	0	0	791	221	0	315	203
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0					4.0			4.0	
Lane Util. Factor	1.00		1.00					0.95			0.95	
Frt	1.00		0.85					0.97			0.94	
Flt Protected	0.95		1.00					1.00			1.00	
Satd. Flow (prot)	1770		1583					3423			3331	
Flt Permitted	0.95		1.00					1.00			1.00	
Satd. Flow (perm)	1770		1583					3423			3331	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	201	0	477	0	0	0	0	860	240	0	342	221
RTOR Reduction (vph)	0	0	303	0	0	0	0	53	0	0	102	0
Lane Group Flow (vph)	201	0	174	0	0	0	0	1047	0	0	461	0
Turn Type	Prot		custom									
Protected Phases	4		4					2			6	
Permitted Phases												
Actuated Green, G (s)	10.4		10.4					21.6			21.6	
Effective Green, g (s)	10.4		10.4					21.6			21.6	
Actuated g/C Ratio	0.26		0.26					0.54			0.54	
Clearance Time (s)	4.0		4.0					4.0			4.0	
Vehicle Extension (s)	3.0		3.0					3.0			3.0	
Lane Grp Cap (vph)	460		412					1848			1799	
v/s Ratio Prot	c0.11		0.11					c0.31			0.14	
v/s Ratio Perm												
v/c Ratio	0.44		0.42					0.57			0.26	
Uniform Delay, d1	12.4		12.3					6.1			4.9	
Progression Factor	1.00		1.00					0.38			1.00	
Incremental Delay, d2	0.7		0.7					1.1			0.3	
Delay (s)	13.0		13.0					3.4			5.3	
Level of Service	B		B					A			A	
Approach Delay (s)		13.0			0.0			3.4			5.3	
Approach LOS		B			A			A			A	

Intersection Summary				
HCM Average Control Delay	6.6	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.52			
Actuated Cycle Length (s)	40.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	49.1%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
13: California Avenue & SR-4 WB Ramps

Year 2015 - Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	198	4	262	268	24	141	38	131	17	8	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		0.97	0.95	1.00	0.95	0.95	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3530		3433	3539	1583	1681	1720	1583	1770	1763	
Flt Permitted	0.57	1.00		0.95	1.00	1.00	0.95	0.88	1.00	0.69	1.00	
Satd. Flow (perm)	1069	3530		3433	3539	1583	1681	1553	1583	1286	1763	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	41	215	4	285	291	26	153	41	142	18	9	5
RTOR Reduction (vph)	0	3	0	0	0	15	0	0	85	0	4	0
Lane Group Flow (vph)	41	216	0	285	291	11	96	98	57	18	10	0
Turn Type	Perm			Prot		Perm	Prot		Perm	Perm		
Protected Phases		4		3	8		5	2			6	
Permitted Phases	4					8			2	6		
Actuated Green, G (s)	7.9	7.9		5.3	17.2	17.2	3.3	17.1	17.1	9.8	9.8	
Effective Green, g (s)	7.9	7.9		5.3	17.2	17.2	3.3	17.1	17.1	9.8	9.8	
Actuated g/C Ratio	0.19	0.19		0.13	0.41	0.41	0.08	0.40	0.40	0.23	0.23	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	200	659		430	1439	644	131	641	640	298	408	
v/s Ratio Prot		c0.06		c0.08	0.08		c0.06	0.01			0.01	
v/s Ratio Perm	0.04					0.01		c0.05	0.04	0.01		
v/c Ratio	0.20	0.33		0.66	0.20	0.02	0.73	0.15	0.09	0.06	0.02	
Uniform Delay, d1	14.5	14.9		17.6	8.1	7.5	19.1	8.0	7.8	12.7	12.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.5	0.3		3.8	0.1	0.0	18.9	0.1	0.3	0.4	0.1	
Delay (s)	15.1	15.2		21.5	8.2	7.5	38.0	8.1	8.1	13.1	12.7	
Level of Service	B	B		C	A	A	D	A	A	B	B	
Approach Delay (s)		15.2			14.4			16.6			12.9	
Approach LOS		B			B			B			B	

Intersection Summary				
HCM Average Control Delay	15.2	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.34			
Actuated Cycle Length (s)	42.3	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	34.6%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
14: California Avenue & Harbor Street

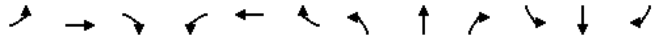
Year 2015 - Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	87	72	109	561	377	236	110	512	55	43	582	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.91		1.00	1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1695		1770	1863	1583	1770	3488		1770	3505	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1695		1770	1863	1583	1770	3488		1770	3505	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	95	78	118	610	410	257	120	557	60	47	633	43
RTOR Reduction (vph)	0	64	0	0	0	147	0	9	0	0	5	0
Lane Group Flow (vph)	95	132	0	610	410	110	120	608	0	47	671	0
Turn Type	Prot			Prot		Perm	Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						
Actuated Green, G (s)	7.7	11.6		34.7	38.6	38.6	7.8	24.5		3.2	19.9	
Effective Green, g (s)	7.7	11.6		34.7	38.6	38.6	7.8	24.5		3.2	19.9	
Actuated g/C Ratio	0.09	0.13		0.39	0.43	0.43	0.09	0.27		0.04	0.22	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	151	218		682	799	679	153	950		63	775	
v/s Ratio Prot	0.05	c0.08		c0.34	c0.22		c0.07	c0.17		0.03	c0.19	
v/s Ratio Perm						0.07						
v/c Ratio	0.63	0.60		0.89	0.51	0.16	0.78	0.64		0.75	0.87	
Uniform Delay, d1	39.8	37.0		25.9	18.8	15.8	40.3	28.9		43.0	33.8	
Progression Factor	1.00	1.00		1.00	1.00	1.00	0.94	0.91		1.00	1.00	
Incremental Delay, d2	8.0	4.7		14.2	0.6	0.1	22.1	3.2		37.6	12.4	
Delay (s)	47.7	41.7		40.1	19.4	15.9	59.8	29.4		80.6	46.1	
Level of Service	D	D		D	B	B	E	C		F	D	
Approach Delay (s)		43.7			28.6			34.4			48.4	
Approach LOS		D			C			C			D	

Intersection Summary				
HCM Average Control Delay	36.2	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.82			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	78.3%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
15: Bliss Avenue & Harbor Street

Year 2015 - Build AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	13	8	125	3	7	1	138	663	5	2	1214	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	*0.95		1.00	*0.95	
Frt		1.00	0.85		0.99		1.00	1.00		1.00	1.00	
Flt Protected		0.97	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1808	1583		1822		1770	3535		1770	3524	
Flt Permitted		0.85	1.00		0.94		0.11	1.00		0.33	1.00	
Satd. Flow (perm)		1586	1583		1739		210	3535		620	3524	
Peak-hour factor, PHF	0.90	0.90	0.90	0.67	0.67	0.67	0.81	0.81	0.81	0.73	0.73	0.73
Adj. Flow (vph)	14	9	139	4	10	1	170	819	6	3	1663	49
RTOR Reduction (vph)	0	0	60	0	4	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	23	79	0	11	0	170	825	0	3	1708	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		9.9	9.9		9.9		72.1	72.1		72.1	72.1	
Effective Green, g (s)		9.9	9.9		9.9		72.1	72.1		72.1	72.1	
Actuated g/C Ratio		0.11	0.11		0.11		0.80	0.80		0.80	0.80	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		174	174		191		168	2832		497	2823	
v/s Ratio Prot								0.23			0.48	
v/s Ratio Perm		0.01	c0.05		0.01		c0.81			0.00		
v/c Ratio		0.13	0.46		0.06		1.01	0.29		0.01	0.60	
Uniform Delay, d1		36.2	37.5		35.9		9.0	2.3		1.8	3.5	
Progression Factor		1.00	1.00		1.00		1.00	1.00		0.32	0.27	
Incremental Delay, d2		0.3	1.9		0.1		72.6	0.3		0.0	0.7	
Delay (s)		36.5	39.4		36.0		81.5	2.6		0.6	1.6	
Level of Service		D	D		D		F	A		A	A	
Approach Delay (s)		39.0			36.0			16.1			1.6	
Approach LOS		D			D			B			A	

Intersection Summary				
HCM Average Control Delay	8.9	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.94			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	55.8%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
16: Garcia Ave & Harbor Street

Year 2015 - Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	9	1	147	57	7	70	149	720	66	109	1049	40
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	1	160	62	8	76	162	783	72	118	1140	43
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								663			696	
pX, platoon unblocked	0.95	0.95	0.95	0.95	0.95	0.99	0.95			0.99		
vC, conflicting volume	2194	2577	592	2110	2563	427	1184			854		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2124	2527	455	2035	2513	412	1080			842		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	10	93	69	0	54	87	73			85		
cM capacity (veh/h)	11	16	523	15	16	585	607			785		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	10	161	62	84	162	522	333	118	760	424
Volume Left	10	0	62	0	162	0	0	118	0	0
Volume Right	0	160	0	76	0	0	72	0	0	43
cSH	11	431	15	141	607	1700	1700	785	1700	1700
Volume to Capacity	0.90	0.37	4.21	0.59	0.27	0.31	0.20	0.15	0.45	0.25
Queue Length 95th (ft)	46	43	Err	77	27	0	0	13	0	0
Control Delay (s)	678.9	18.2	Err	62.1	13.1	0.0	0.0	10.4	0.0	0.0
Lane LOS	F	C	F	F	B			B		
Approach Delay (s)	56.1		4289.0		2.1			0.9		
Approach LOS	F		F							

Intersection Summary				
Average Delay	242.0			
Intersection Capacity Utilization	64.3%	ICU Level of Service	C	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
17: Garcia Ave & Railroad Avenue

Year 2015 - Build AM

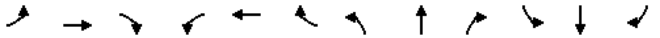
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	11	9	57	12	166	9	857	42	107	693	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.97	1.00		0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1811	1583		1789	1583	1770	3514		1770	3525	
Flt Permitted		0.58	1.00		0.96	1.00	0.33	1.00		0.26	1.00	
Satd. Flow (perm)		1084	1583		1789	1583	623	3514		480	3525	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	12	10	62	13	180	10	932	46	116	753	21
RTOR Reduction (vph)	0	0	9	0	0	160	0	3	0	0	1	0
Lane Group Flow (vph)	0	28	1	0	75	20	10	975	0	116	773	0
Turn Type	Perm		Perm	Split		Perm	Perm			Perm		
Protected Phases		4		8	8			2			6	
Permitted Phases	4		4			8	2			6		
Actuated Green, G (s)		5.4	5.4		8.7	8.7	53.9	53.9		53.9	53.9	
Effective Green, g (s)		5.4	5.4		8.7	8.7	53.9	53.9		53.9	53.9	
Actuated g/C Ratio		0.07	0.07		0.11	0.11	0.67	0.67		0.67	0.67	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		73	107		195	172	420	2368		323	2375	
v/s Ratio Prot					c0.04			c0.28			0.22	
v/s Ratio Perm		c0.03	0.00			0.01	0.02			0.24		
v/c Ratio		0.38	0.01		0.38	0.11	0.02	0.41		0.36	0.33	
Uniform Delay, d1		35.7	34.8		33.2	32.2	4.3	5.9		5.6	5.5	
Progression Factor		1.00	1.00		0.96	1.30	0.23	0.18		1.00	1.00	
Incremental Delay, d2		3.3	0.0		1.2	0.3	0.1	0.4		3.1	0.4	
Delay (s)		39.0	34.8		33.2	42.2	1.0	1.4		8.7	5.8	
Level of Service		D	C		C	D	A	A		A	A	
Approach Delay (s)		37.9			39.6			1.4			6.2	
Approach LOS		D			D			A			A	

Intersection Summary					
HCM Average Control Delay	8.5	HCM Level of Service		A	
HCM Volume to Capacity ratio	0.41				
Actuated Cycle Length (s)	80.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	51.4%	ICU Level of Service		A	
Analysis Period (min)	15				
c Critical Lane Group					

FUTURE YEAR 2015 PROJECT BUILD CONDITIONS – PM PEAK HOUR

HCM Unsignalized Intersection Capacity Analysis
1: Civic Avenue & Davi Avenue

YR2015 Build - PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	3	91	27	69	134	4	6	2	35	6	23	3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	99	29	75	146	4	7	2	38	7	25	3

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	132	221	4	9	38	35
Volume Left (vph)	3	75	0	7	0	7
Volume Right (vph)	29	0	4	0	38	3
Hadj (s)	-0.09	0.20	-0.67	0.18	-0.57	0.02
Departure Headway (s)	4.3	4.9	4.0	5.0	3.2	4.8
Degree Utilization, x	0.16	0.30	0.00	0.01	0.03	0.05
Capacity (veh/h)	827	717	870	668	1121	699
Control Delay (s)	8.1	8.8	5.9	8.0	6.3	8.0
Approach Delay (s)	8.1	8.7		6.6		8.0
Approach LOS	A	A		A		A

Intersection Summary				
Delay	8.3			
HCM Level of Service	A			
Intersection Capacity Utilization	32.8%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
3: Civic Avenue & Railroad Avenue

YR2015 Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	112	0	29	1	2	2	225	558	2	2	731	89
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97		1.00		1.00		0.97	0.95		1.00	0.95	1.00
Frt	1.00		0.85		0.95		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95		1.00		0.99		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433		1583		1745		3433	3537		1770	3539	1583
Flt Permitted	0.30		1.00		0.99		0.95	1.00		0.43	1.00	1.00
Satd. Flow (perm)	1087		1583		1745		3433	3537		800	3539	1583
Peak-hour factor, PHF	0.77	0.77	0.77	0.50	0.50	0.50	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	145	0	38	2	4	4	237	587	2	2	795	97
RTOR Reduction (vph)	0	0	30	0	4	0	0	0	0	0	0	38
Lane Group Flow (vph)	145	0	8	0	6	0	237	589	0	2	795	59
Turn Type	custom		custom	Split			Prot			Perm		Perm
Protected Phases				8	8		5	2			6	
Permitted Phases	4		4							6		6
Actuated Green, G (s)	13.3		13.3		1.1		9.4	37.1		23.7	23.7	23.7
Effective Green, g (s)	13.3		13.3		1.1		9.4	37.1		23.7	23.7	23.7
Actuated g/C Ratio	0.21		0.21		0.02		0.15	0.58		0.37	0.37	0.37
Clearance Time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0		3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	228		332		30		508	2066		299	1321	591
v/s Ratio Prot					c0.00		c0.07	0.17			c0.22	
v/s Ratio Perm	c0.13		0.01							0.00		0.04
v/c Ratio	0.64		0.02		0.20		0.47	0.28		0.01	0.60	0.10
Uniform Delay, d1	22.9		19.9		30.8		24.8	6.6		12.5	16.1	13.0
Progression Factor	1.00		1.00		1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	5.7		0.0		3.3		0.7	0.3		0.0	2.0	0.3
Delay (s)	28.6		20.0		34.1		25.4	6.9		12.5	18.1	13.3
Level of Service	C		B		C		C	A		B	B	B
Approach Delay (s)		26.8			34.1			12.2			17.6	
Approach LOS		C			C			B			B	

Intersection Summary					
HCM Average Control Delay	16.2	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.58				
Actuated Cycle Length (s)	63.5	Sum of lost time (s)		16.0	
Intersection Capacity Utilization	46.5%	ICU Level of Service		A	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
4: Center Drive & Railroad Avenue

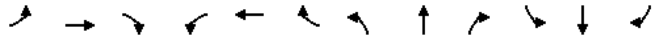
YR2015 Build - PM

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	9	506	321	776	818	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	
Frt	0.86	0.85	1.00	1.00	1.00	
Flt Protected	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1590	1504	1770	3539	3537	
Flt Permitted	1.00	1.00	0.31	1.00	1.00	
Satd. Flow (perm)	1590	1504	568	3539	3537	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	550	349	843	889	4
RTOR Reduction (vph)	233	234	0	0	0	0
Lane Group Flow (vph)	47	46	349	843	893	0
Turn Type		Perm	Perm			
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	9.4	9.4	50.4	50.4	50.4	
Effective Green, g (s)	9.4	9.4	50.4	50.4	50.4	
Actuated g/C Ratio	0.14	0.14	0.74	0.74	0.74	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	220	209	422	2631	2629	
v/s Ratio Prot	0.03			0.24	0.25	
v/s Ratio Perm		c0.03	c0.61			
v/c Ratio	0.22	0.22	0.83	0.32	0.34	
Uniform Delay, d1	25.9	25.9	5.8	2.9	3.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.5	0.5	12.5	0.1	0.1	
Delay (s)	26.4	26.5	18.3	3.0	3.1	
Level of Service	C	C	B	A	A	
Approach Delay (s)	26.4			7.5	3.1	
Approach LOS	C			A	A	

Intersection Summary				
HCM Average Control Delay	10.0	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.73			
Actuated Cycle Length (s)	67.8	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	61.5%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
5: SR-4 WB On-Ramp & Railroad Avenue

YR2015 Build - PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	62	100	267	242	830	127	92	851	381
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor					0.95		0.97	0.95		1.00	0.95	1.00
Frt					0.91		1.00	0.98		1.00	1.00	0.85
Flt Protected					0.99		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)					3186		3433	3469		1770	3539	1583
Flt Permitted					0.99		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)					3186		3433	3469		1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.88	0.88	0.88	0.93	0.93	0.93	0.83	0.83	0.83
Adj. Flow (vph)	0	0	0	70	114	303	260	892	137	111	1025	459
RTOR Reduction (vph)	0	0	0	0	256	0	0	17	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	231	0	260	1012	0	111	1025	459
Turn Type				Split			Prot			Prot		Free
Protected Phases				8	8		5	2		1	6	
Permitted Phases												Free
Actuated Green, G (s)					9.4		7.8	31.4		7.2	30.8	60.0
Effective Green, g (s)					9.4		7.8	31.4		7.2	30.8	60.0
Actuated g/C Ratio					0.16		0.13	0.52		0.12	0.51	1.00
Clearance Time (s)					4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)					3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)					499		446	1815		212	1817	1583
v/s Ratio Prot					c0.07		0.08	c0.29		0.06	c0.29	
v/s Ratio Perm												0.29
v/c Ratio					0.46		0.58	0.56		0.52	0.56	0.29
Uniform Delay, d1					23.0		24.6	9.6		24.8	10.0	0.0
Progression Factor					1.00		0.66	0.35		1.00	1.00	1.00
Incremental Delay, d2					0.7		1.3	0.8		2.3	1.3	0.5
Delay (s)					23.7		17.6	4.2		27.1	11.3	0.5
Level of Service					C		B	A		C	B	A
Approach Delay (s)		0.0			23.7			6.9			9.3	
Approach LOS		A			C			A			A	

Intersection Summary				
HCM Average Control Delay	10.4	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.53			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	55.3%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
6: SR-4 EB Off-Ramp & Railroad Avenue

YR2015 Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	492	0	688	0	0	0	0	707	323	203	710	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor	0.95	0.91	0.95					0.91		1.00	0.95	
Frt	1.00	0.88	0.85					0.95		1.00	1.00	
Flt Protected	0.95	0.99	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1681	1478	1504					4846		1770	3539	
Flt Permitted	0.95	0.99	1.00					1.00		0.95	1.00	
Satd. Flow (perm)	1681	1478	1504					4846		1770	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93	0.88	0.88	0.88
Adj. Flow (vph)	535	0	748	0	0	0	0	760	347	231	807	0
RTOR Reduction (vph)	0	102	102	0	0	0	0	134	0	0	0	0
Lane Group Flow (vph)	449	321	309	0	0	0	0	973	0	231	807	0
Turn Type	Split		Prot							Prot		
Protected Phases	4	4	4					2		1	6	
Permitted Phases												
Actuated Green, G (s)	19.1	19.1	19.1					17.9		11.0	32.9	
Effective Green, g (s)	19.1	19.1	19.1					17.9		11.0	32.9	
Actuated g/C Ratio	0.32	0.32	0.32					0.30		0.18	0.55	
Clearance Time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)	535	470	479					1446		325	1941	
v/s Ratio Prot	c0.27	0.22	0.21					c0.20		c0.13	0.23	
v/s Ratio Perm												
v/c Ratio	0.84	0.68	0.65					0.67		0.71	0.42	
Uniform Delay, d1	19.0	17.8	17.5					18.5		23.0	7.9	
Progression Factor	1.00	1.00	1.00					0.42		0.98	0.68	
Incremental Delay, d2	11.1	4.1	3.0					2.2		6.1	0.6	
Delay (s)	30.1	21.9	20.5					10.0		28.7	5.9	
Level of Service	C	C	C					B		C	A	
Approach Delay (s)		24.3			0.0			10.0			11.0	
Approach LOS		C			A			B			B	

Intersection Summary				
HCM Average Control Delay	15.7	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.75			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	62.8%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
7: Bliss Avenue & Railroad Avenue

YR2015 Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	104	5	10	83	21	139	3	787	17	179	1153	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	0.99	
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1778	1583		1791	1583	1770	3528		1770	3510	
Flt Permitted		0.64	1.00		0.68	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1184	1583		1274	1583	1770	3528		1770	3510	
Peak-hour factor, PHF	0.84	0.84	0.84	0.75	0.75	0.75	0.88	0.88	0.88	0.92	0.92	0.92
Adj. Flow (vph)	124	6	12	111	28	185	3	894	19	195	1253	72
RTOR Reduction (vph)	0	0	10	0	0	149	0	2	0	0	5	0
Lane Group Flow (vph)	0	130	2	0	139	36	3	911	0	195	1320	0
Turn Type	Perm		Perm	Perm		Perm	Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		11.6	11.6		11.6	11.6	0.8	23.2		13.2	35.6	
Effective Green, g (s)		11.6	11.6		11.6	11.6	0.8	23.2		13.2	35.6	
Actuated g/C Ratio		0.19	0.19		0.19	0.19	0.01	0.39		0.22	0.59	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		229	306		246	306	24	1364		389	2083	
v/s Ratio Prot							0.00	c0.26		0.11	c0.38	
v/s Ratio Perm		c0.11	0.00		0.11	0.02						
v/c Ratio		0.57	0.01		0.57	0.12	0.12	0.67		0.50	0.63	
Uniform Delay, d1		21.9	19.5		21.9	20.0	29.3	15.2		20.5	7.9	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		0.70	0.46	
Incremental Delay, d2		3.2	0.0		3.0	0.2	2.3	2.6		0.9	1.2	
Delay (s)		25.1	19.6		24.9	20.1	31.6	17.8		15.2	4.9	
Level of Service		C	B		C	C	C	B		B	A	
Approach Delay (s)		24.7			22.2			17.9			6.2	
Approach LOS		C			C			B			A	

Intersection Summary				
HCM Average Control Delay	12.6	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.62			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	60.0%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: Leland Road & Railroad Avenue

YR2015 Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	157	857	350	180	298	139	246	807	235	174	828	130
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.88
Frt	1.00	0.99	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3370	1441	1770	3539	1583	1770	3539	1583	1770	3539	2787
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3370	1441	1770	3539	1583	1770	3539	1583	1770	3539	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	171	932	380	196	324	151	267	877	255	189	900	141
RTOR Reduction (vph)	0	4	248	0	0	100	0	0	29	0	0	83
Lane Group Flow (vph)	171	966	94	196	324	51	267	877	226	189	900	58
Turn Type	Prot		Perm	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	13.0	22.0	22.0	8.0	17.0	25.0	11.0	21.0	29.0	8.0	18.0	31.0
Effective Green, g (s)	14.0	23.0	22.0	9.0	18.0	27.0	12.0	23.0	31.0	9.0	20.0	33.0
Actuated g/C Ratio	0.18	0.29	0.28	0.11	0.22	0.34	0.15	0.29	0.39	0.11	0.25	0.41
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.0	5.0	5.0	6.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	310	969	396	199	796	534	266	1017	613	199	885	1289
v/s Ratio Prot	0.10	c0.29		c0.11	0.09	0.01	0.15	c0.25	0.04	0.11	c0.25	0.01
v/s Ratio Perm			0.07			0.02			0.10			0.01
v/c Ratio	0.55	1.00	0.24	0.98	0.41	0.10	1.00	0.86	0.37	0.95	1.02	0.05
Uniform Delay, d1	30.1	28.5	22.5	35.4	26.4	18.1	34.0	27.0	17.5	35.3	30.0	14.1
Progression Factor	1.00	1.00	1.00	0.62	0.59	1.16	1.00	1.00	1.00	0.64	0.38	0.00
Incremental Delay, d2	2.1	28.3	1.4	56.6	1.4	0.1	56.1	9.6	0.4	34.9	27.3	0.0
Delay (s)	32.3	56.8	23.9	78.4	17.1	21.0	90.1	36.6	17.9	57.4	38.8	0.0
Level of Service	C	E	C	E	B	C	F	D	B	E	D	A
Approach Delay (s)		46.4			35.9			43.4			37.2	
Approach LOS		D			D			D			D	

Intersection Summary				
HCM Average Control Delay	41.7	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.95			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	87.2%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: Leland Road & Harbor Street

YR2015 Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	162	926	132	29	166	41	175	380	209	200	363	237
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	176	1007	143	32	180	45	190	413	227	217	395	258
RTOR Reduction (vph)	0	0	87	0	0	36	0	0	155	0	0	206
Lane Group Flow (vph)	176	1007	56	32	180	9	190	413	72	217	395	52
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	17.4	31.4	31.4	1.6	15.6	15.6	13.0	16.0	16.0	13.0	16.0	16.0
Effective Green, g (s)	17.4	32.4	31.4	1.6	16.6	15.6	13.0	17.0	16.0	13.0	17.0	16.0
Actuated g/C Ratio	0.22	0.40	0.39	0.02	0.21	0.19	0.16	0.21	0.20	0.16	0.21	0.20
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	385	1433	621	35	734	309	288	752	317	288	752	317
v/s Ratio Prot	0.10	c0.28		c0.02	0.05		0.11	c0.12		c0.12	0.11	
v/s Ratio Perm			0.04			0.01			0.05			0.03
v/c Ratio	0.46	0.70	0.09	0.91	0.25	0.03	0.66	0.55	0.23	0.75	0.53	0.16
Uniform Delay, d1	27.2	19.8	15.3	39.1	26.5	26.1	31.4	28.1	26.8	32.0	27.9	26.5
Progression Factor	0.63	0.46	0.14	0.79	1.01	1.35	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	1.4	0.1	115.6	0.8	0.2	5.4	2.9	1.7	10.6	2.6	1.1
Delay (s)	17.5	10.5	2.3	146.4	27.6	35.4	36.8	31.0	28.5	42.6	30.5	27.6
Level of Service	B	B	A	F	C	D	D	C	C	D	C	C
Approach Delay (s)		10.6			43.7			31.6			32.7	
Approach LOS		B			D			C			C	

Intersection Summary				
HCM Average Control Delay	24.3	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.68			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	63.8%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
10: Leland Road & Freed Avenue

YR2015 Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	20	1390	21	20	193	26	4	4	31	42	1	9
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.81	0.81	0.81	0.54	0.54	0.54	0.60	0.60	0.60
Hourly flow rate (vph)	22	1495	23	25	238	32	7	7	57	70	2	15
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												2
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	270			1517			1718	1869	759	1155	1864	135
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	270			1517			1718	1869	759	1155	1864	135
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			94			86	89	84	36	98	98
cM capacity (veh/h)	1290			436			53	66	349	110	67	889

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	22	996	521	25	159	112	72	87
Volume Left	22	0	0	25	0	0	7	70
Volume Right	0	0	23	0	0	32	57	15
cSH	1290	1700	1700	436	1700	1700	173	130
Volume to Capacity	0.02	0.59	0.31	0.06	0.09	0.07	0.42	0.67
Queue Length 95th (ft)	1	0	0	4	0	0	47	90
Control Delay (s)	7.8	0.0	0.0	13.7	0.0	0.0	39.8	75.5
Lane LOS	A			B			E	F
Approach Delay (s)	0.1			1.2			39.8	75.5
Approach LOS							E	F

Intersection Summary					
Average Delay	5.0				
Intersection Capacity Utilization	54.8%	ICU Level of Service		A	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
11: Leland Road & Loveridge Road

YR2015 Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	465	573	257	181	200	201	38	297	51	201	599	126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.91	0.91	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	1770	3381	1441	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	1770	3381	1441	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	505	623	279	197	217	218	41	323	55	218	651	137
RTOR Reduction (vph)	0	0	174	0	0	187	0	1	45	0	0	85
Lane Group Flow (vph)	505	623	105	197	217	31	41	328	4	218	651	52
Turn Type	Prot		Perm	Prot		Perm	Prot		Over	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	17.2	20.6	20.6	7.0	10.4	10.4	3.0	23.3	7.0	9.1	29.4	29.4
Effective Green, g (s)	18.2	21.6	21.6	8.0	11.4	11.4	4.0	24.3	7.0	10.1	30.4	30.4
Actuated g/C Ratio	0.23	0.27	0.27	0.10	0.14	0.14	0.05	0.30	0.09	0.13	0.38	0.38
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	781	956	427	343	504	226	89	1027	126	433	1345	602
v/s Ratio Prot	0.15	c0.18		c0.06	0.06		0.02	c0.10	0.00	0.06	c0.18	
v/s Ratio Perm			0.07			0.02						0.03
v/c Ratio	0.65	0.65	0.25	0.57	0.43	0.14	0.46	0.32	0.03	0.50	0.48	0.09
Uniform Delay, d1	28.0	25.9	22.8	34.4	31.3	30.0	37.0	21.5	33.4	32.6	18.8	15.9
Progression Factor	0.66	0.63	0.34	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.91	1.18
Incremental Delay, d2	1.6	1.4	0.3	2.3	0.6	0.3	3.7	0.8	0.1	0.9	1.2	0.3
Delay (s)	20.1	17.7	8.1	36.7	31.9	30.3	40.7	22.3	33.5	32.7	18.3	19.0
Level of Service	C	B	A	D	C	C	D	C	C	C	B	B
Approach Delay (s)		16.7			32.8			25.4			21.5	
Approach LOS		B			C			C			C	

Intersection Summary					
HCM Average Control Delay	22.1	HCM Level of Service		C	
HCM Volume to Capacity ratio	0.52				
Actuated Cycle Length (s)	80.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	54.2%	ICU Level of Service		A	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
12: SR-4 EB Ramps & Loveridge Road

YR2015 Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	112	0	192	0	0	0	0	965	68	0	745	157
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0					4.0			4.0	
Lane Util. Factor	1.00		1.00					0.95			0.95	
Frt	1.00		0.85					0.99			0.97	
Flt Protected	0.95		1.00					1.00			1.00	
Satd. Flow (prot)	1770		1583					3504			3447	
Flt Permitted	0.95		1.00					1.00			1.00	
Satd. Flow (perm)	1770		1583					3504			3447	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	122	0	209	0	0	0	0	1049	74	0	810	171
RTOR Reduction (vph)	0	0	130	0	0	0	0	11	0	0	37	0
Lane Group Flow (vph)	122	0	79	0	0	0	0	1112	0	0	944	0
Turn Type	Prot		custom									
Protected Phases	4		4					2			6	
Permitted Phases												
Actuated Green, G (s)	6.8		6.8					25.2			25.2	
Effective Green, g (s)	6.8		6.8					25.2			25.2	
Actuated g/C Ratio	0.17		0.17					0.63			0.63	
Clearance Time (s)	4.0		4.0					4.0			4.0	
Vehicle Extension (s)	3.0		3.0					3.0			3.0	
Lane Grp Cap (vph)	301		269					2208			2172	
v/s Ratio Prot	c0.07		0.05					c0.32			0.27	
v/s Ratio Perm												
v/c Ratio	0.41		0.29					0.50			0.43	
Uniform Delay, d1	14.8		14.5					4.0			3.8	
Progression Factor	1.00		1.00					0.31			1.00	
Incremental Delay, d2	0.9		0.6					0.7			0.6	
Delay (s)	15.7		15.1					2.0			4.4	
Level of Service	B		B					A			A	
Approach Delay (s)		15.3			0.0			2.0			4.4	
Approach LOS		B			A			A			A	

Intersection Summary				
HCM Average Control Delay	4.8	HCM Level of Service		A
HCM Volume to Capacity ratio	0.48			
Actuated Cycle Length (s)	40.0	Sum of lost time (s)		8.0
Intersection Capacity Utilization	44.2%	ICU Level of Service		A
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
13: California Avenue & SR-4 WB Ramps

YR2015 Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	369	4	563	307	5	189	22	562	20	61	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		0.97	0.95	1.00	0.95	0.95	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	0.96	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3534		3433	3539	1583	1681	1702	1583	1770	1795	
Flt Permitted	0.55	1.00		0.95	1.00	1.00	0.95	0.53	1.00	0.80	1.00	
Satd. Flow (perm)	1025	3534		3433	3539	1583	1681	935	1583	1490	1795	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	401	4	612	334	5	205	24	611	22	66	21
RTOR Reduction (vph)	0	2	0	0	0	2	0	0	373	0	19	0
Lane Group Flow (vph)	2	403	0	612	334	3	115	114	238	22	68	0
Turn Type	Perm			Prot		Perm	Prot		Perm	Perm		
Protected Phases		4		3	8		5	2			6	
Permitted Phases	4					8			2	6		
Actuated Green, G (s)	10.4	10.4		9.0	23.4	23.4	4.0	13.0	13.0	5.0	5.0	
Effective Green, g (s)	10.4	10.4		9.0	23.4	23.4	4.0	13.0	13.0	5.0	5.0	
Actuated g/C Ratio	0.23	0.23		0.20	0.53	0.53	0.09	0.29	0.29	0.11	0.11	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	240	828		696	1865	834	151	343	463	168	202	
v/s Ratio Prot		c0.11		c0.18	0.09		c0.07	0.03			0.04	
v/s Ratio Perm	0.00					0.00		0.07	c0.15	0.01		
v/c Ratio	0.01	0.49		0.88	0.18	0.00	0.76	0.33	0.51	0.13	0.34	
Uniform Delay, d1	13.0	14.7		17.2	5.5	5.0	19.7	12.3	13.1	17.7	18.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	0.5		12.2	0.0	0.0	20.0	0.6	4.0	1.6	4.5	
Delay (s)	13.1	15.1		29.4	5.5	5.0	39.8	12.9	17.1	19.4	22.7	
Level of Service	B	B		C	A	A	D	B	B	B	C	
Approach Delay (s)		15.1			20.9			19.6			22.0	
Approach LOS		B			C			B			C	

Intersection Summary				
HCM Average Control Delay	19.5	HCM Level of Service		B
HCM Volume to Capacity ratio	0.61			
Actuated Cycle Length (s)	44.4	Sum of lost time (s)		12.0
Intersection Capacity Utilization	59.5%	ICU Level of Service		B
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
14: California Avenue & Harbor Street

YR2015 Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	27	99	52	446	443	386	74	388	105	114	373	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.95		1.00	1.00	0.85	1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1766		1770	1863	1583	1770	3426		1770	3464	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1766		1770	1863	1583	1770	3426		1770	3464	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	29	108	57	485	482	420	80	422	114	124	405	67
RTOR Reduction (vph)	0	26	0	0	0	230	0	30	0	0	16	0
Lane Group Flow (vph)	29	139	0	485	482	190	80	506	0	124	456	0
Turn Type	Prot			Prot		Perm	Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						
Actuated Green, G (s)	1.9	10.9		25.6	34.6	34.6	4.6	18.1		6.0	19.5	
Effective Green, g (s)	1.9	10.9		25.6	34.6	34.6	4.6	18.1		6.0	19.5	
Actuated g/C Ratio	0.02	0.14		0.33	0.45	0.45	0.06	0.24		0.08	0.25	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	44	251		592	842	715	106	810		139	882	
v/s Ratio Prot	0.02	c0.08		c0.27	0.26		0.05	c0.15		c0.07	0.13	
v/s Ratio Perm						0.12						
v/c Ratio	0.66	0.55		0.82	0.57	0.27	0.75	0.62		0.89	0.52	
Uniform Delay, d1	37.0	30.6		23.4	15.5	13.1	35.4	26.2		35.0	24.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	30.4	2.6		8.7	0.9	0.2	25.8	3.6		45.5	2.2	
Delay (s)	67.4	33.2		32.0	16.5	13.3	61.3	29.8		80.5	26.7	
Level of Service	E	C		C	B	B	E	C		F	C	
Approach Delay (s)		38.3			21.0			33.9			37.9	
Approach LOS		D			C			C			D	

Intersection Summary				
HCM Average Control Delay	28.6	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.72			
Actuated Cycle Length (s)	76.6	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	66.8%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
15: Bliss Avenue & Harbor Street

YR2015 Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	26	4	229	10	4	15	143	526	15	3	820	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85		0.93		1.00	1.00		1.00	0.99	
Flt Protected		0.96	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1786	1583		1704		1770	3524		1770	3510	
Flt Permitted		0.75	1.00		0.90		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1404	1583		1558		1770	3524		1770	3510	
Peak-hour factor, PHF	0.86	0.86	0.86	0.78	0.78	0.78	0.89	0.89	0.89	0.90	0.90	0.90
Adj. Flow (vph)	30	5	266	13	5	19	161	591	17	3	911	53
RTOR Reduction (vph)	0	0	226	0	16	0	0	2	0	0	6	0
Lane Group Flow (vph)	0	35	40	0	21	0	161	606	0	3	958	0
Turn Type	Perm		Perm	Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		7.8	7.8		7.8		10.4	32.1		0.6	22.3	
Effective Green, g (s)		7.8	7.8		7.8		10.4	32.1		0.6	22.3	
Actuated g/C Ratio		0.15	0.15		0.15		0.20	0.61		0.01	0.42	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		209	235		231		351	2155		20	1491	
v/s Ratio Prot							c0.09	0.17		0.00	c0.27	
v/s Ratio Perm		0.02	c0.02		0.01							
v/c Ratio		0.17	0.17		0.09		0.46	0.28		0.15	0.64	
Uniform Delay, d1		19.5	19.5		19.3		18.6	4.8		25.7	11.9	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.4	0.3		0.2		1.0	0.1		3.5	1.0	
Delay (s)		19.9	19.9		19.5		19.5	4.9		29.2	12.9	
Level of Service		B	B		B		B	A		C	B	
Approach Delay (s)		19.9			19.5			7.9			13.0	
Approach LOS		B			B			A			B	

Intersection Summary				
HCM Average Control Delay	12.2	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.50			
Actuated Cycle Length (s)	52.5	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	51.7%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
16: Garcia Avenue & Harbor Street

YR2015 Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	62	32	147	55	34	173	96	492	88	347	757	84
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	67	35	160	60	37	188	104	535	96	377	823	91
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								663			696	
pX, platoon unblocked	0.96	0.96	0.99	0.96	0.96	0.96	0.99			0.96		
vC, conflicting volume	2305	2462	457	2134	2460	315	914			630		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2226	2389	429	2048	2387	192	891			522		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	72	0	0	76	86			62		
cM capacity (veh/h)	0	17	568	0	17	781	748			995		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	67	195	60	225	104	357	274	377	549	366
Volume Left	67	0	60	0	104	0	0	377	0	0
Volume Right	0	160	0	188	0	0	96	0	0	91
cSH	0	84	0	94	748	1700	1700	995	1700	1700
Volume to Capacity	Err	2.30	Err	2.38	0.14	0.21	0.16	0.38	0.32	0.22
Queue Length 95th (ft)	Err	446	Err	511	12	0	0	45	0	0
Control Delay (s)	Err	701.6	Err	724.9	10.6	0.0	0.0	10.8	0.0	0.0
Lane LOS	F	F	F	F	B			B		
Approach Delay (s)	Err		Err		1.5			3.2		
Approach LOS	F		F							

Intersection Summary					
Average Delay	Err				
Intersection Capacity Utilization	64.9%	ICU Level of Service		C	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
17: Garcia Avenue & Railroad Avenue

YR2015 Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	78	16	25	67	52	95	9	646	59	212	1104	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.96	1.00		0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1788	1583		1812	1583	1770	3495		1770	3514	
Flt Permitted		0.20	1.00		0.97	1.00	0.12	1.00		0.26	1.00	
Satd. Flow (perm)		379	1583		1812	1583	219	3495		489	3514	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	85	17	27	73	57	103	10	702	64	230	1200	61
RTOR Reduction (vph)	0	0	21	0	0	82	0	9	0	0	5	0
Lane Group Flow (vph)	0	102	6	0	130	21	10	757	0	230	1256	0
Turn Type	Perm		Perm	Split		Perm	Perm			Perm		
Protected Phases		4		8	8			2			6	
Permitted Phases	4		4			8	2			6		
Actuated Green, G (s)		18.0	18.0		16.0	16.0	34.0	34.0		34.0	34.0	
Effective Green, g (s)		18.0	18.0		16.0	16.0	34.0	34.0		34.0	34.0	
Actuated g/C Ratio		0.22	0.22		0.20	0.20	0.42	0.42		0.42	0.42	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)		85	356		362	317	93	1485		208	1493	
v/s Ratio Prot					c0.07			0.22			0.36	
v/s Ratio Perm		c0.27	0.00			0.01	0.05			c0.47		
v/c Ratio		1.20	0.02		0.36	0.06	0.11	0.51		1.11	0.84	
Uniform Delay, d1		31.0	24.1		27.6	25.9	13.9	16.9		23.0	20.6	
Progression Factor		1.00	1.00		0.80	0.55	0.95	1.00		1.00	1.00	
Incremental Delay, d2		161.0	0.1		2.7	0.4	1.5	0.8		93.6	5.9	
Delay (s)		192.0	24.2		24.7	14.6	14.7	17.8		116.6	26.5	
Level of Service		F	C		C	B	B	B		F	C	
Approach Delay (s)		156.9			20.2			17.7			40.4	
Approach LOS		F			C			B			D	

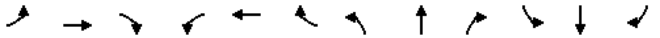
Intersection Summary					
HCM Average Control Delay	37.6	HCM Level of Service		D	
HCM Volume to Capacity ratio	0.95				
Actuated Cycle Length (s)	80.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	58.7%	ICU Level of Service		B	
Analysis Period (min)	15				

c Critical Lane Group

FUTURE YEAR 2030 PROJECT BUILD CONDITIONS – AM PEAK HOUR

HCM Unsignalized Intersection Capacity Analysis
1: Civic Avenue & Davi Avenue

Year 2030 - Build AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	3	130	54	453	125	28	5	2	40	6	29	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	141	59	492	136	30	5	2	43	7	32	5

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	203	628	30	8	43	43
Volume Left (vph)	3	492	0	5	0	7
Volume Right (vph)	59	0	30	0	43	5
Hadj (s)	-0.14	0.43	-0.67	0.18	-0.57	-0.01
Departure Headway (s)	4.8	5.3	4.2	6.3	3.2	6.0
Degree Utilization, x	0.27	0.92	0.04	0.01	0.04	0.07
Capacity (veh/h)	731	628	860	542	1121	571
Control Delay (s)	9.6	38.4	6.1	9.4	6.3	9.5
Approach Delay (s)	9.6	36.9		6.8		9.5
Approach LOS	A	E		A		A

Intersection Summary				
Delay	28.2			
HCM Level of Service	D			
Intersection Capacity Utilization	61.9%	ICU Level of Service	B	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
3: Civic Avenue & Railroad Avenue

Year 2030 - Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	0	132	9	2	7	558	710	7	2	612	127
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97		1.00		1.00		0.97	0.95		1.00	0.95	1.00
Frt	1.00		0.85		0.95		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95		1.00		0.98		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433		1583		1725		3433	3534		1770	3539	1583
Flt Permitted	0.95		1.00		0.98		0.95	1.00		0.31	1.00	1.00
Satd. Flow (perm)	3433		1583		1725		3433	3534		572	3539	1583
Peak-hour factor, PHF	0.72	0.72	0.72	0.56	0.56	0.56	0.77	0.77	0.77	0.92	0.92	0.92
Adj. Flow (vph)	11	0	183	16	4	12	725	922	9	2	665	138
RTOR Reduction (vph)	0	0	161	0	11	0	0	1	0	0	0	73
Lane Group Flow (vph)	11	0	22	0	21	0	725	930	0	2	665	65
Turn Type	Prot		custom	Split			Prot			Perm		Perm
Protected Phases	4		4	8	8		5	2			6	
Permitted Phases										6		6
Actuated Green, G (s)	6.9		6.9		2.6		16.3	36.6		16.3	16.3	16.3
Effective Green, g (s)	6.9		6.9		2.6		16.3	36.6		16.3	16.3	16.3
Actuated g/C Ratio	0.12		0.12		0.04		0.28	0.63		0.28	0.28	0.28
Clearance Time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0		3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	408		188		77		963	2226		160	993	444
v/s Ratio Prot	0.00		c0.01		c0.01		c0.21	0.26			c0.19	
v/s Ratio Perm										0.00		0.04
v/c Ratio	0.03		0.12		0.27		0.75	0.42		0.01	0.67	0.15
Uniform Delay, d1	22.6		22.9		26.8		19.1	5.4		15.1	18.5	15.7
Progression Factor	1.00		1.00		1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.0		0.3		1.9		3.4	0.6		0.1	3.6	0.7
Delay (s)	22.7		23.1		28.7		22.4	6.0		15.2	22.1	16.4
Level of Service	C		C		C		C	A		B	C	B
Approach Delay (s)		23.1			28.7			13.2			21.1	
Approach LOS		C			C			B			C	

Intersection Summary					
HCM Average Control Delay	16.5	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.59				
Actuated Cycle Length (s)	58.1	Sum of lost time (s)		16.0	
Intersection Capacity Utilization	50.5%	ICU Level of Service		A	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
4: Center Drive & Railroad Avenue

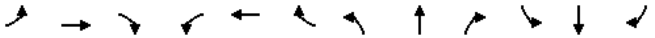
Year 2030 - Build AM

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	24	514	223	1251	742	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	
Frt	0.86	0.85	1.00	1.00	0.99	
Flt Protected	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1601	1504	1770	3539	3515	
Flt Permitted	1.00	1.00	0.32	1.00	1.00	
Satd. Flow (perm)	1601	1504	599	3539	3515	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	559	242	1360	807	39
RTOR Reduction (vph)	188	188	0	0	4	0
Lane Group Flow (vph)	106	103	242	1360	842	0
Turn Type		Perm	Perm			
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	10.0	10.0	52.0	52.0	52.0	
Effective Green, g (s)	10.0	10.0	52.0	52.0	52.0	
Actuated g/C Ratio	0.14	0.14	0.74	0.74	0.74	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	229	215	445	2629	2611	
v/s Ratio Prot	0.07			0.38	0.24	
v/s Ratio Perm		c0.07	c0.40			
v/c Ratio	0.46	0.48	0.54	0.52	0.32	
Uniform Delay, d1	27.5	27.6	3.9	3.8	3.0	
Progression Factor	1.00	1.00	1.05	0.90	1.00	
Incremental Delay, d2	1.5	1.7	3.1	0.5	0.3	
Delay (s)	29.0	29.3	7.2	3.9	3.4	
Level of Service	C	C	A	A	A	
Approach Delay (s)	29.2			4.4	3.4	
Approach LOS	C			A	A	

Intersection Summary				
HCM Average Control Delay	8.9	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.53			
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	55.9%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
5: SR-4 WB On-Ramp & Railroad Avenue

Year 2030 - Build AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	2	401	500	601	974	60	42	902	312
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor					0.95	1.00	0.97	0.95		1.00	0.95	1.00
Frt					1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected					1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)					3538	1583	3433	3509		1770	3539	1583
Flt Permitted					1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)					3538	1583	3433	3509		1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.83	0.83	0.83	0.96	0.96	0.96	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	2	483	602	626	1015	62	43	930	322
RTOR Reduction (vph)	0	0	0	0	0	126	0	6	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	485	476	626	1071	0	43	930	322
Turn Type				Split		Prot	Prot			Prot		Free
Protected Phases				8	8	8	5	2		1	6	
Permitted Phases												Free
Actuated Green, G (s)					22.5	22.5	14.1	33.1		2.4	21.4	70.0
Effective Green, g (s)					22.5	22.5	14.1	33.1		2.4	21.4	70.0
Actuated g/C Ratio					0.32	0.32	0.20	0.47		0.03	0.31	1.00
Clearance Time (s)					4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)					1137	509	692	1659		61	1082	1583
v/s Ratio Prot					0.14	c0.30	c0.18	0.31		0.02	c0.26	
v/s Ratio Perm												0.20
v/c Ratio					0.43	0.94	0.90	0.65		0.70	0.86	0.20
Uniform Delay, d1					18.7	23.1	27.3	14.0		33.4	22.9	0.0
Progression Factor					0.47	0.30	0.99	0.23		0.92	0.92	1.00
Incremental Delay, d2					0.2	21.0	7.8	0.9		28.9	8.3	0.3
Delay (s)					8.9	28.0	34.8	4.2		59.6	29.4	0.3
Level of Service					A	C	C	A		E	C	A
Approach Delay (s)		0.0			19.5			15.4			23.1	
Approach LOS		A			B			B			C	

Intersection Summary				
HCM Average Control Delay	19.0	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.90			
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	66.5%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
6: SR-4 EB Off-Ramp & Railroad Avenue

Year 2030 - Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	440	2	356	0	0	0	0	1195	257	363	541	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor	0.95	0.91	0.95					0.91		1.00	0.95	
Frt	1.00	0.94	0.85					0.97		1.00	1.00	
Flt Protected	0.95	0.97	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1681	1550	1504					4950		1770	3539	
Flt Permitted	0.95	0.97	1.00					1.00		0.95	1.00	
Satd. Flow (perm)	1681	1550	1504					4950		1770	3539	
Peak-hour factor, PHF	0.88	0.88	0.88	0.92	0.92	0.92	0.89	0.89	0.89	0.90	0.90	0.90
Adj. Flow (vph)	500	2	405	0	0	0	0	1343	289	403	601	0
RTOR Reduction (vph)	0	32	228	0	0	0	0	48	0	0	0	0
Lane Group Flow (vph)	315	272	60	0	0	0	0	1584	0	403	601	0
Turn Type	Split		Prot							Prot		
Protected Phases	4	4	4					2		1	6	
Permitted Phases												
Actuated Green, G (s)	14.7	14.7	14.7					25.3		18.0	47.3	
Effective Green, g (s)	14.7	14.7	14.7					25.3		18.0	47.3	
Actuated g/C Ratio	0.21	0.21	0.21					0.36		0.26	0.68	
Clearance Time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)	353	326	316					1789		455	2391	
v/s Ratio Prot	c0.19	0.18	0.04					c0.32		c0.23	0.17	
v/s Ratio Perm												
v/c Ratio	0.89	0.83	0.19					0.89		0.89	0.25	
Uniform Delay, d1	26.9	26.5	22.8					21.0		25.0	4.4	
Progression Factor	1.00	1.00	1.00					0.52		0.26	0.47	
Incremental Delay, d2	23.5	16.5	0.3					4.9		11.7	0.1	
Delay (s)	50.3	42.9	23.1					15.9		18.2	2.2	
Level of Service	D	D	C					B		B	A	
Approach Delay (s)		39.2			0.0			15.9			8.6	
Approach LOS		D			A			B			A	

Intersection Summary				
HCM Average Control Delay	19.8	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.89			
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	74.8%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
7: Bliss Avenue & Railroad Avenue

Year 2030 - Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	41	25	15	60	182	154	142	1175	111	92	792	184
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.97	
Flt Protected		0.97	1.00		0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1807	1583		1840	1583	1770	3493		1770	3439	
Flt Permitted		0.52	1.00		0.90	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		966	1583		1667	1583	1770	3493		1770	3439	
Peak-hour factor, PHF	0.68	0.68	0.68	0.91	0.91	0.91	0.85	0.85	0.85	0.91	0.91	0.91
Adj. Flow (vph)	60	37	22	66	200	169	167	1382	131	101	870	202
RTOR Reduction (vph)	0	0	17	0	0	134	0	10	0	0	28	0
Lane Group Flow (vph)	0	97	5	0	266	35	167	1503	0	101	1044	0
Turn Type	Perm		Perm	Perm		Perm	Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		14.5	14.5		14.5	14.5	9.8	38.3		5.2	33.7	
Effective Green, g (s)		14.5	14.5		14.5	14.5	9.8	38.3		5.2	33.7	
Actuated g/C Ratio		0.21	0.21		0.21	0.21	0.14	0.55		0.07	0.48	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		200	328		345	328	248	1911		131	1656	
v/s Ratio Prot							0.09	c0.43		0.06	c0.30	
v/s Ratio Perm		0.10	0.00		c0.16	0.02						
v/c Ratio		0.48	0.01		0.77	0.11	0.67	0.79		0.77	0.63	
Uniform Delay, d1		24.5	22.1		26.2	22.5	28.6	12.6		31.8	13.5	
Progression Factor		1.00	1.00		0.81	0.80	1.00	1.00		1.12	0.59	
Incremental Delay, d2		1.8	0.0		8.4	0.1	7.0	3.4		23.1	1.8	
Delay (s)		26.3	22.1		29.6	18.2	35.6	16.0		58.8	9.8	
Level of Service		C	C		C	B	D	B		E	A	
Approach Delay (s)		25.5			25.2			17.9			14.0	
Approach LOS		C			C			B			B	

Intersection Summary				
HCM Average Control Delay	17.7	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.78			
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	70.9%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: Leland Road & Railroad Avenue

Year 2030 - Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	290	682	313	160	742	161	401	980	164	244	661	186
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.88
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	2787
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	315	741	340	174	807	175	436	1065	178	265	718	202
RTOR Reduction (vph)	0	0	257	0	0	26	0	0	31	0	0	63
Lane Group Flow (vph)	315	741	83	174	807	149	436	1065	147	265	718	139
Turn Type	Prot		Perm	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	14.0	22.0	22.0	11.0	19.0	31.0	20.0	24.0	35.0	12.0	16.0	30.0
Effective Green, g (s)	15.0	23.0	22.0	12.0	20.0	33.0	21.0	26.0	37.0	13.0	18.0	32.0
Actuated g/C Ratio	0.17	0.26	0.24	0.13	0.22	0.37	0.23	0.29	0.41	0.14	0.20	0.36
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.0	5.0	5.0	6.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	295	904	387	236	786	651	413	1022	651	256	708	991
v/s Ratio Prot	c0.18	0.21		0.10	c0.23	0.03	0.25	c0.30	0.03	0.15	c0.20	0.02
v/s Ratio Perm			0.05			0.06			0.06			0.03
v/c Ratio	1.07	0.82	0.21	0.74	1.03	0.23	1.06	1.04	0.23	1.04	1.01	0.14
Uniform Delay, d1	37.5	31.5	27.1	37.5	35.0	19.7	34.5	32.0	17.2	38.5	36.0	19.7
Progression Factor	1.00	1.00	1.00	0.57	0.52	0.34	1.00	1.00	1.00	0.82	0.90	1.20
Incremental Delay, d2	71.5	8.2	1.3	7.6	32.8	0.1	59.7	39.7	0.2	64.7	36.8	0.1
Delay (s)	109.0	39.8	28.4	28.9	51.2	6.8	94.2	71.7	17.4	96.3	69.1	23.7
Level of Service	F	D	C	C	D	A	F	E	B	F	E	C
Approach Delay (s)		52.6			41.1			71.8			67.4	
Approach LOS		D			D			E			E	

Intersection Summary				
HCM Average Control Delay	59.4	HCM Level of Service	E	
HCM Volume to Capacity ratio	1.02			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	90.5%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: Leland Road & Harbor Street

Year 2030 - Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	380	529	124	49	758	304	67	316	41	167	378	314
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	413	575	135	53	824	330	73	343	45	182	411	341
RTOR Reduction (vph)	0	0	73	0	0	237	0	0	37	0	0	266
Lane Group Flow (vph)	413	575	62	53	824	93	73	343	8	182	411	75
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	22.5	41.6	41.6	3.6	22.7	22.7	6.9	16.0	16.0	10.8	19.9	19.9
Effective Green, g (s)	22.5	42.6	41.6	3.6	23.7	22.7	6.9	17.0	16.0	10.8	20.9	19.9
Actuated g/C Ratio	0.25	0.47	0.46	0.04	0.26	0.25	0.08	0.19	0.18	0.12	0.23	0.22
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	443	1675	732	71	932	399	136	668	281	212	822	350
v/s Ratio Prot	c0.23	0.16		0.03	c0.23		0.04	c0.10		c0.10	0.12	
v/s Ratio Perm			0.04			0.06			0.01			0.05
v/c Ratio	0.93	0.34	0.09	0.75	0.88	0.23	0.54	0.51	0.03	0.86	0.50	0.22
Uniform Delay, d1	33.0	14.9	13.5	42.7	31.8	26.7	40.0	32.8	30.6	38.9	30.0	28.7
Progression Factor	0.58	0.63	0.67	0.66	0.56	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	18.5	0.3	0.1	29.5	10.3	1.1	4.0	2.8	0.2	27.4	2.2	1.4
Delay (s)	37.6	9.8	9.3	57.7	28.1	10.0	44.0	35.6	30.8	66.2	32.2	30.1
Level of Service	D	A	A	E	C	A	D	D	C	E	C	C
Approach Delay (s)		20.0			24.4			36.5			38.0	
Approach LOS		B			C			D			D	

Intersection Summary				
HCM Average Control Delay	28.0	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.81			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	73.3%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
10: Leland Road & Freed Avenue

Year 2030 - Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	8	800	10	26	858	32	4	10	50	27	11	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.90	0.90	0.90	0.71	0.71	0.71	0.56	0.56	0.56
Hourly flow rate (vph)	10	976	12	29	953	36	6	14	70	48	20	7
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												2
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	989			988			1545	2048	494	1614	2036	494
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	989			988			1545	2048	494	1614	2036	494
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			96			89	73	86	0	63	99
cM capacity (veh/h)	695			695			53	52	521	46	53	521

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	10	650	337	29	636	353	90	75
Volume Left	10	0	0	29	0	0	6	48
Volume Right	0	0	12	0	0	36	70	7
cSH	695	1700	1700	695	1700	1700	176	52
Volume to Capacity	0.01	0.38	0.20	0.04	0.37	0.21	0.51	1.44
Queue Length 95th (ft)	1	0	0	3	0	0	64	173
Control Delay (s)	10.3	0.0	0.0	10.4	0.0	0.0	45.2	406.1
Lane LOS	B			B			E	F
Approach Delay (s)	0.1			0.3			45.2	406.1
Approach LOS							E	F

Intersection Summary					
Average Delay	16.0				
Intersection Capacity Utilization	41.9%	ICU Level of Service		A	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
11: Leland Road & Loveridge Road

Year 2030 - Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	415	376	50	7	488	136	305	561	97	365	91	306
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	451	409	54	8	530	148	332	610	105	397	99	333
RTOR Reduction (vph)	0	0	38	0	0	121	0	0	99	0	0	264
Lane Group Flow (vph)	451	409	16	8	530	27	332	610	6	397	99	69
Turn Type	Prot		Perm	Prot		Perm	Prot		Over	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	14.8	25.4	25.4	5.0	15.6	15.6	22.0	25.5	5.0	14.1	17.6	17.6
Effective Green, g (s)	15.8	26.4	26.4	6.0	16.6	16.6	23.0	26.5	5.0	15.1	18.6	18.6
Actuated g/C Ratio	0.18	0.29	0.29	0.07	0.18	0.18	0.26	0.29	0.06	0.17	0.21	0.21
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	603	1038	464	229	653	292	452	1042	88	576	731	327
v/s Ratio Prot	c0.13	0.12		0.00	c0.15		c0.19	c0.17	0.00	c0.12	0.03	
v/s Ratio Perm			0.01			0.02						0.04
v/c Ratio	0.75	0.39	0.03	0.03	0.81	0.09	0.73	0.59	0.07	0.69	0.14	0.21
Uniform Delay, d1	35.2	25.4	22.7	39.3	35.2	30.5	30.7	27.1	40.3	35.2	29.1	29.6
Progression Factor	0.71	0.60	0.38	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.97	1.14
Incremental Delay, d2	4.9	0.2	0.0	0.1	7.6	0.1	6.1	2.4	0.3	3.0	0.3	1.3
Delay (s)	30.0	15.4	8.6	39.4	42.8	30.6	36.8	29.5	40.6	36.6	28.5	34.9
Level of Service	C	B	A	D	D	C	D	C	D	D	C	C
Approach Delay (s)		22.2			40.1			32.9			35.0	
Approach LOS		C			D			C			C	

Intersection Summary					
HCM Average Control Delay	32.0	HCM Level of Service		C	
HCM Volume to Capacity ratio	0.76				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		20.0	
Intersection Capacity Utilization	64.6%	ICU Level of Service		C	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
12: SR-4 EB Ramps & Loveridge Road

Year 2030 - Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	264	0	459	0	0	0	0	884	292	0	399	226
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0					4.0	4.0		4.0	
Lane Util. Factor	1.00		1.00					0.95	1.00		0.95	
Frt	1.00		0.85					1.00	0.85		0.95	
Flt Protected	0.95		1.00					1.00	1.00		1.00	
Satd. Flow (prot)	1770		1583					3539	1583		3347	
Flt Permitted	0.95		1.00					1.00	1.00		1.00	
Satd. Flow (perm)	1770		1583					3539	1583		3347	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	287	0	499	0	0	0	0	961	317	0	434	246
RTOR Reduction (vph)	0	0	202	0	0	0	0	0	151	0	117	0
Lane Group Flow (vph)	287	0	297	0	0	0	0	961	166	0	563	0
Turn Type	Prot		custom						Perm			
Protected Phases	4		4					2			6	
Permitted Phases									2			
Actuated Green, G (s)	13.4		13.4					23.6	23.6		23.6	
Effective Green, g (s)	13.4		13.4					23.6	23.6		23.6	
Actuated g/C Ratio	0.30		0.30					0.52	0.52		0.52	
Clearance Time (s)	4.0		4.0					4.0	4.0		4.0	
Vehicle Extension (s)	3.0		3.0					3.0	3.0		3.0	
Lane Grp Cap (vph)	527		471					1856	830		1755	
v/s Ratio Prot	0.16		c0.19					c0.27			0.17	
v/s Ratio Perm									0.10			
v/c Ratio	0.54		0.63					0.52	0.20		0.32	
Uniform Delay, d1	13.2		13.7					7.0	5.7		6.1	
Progression Factor	1.00		1.00					0.25	0.10		1.00	
Incremental Delay, d2	1.2		2.8					0.8	0.4		0.5	
Delay (s)	14.4		16.4					2.6	1.0		6.6	
Level of Service	B		B					A	A		A	
Approach Delay (s)		15.7			0.0			2.2			6.6	
Approach LOS		B			A			A			A	

Intersection Summary				
HCM Average Control Delay	7.1	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.56			
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	53.4%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
13: California Avenue & SR-4 WB Ramps

Year 2030 - Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	168	2	492	552	28	244	42	156	15	9	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		0.97	0.95	1.00	0.95	0.95	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3533		3433	3539	1583	1681	1709	1583	1770	1748	
Flt Permitted	0.43	1.00		0.95	1.00	1.00	0.95	0.83	1.00	0.65	1.00	
Satd. Flow (perm)	801	3533		3433	3539	1583	1681	1461	1583	1215	1748	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	33	183	2	535	600	30	265	46	170	16	10	7
RTOR Reduction (vph)	0	1	0	0	0	18	0	0	90	0	5	0
Lane Group Flow (vph)	33	184	0	535	600	12	154	157	80	16	12	0
Turn Type	Perm			Prot		Perm	Prot		Perm	Perm		
Protected Phases		4		3	8		5	2			6	
Permitted Phases	4					8			2	6		
Actuated Green, G (s)	9.3	9.3		15.6	28.9	28.9	13.0	33.1	33.1	16.1	16.1	
Effective Green, g (s)	9.3	9.3		15.6	28.9	28.9	13.0	33.1	33.1	16.1	16.1	
Actuated g/C Ratio	0.13	0.13		0.22	0.41	0.41	0.19	0.47	0.47	0.23	0.23	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	106	469		765	1461	654	312	737	749	279	402	
v/s Ratio Prot		0.05		c0.16	c0.17		c0.09	0.04			0.01	
v/s Ratio Perm	0.04					0.01		c0.06	0.05	0.01		
v/c Ratio	0.31	0.39		0.70	0.41	0.02	0.49	0.21	0.11	0.06	0.03	
Uniform Delay, d1	27.5	27.8		25.0	14.5	12.2	25.5	10.8	10.2	21.0	20.9	
Progression Factor	1.07	1.06		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.6	0.5		2.8	0.2	0.0	1.2	0.1	0.3	0.4	0.1	
Delay (s)	30.9	30.0		27.9	14.7	12.2	26.8	11.0	10.5	21.4	21.0	
Level of Service	C	C		C	B	B	C	B	B	C	C	
Approach Delay (s)		30.1			20.7			15.9			21.2	
Approach LOS		C			C			B			C	

Intersection Summary				
HCM Average Control Delay	20.6	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.45			
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	43.3%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
14: California Avenue & Harbor Street

Year 2030 - Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	123	47	90	666	518	478	139	947	48	33	562	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	1863	1583	1770	3514		1770	3500	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3539	1583	1770	1863	1583	1770	3514		1770	3500	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	134	51	98	724	563	520	151	1029	52	36	611	49
RTOR Reduction (vph)	0	0	86	0	0	139	0	5	0	0	9	0
Lane Group Flow (vph)	134	51	12	724	563	381	151	1076	0	36	651	0
Turn Type	Prot		Over	Prot		Perm	Prot			Prot		
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases						8						
Actuated Green, G (s)	8.6	4.2	8.4	28.4	24.0	24.0	8.4	19.8		1.6	13.0	
Effective Green, g (s)	8.6	4.2	8.4	28.4	24.0	24.0	8.4	19.8		1.6	13.0	
Actuated g/C Ratio	0.12	0.06	0.12	0.41	0.34	0.34	0.12	0.28		0.02	0.19	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	217	212	190	718	639	543	212	994		40	650	
v/s Ratio Prot	0.08	0.01	0.01	c0.41	c0.30		0.09	c0.31		0.02	c0.19	
v/s Ratio Perm						0.24						
v/c Ratio	0.62	0.24	0.06	1.01	0.88	0.70	0.71	1.08		0.90	1.00	
Uniform Delay, d1	29.1	31.4	27.3	20.8	21.7	19.9	29.6	25.1		34.1	28.5	
Progression Factor	0.93	1.01	1.22	0.75	0.72	0.56	0.90	0.88		1.00	1.00	
Incremental Delay, d2	5.1	0.6	0.1	35.5	13.4	4.0	9.8	52.3		103.3	35.7	
Delay (s)	32.3	32.4	33.3	51.2	29.1	15.1	36.4	74.3		137.4	64.2	
Level of Service	C	C	C	D	C	B	D	E		F	E	
Approach Delay (s)		32.7			33.9			69.7			68.0	
Approach LOS		C			C			E			E	

Intersection Summary				
HCM Average Control Delay	50.7	HCM Level of Service	D	
HCM Volume to Capacity ratio	1.01			
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	84.6%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
15: Bliss Avenue & Harbor Street

Year 2030 - Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	126	7	29	2	8	5	58	1003	0	9	1082	227
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	*0.95		1.00	*0.95	
Frt		1.00	0.85		0.96		1.00	1.00		1.00	0.97	
Flt Protected		0.95	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1779	1583		1771		1770	3539		1770	3447	
Flt Permitted		0.72	1.00		0.96		0.09	1.00		0.20	1.00	
Satd. Flow (perm)		1344	1583		1714		161	3539		365	3447	
Peak-hour factor, PHF	0.90	0.90	0.90	0.67	0.67	0.67	0.81	0.81	0.81	0.73	0.73	0.73
Adj. Flow (vph)	140	8	32	3	12	7	72	1238	0	12	1482	311
RTOR Reduction (vph)	0	0	27	0	3	0	0	0	0	0	6	0
Lane Group Flow (vph)	0	148	5	0	19	0	72	1238	0	12	1787	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		10.9	10.9		10.9		51.1	51.1		51.1	51.1	
Effective Green, g (s)		10.9	10.9		10.9		51.1	51.1		51.1	51.1	
Actuated g/C Ratio		0.16	0.16		0.16		0.73	0.73		0.73	0.73	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		209	246		267		118	2583		266	2516	
v/s Ratio Prot								0.35			c0.52	
v/s Ratio Perm		c0.11	0.00		0.01		0.45			0.03		
v/c Ratio		0.71	0.02		0.07		0.61	0.48		0.05	0.71	
Uniform Delay, d1		28.0	25.0		25.2		4.6	3.9		2.6	5.3	
Progression Factor		0.96	0.31		1.00		1.00	1.00		0.32	0.39	
Incremental Delay, d2		7.8	0.0		0.1		21.3	0.6		0.2	1.2	
Delay (s)		34.7	7.7		25.3		25.9	4.6		1.1	3.3	
Level of Service		C	A		C		C	A		A	A	
Approach Delay (s)		29.9			25.3			5.7			3.3	
Approach LOS		C			C			A			A	

Intersection Summary				
HCM Average Control Delay	5.9	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.71			
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	64.5%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
16: Garcia Ave & Harbor Street

Year 2030 - Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	24	3	209	45	11	101	192	911	87	150	756	53
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	26	3	227	49	12	110	209	990	95	163	822	58
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								663			696	
pX, platoon unblocked	0.97	0.97		0.97	0.97	0.97				0.97		
vC, conflicting volume	2205	2679	440	2421	2660	542	879			1085		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2183	2670	440	2405	2651	475	879			1032		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	72	60	0	0	79	73			75		
cM capacity (veh/h)	1	12	565	5	12	522	764			651		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	26	230	49	122	209	660	425	163	548	332
Volume Left	26	0	49	0	209	0	0	163	0	0
Volume Right	0	227	0	110	0	0	95	0	0	58
cSH	1	338	5	101	764	1700	1700	651	1700	1700
Volume to Capacity	44.53	0.68	9.44	1.21	0.27	0.39	0.25	0.25	0.32	0.20
Queue Length 95th (ft)	Err	119	Err	205	28	0	0	25	0	0
Control Delay (s)	Err	35.6	Err	233.7	11.5	0.0	0.0	12.4	0.0	0.0
Lane LOS	F	E	F	F	B			B		
Approach Delay (s)	1048.9		3032.7		1.9			1.9		
Approach LOS	F		F							

Intersection Summary				
Average Delay	286.3			
Intersection Capacity Utilization	66.0%	ICU Level of Service	C	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
17: Garcia Ave & Railroad Avenue

Year 2030 - Build AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	48	19	8	94	25	154	21	1112	88	85	740	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.97	1.00		0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1799	1583		1792	1583	1770	3500		1770	3528	
Flt Permitted		0.21	1.00		0.96	1.00	0.28	1.00		0.13	1.00	
Satd. Flow (perm)		399	1583		1792	1583	529	3500		233	3528	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	52	21	9	102	27	167	23	1209	96	92	804	17
RTOR Reduction (vph)	0	0	7	0	0	145	0	6	0	0	1	0
Lane Group Flow (vph)	0	73	2	0	129	22	23	1299	0	92	820	0
Turn Type	Perm		Perm	Split		Perm	Perm			Perm		
Protected Phases		4		8	8			2			6	
Permitted Phases	4		4			8	2			6		
Actuated Green, G (s)		16.0	16.0		11.7	11.7	50.3	50.3		50.3	50.3	
Effective Green, g (s)		16.0	16.0		11.7	11.7	50.3	50.3		50.3	50.3	
Actuated g/C Ratio		0.18	0.18		0.13	0.13	0.56	0.56		0.56	0.56	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		71	281		233	206	296	1956		130	1972	
v/s Ratio Prot					c0.07			0.37			0.23	
v/s Ratio Perm		c0.18	0.00			0.01	0.04			c0.39		
v/c Ratio		1.03	0.01		0.55	0.11	0.08	0.66		0.71	0.42	
Uniform Delay, d1		37.0	30.5		36.7	34.5	9.2	13.9		14.5	11.4	
Progression Factor		1.00	1.00		1.03	1.48	0.26	0.38		1.00	1.00	
Incremental Delay, d2		114.8	0.0		2.7	0.2	0.2	0.6		27.7	0.6	
Delay (s)		151.8	30.5		40.5	51.2	2.5	5.9		42.2	12.1	
Level of Service		F	C		D	D	A	A		D	B	
Approach Delay (s)		138.5			46.5			5.8			15.1	
Approach LOS		F			D			A			B	

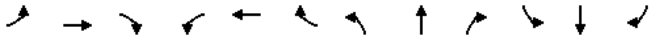
Intersection Summary					
HCM Average Control Delay	17.8	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.75				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	61.4%	ICU Level of Service		B	
Analysis Period (min)	15				

c Critical Lane Group

FUTURE YEAR 2030 PROJECT BUILD CONDITIONS – PM PEAK HOUR

HCM Unsignalized Intersection Capacity Analysis
1: Civic Avenue & Davi Avenue

YR2030 Build - PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	2	118	18	134	135	8	9	7	202	13	23	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	128	20	146	147	9	10	8	220	14	25	4

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	150	292	9	17	220	43
Volume Left (vph)	2	146	0	10	0	14
Volume Right (vph)	20	0	9	0	220	4
Hadj (s)	-0.04	0.28	-0.67	0.15	-0.57	0.04
Departure Headway (s)	4.5	5.1	4.1	5.2	3.2	5.1
Degree Utilization, x	0.19	0.41	0.01	0.03	0.20	0.06
Capacity (veh/h)	785	696	853	628	1121	650
Control Delay (s)	8.5	10.3	5.9	8.3	7.0	8.4
Approach Delay (s)	8.5	10.2		7.1		8.4
Approach LOS	A	B		A		A

Intersection Summary				
Delay	8.7			
HCM Level of Service	A			
Intersection Capacity Utilization	43.9%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
3: Civic Avenue & Railroad Avenue

YR2030 Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	153	0	121	3	2	1	181	622	3	2	697	182
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97		1.00		1.00		0.97	0.95		1.00	0.95	1.00
Frt	1.00		0.85		0.98		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95		1.00		0.98		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433		1583		1776		3433	3537		1770	3539	1583
Flt Permitted	0.51		1.00		0.98		0.95	1.00		0.40	1.00	1.00
Satd. Flow (perm)	1825		1583		1776		3433	3537		748	3539	1583
Peak-hour factor, PHF	0.77	0.77	0.77	0.50	0.50	0.50	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	199	0	157	6	4	2	191	655	3	2	758	198
RTOR Reduction (vph)	0	0	131	0	2	0	0	0	0	0	0	65
Lane Group Flow (vph)	199	0	26	0	10	0	191	658	0	2	758	133
Turn Type	custom		custom	Split			Prot			Perm		Perm
Protected Phases				8	8		5	2			6	
Permitted Phases	4		4							6		6
Actuated Green, G (s)	13.3		13.3		1.4		9.8	53.3		39.5	39.5	39.5
Effective Green, g (s)	13.3		13.3		1.4		9.8	53.3		39.5	39.5	39.5
Actuated g/C Ratio	0.17		0.17		0.02		0.12	0.67		0.49	0.49	0.49
Clearance Time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0		3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	303		263		31		421	2357		369	1747	782
v/s Ratio Prot					c0.01		c0.06	0.19			c0.21	
v/s Ratio Perm	c0.11		0.02							0.00		0.08
v/c Ratio	0.66		0.10		0.32		0.45	0.28		0.01	0.43	0.17
Uniform Delay, d1	31.2		28.3		38.8		32.6	5.5		10.3	13.0	11.2
Progression Factor	1.00		1.00		1.00		0.84	1.41		1.00	1.00	1.00
Incremental Delay, d2	5.1		0.2		6.0		0.7	0.3		0.0	0.8	0.5
Delay (s)	36.3		28.4		44.8		28.2	8.0		10.3	13.8	11.7
Level of Service	D		C		D		C	A		B	B	B
Approach Delay (s)		32.8			44.8			12.5			13.4	
Approach LOS		C			D			B			B	

Intersection Summary					
HCM Average Control Delay	16.4	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.48				
Actuated Cycle Length (s)	80.0	Sum of lost time (s)		16.0	
Intersection Capacity Utilization	42.1%	ICU Level of Service		A	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
4: Center Drive & Railroad Avenue

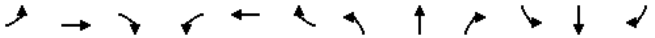
YR2030 Build - PM

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	15	669	344	791	853	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	
Frt	0.86	0.85	1.00	1.00	1.00	
Flt Protected	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1592	1504	1770	3539	3535	
Flt Permitted	1.00	1.00	0.28	1.00	1.00	
Satd. Flow (perm)	1592	1504	529	3539	3535	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	727	374	860	927	7
RTOR Reduction (vph)	159	159	0	0	1	0
Lane Group Flow (vph)	213	212	374	860	933	0
Turn Type		Perm	Perm			
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	13.9	13.9	58.1	58.1	58.1	
Effective Green, g (s)	13.9	13.9	58.1	58.1	58.1	
Actuated g/C Ratio	0.17	0.17	0.73	0.73	0.73	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	277	261	384	2570	2567	
v/s Ratio Prot	0.13			0.24	0.26	
v/s Ratio Perm		c0.14	c0.71			
v/c Ratio	0.77	0.81	0.97	0.33	0.36	
Uniform Delay, d1	31.5	31.8	10.2	4.0	4.1	
Progression Factor	1.00	1.00	0.43	0.27	0.51	
Incremental Delay, d2	12.0	17.1	35.0	0.3	0.4	
Delay (s)	43.5	48.9	39.4	1.4	2.4	
Level of Service	D	D	D	A	A	
Approach Delay (s)	46.2			12.9	2.4	
Approach LOS	D			B	A	

Intersection Summary				
HCM Average Control Delay	18.0	HCM Level of Service		B
HCM Volume to Capacity ratio	0.94			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)		8.0
Intersection Capacity Utilization	67.4%	ICU Level of Service		C
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
5: SR-4 WB On-Ramp & Railroad Avenue

YR2030 Build - PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	131	129	306	265	829	231	121	1101	300
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor					0.95	1.00	0.97	0.95		1.00	0.95	1.00
Frt					1.00	0.85	1.00	0.97		1.00	1.00	0.85
Flt Protected					0.98	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)					3452	1583	3433	3424		1770	3539	1583
Flt Permitted					0.98	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)					3452	1583	3433	3424		1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.88	0.88	0.88	0.93	0.93	0.93	0.83	0.83	0.83
Adj. Flow (vph)	0	0	0	149	147	348	285	891	248	146	1327	361
RTOR Reduction (vph)	0	0	0	0	0	265	0	28	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	296	83	285	1111	0	146	1327	361
Turn Type				Split		Prot	Prot			Prot		Free
Protected Phases				8	8	8	5	2		1	6	
Permitted Phases												Free
Actuated Green, G (s)					12.8	12.8	10.4	42.8		12.4	44.8	80.0
Effective Green, g (s)					12.8	12.8	10.4	42.8		12.4	44.8	80.0
Actuated g/C Ratio					0.16	0.16	0.13	0.53		0.16	0.56	1.00
Clearance Time (s)					4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)					552	253	446	1832		274	1982	1583
v/s Ratio Prot					c0.09	0.05	c0.08	0.32		0.08	c0.37	
v/s Ratio Perm												c0.23
v/c Ratio					0.54	0.33	0.64	0.61		0.53	0.67	0.23
Uniform Delay, d1					30.9	29.8	33.0	12.8		31.1	12.4	0.0
Progression Factor					1.00	1.00	0.91	0.31		1.02	0.64	1.00
Incremental Delay, d2					1.0	0.8	1.4	0.7		1.7	1.6	0.3
Delay (s)					31.9	30.6	31.5	4.7		33.6	9.5	0.3
Level of Service					C	C	C	A		C	A	A
Approach Delay (s)		0.0			31.2			10.1			9.6	
Approach LOS		A			C			B			A	

Intersection Summary				
HCM Average Control Delay	13.3	HCM Level of Service		B
HCM Volume to Capacity ratio	0.64			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)		12.0
Intersection Capacity Utilization	55.9%	ICU Level of Service		B
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
6: SR-4 EB Off-Ramp & Railroad Avenue

YR2030 Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	459	0	646	0	0	0	0	866	498	325	907	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor	0.95	0.91	0.95					0.91		1.00	0.95	
Frt	1.00	0.88	0.85					0.95		1.00	1.00	
Flt Protected	0.95	0.99	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1681	1477	1504					4807		1770	3539	
Flt Permitted	0.95	0.99	1.00					1.00		0.95	1.00	
Satd. Flow (perm)	1681	1477	1504					4807		1770	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93	0.88	0.88	0.88
Adj. Flow (vph)	499	0	702	0	0	0	0	931	535	369	1031	0
RTOR Reduction (vph)	0	85	85	0	0	0	0	128	0	0	0	0
Lane Group Flow (vph)	419	311	301	0	0	0	0	1338	0	369	1031	0
Turn Type	Split		Prot							Prot		
Protected Phases	4	4	4					2		1	6	
Permitted Phases												
Actuated Green, G (s)	22.3	22.3	22.3					25.7		20.0	49.7	
Effective Green, g (s)	22.3	22.3	22.3					25.7		20.0	49.7	
Actuated g/C Ratio	0.28	0.28	0.28					0.32		0.25	0.62	
Clearance Time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)	469	412	419					1544		443	2199	
v/s Ratio Prot	c0.25	0.21	0.20					c0.28		c0.21	0.29	
v/s Ratio Perm												
v/c Ratio	0.89	0.75	0.72					0.87		0.83	0.47	
Uniform Delay, d1	27.7	26.4	26.0					25.5		28.4	8.1	
Progression Factor	1.00	1.00	1.00					0.41		0.98	0.52	
Incremental Delay, d2	19.0	7.7	5.8					3.5		9.9	0.5	
Delay (s)	46.7	34.0	31.8					14.0		37.8	4.8	
Level of Service	D	C	C					B		D	A	
Approach Delay (s)		37.7			0.0			14.0			13.5	
Approach LOS		D			A			B			B	

Intersection Summary				
HCM Average Control Delay	20.8	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.87			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	75.2%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
7: Bliss Avenue & Railroad Avenue

YR2030 Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	271	39	95	131	26	106	8	987	63	172	1339	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.96	1.00		0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1785	1583		1788	1583	1770	3507		1770	3523	
Flt Permitted		0.56	1.00		0.37	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1037	1583		690	1583	1770	3507		1770	3523	
Peak-hour factor, PHF	0.84	0.84	0.84	0.75	0.75	0.75	0.88	0.88	0.88	0.92	0.92	0.92
Adj. Flow (vph)	323	46	113	175	35	141	9	1122	72	187	1455	46
RTOR Reduction (vph)	0	0	72	0	0	90	0	6	0	0	3	0
Lane Group Flow (vph)	0	369	41	0	210	51	9	1188	0	187	1498	0
Turn Type	Perm		Perm	Perm		Perm	Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		29.0	29.0		29.0	29.0	0.8	26.8		12.2	38.2	
Effective Green, g (s)		29.0	29.0		29.0	29.0	0.8	26.8		12.2	38.2	
Actuated g/C Ratio		0.36	0.36		0.36	0.36	0.01	0.34		0.15	0.48	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		376	574		250	574	18	1175		270	1682	
v/s Ratio Prot							0.01	c0.34		c0.11	c0.43	
v/s Ratio Perm		c0.36	0.03		0.30	0.03						
v/c Ratio		0.98	0.07		0.84	0.09	0.50	1.01		0.69	0.89	
Uniform Delay, d1		25.2	16.7		23.4	16.8	39.4	26.6		32.1	19.0	
Progression Factor		1.00	1.00		0.69	0.30	0.73	0.57		0.75	0.59	
Incremental Delay, d2		41.2	0.1		19.4	0.1	17.5	27.0		6.1	6.3	
Delay (s)		66.5	16.7		35.5	5.1	46.2	42.2		30.4	17.6	
Level of Service		E	B		D	A	D	D		C	B	
Approach Delay (s)		54.8			23.3			42.3			19.0	
Approach LOS		D			C			D			B	

Intersection Summary				
HCM Average Control Delay	31.6	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.93			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	75.4%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: Leland Road & Railroad Avenue

YR2030 Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	177	904	447	281	661	191	437	889	243	170	987	220
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.88
Frt	1.00	0.99	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3366	1441	1770	3539	1583	1770	3539	1583	1770	3539	2787
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3366	1441	1770	3539	1583	1770	3539	1583	1770	3539	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	192	983	486	305	718	208	475	966	264	185	1073	239
RTOR Reduction (vph)	0	2	282	0	0	36	0	0	29	0	0	50
Lane Group Flow (vph)	192	1030	155	305	718	172	475	966	235	185	1073	189
Turn Type	Prot		Perm	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	17.0	37.0	37.0	19.0	39.0	56.0	29.0	46.0	65.0	17.0	34.0	51.0
Effective Green, g (s)	18.0	38.0	37.0	20.0	40.0	58.0	30.0	48.0	67.0	18.0	36.0	53.0
Actuated g/C Ratio	0.13	0.27	0.26	0.14	0.29	0.41	0.21	0.34	0.48	0.13	0.26	0.38
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.0	5.0	5.0	6.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	228	914	381	253	1011	701	379	1213	803	228	910	1055
v/s Ratio Prot	0.11	c0.31		c0.17	0.20	0.03	c0.27	0.27	0.04	0.10	c0.30	0.02
v/s Ratio Perm			0.11			0.08			0.11			0.04
v/c Ratio	0.84	1.13	0.41	1.21	0.71	0.24	1.25	0.80	0.29	0.81	1.18	0.18
Uniform Delay, d1	59.6	51.0	42.5	60.0	44.8	26.7	55.0	41.6	22.1	59.3	52.0	29.0
Progression Factor	1.00	1.00	1.00	0.93	0.87	0.71	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	23.5	71.1	3.2	113.4	2.6	0.1	134.0	5.5	0.2	19.3	92.0	0.1
Delay (s)	83.1	122.1	45.7	169.5	41.6	19.0	189.0	47.1	22.3	78.6	144.0	29.1
Level of Service	F	F	D	F	D	B	F	D	C	E	F	C
Approach Delay (s)		97.5			69.5			82.8			117.6	
Approach LOS		F			E			F			F	

Intersection Summary				
HCM Average Control Delay	92.6	HCM Level of Service	F	
HCM Volume to Capacity ratio	1.15			
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	110.1%	ICU Level of Service	H	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: Leland Road & Harbor Street

YR2030 Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	220	911	131	50	411	98	208	428	171	269	493	683
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	239	990	142	54	447	107	226	465	186	292	536	742
RTOR Reduction (vph)	0	0	76	0	0	83	0	0	128	0	0	286
Lane Group Flow (vph)	239	990	66	54	447	24	226	465	58	292	536	456
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	21.6	47.4	47.4	5.6	31.4	31.4	20.6	41.3	41.3	27.7	48.4	48.4
Effective Green, g (s)	21.6	48.4	47.4	5.6	32.4	31.4	20.6	42.3	41.3	27.7	49.4	48.4
Actuated g/C Ratio	0.15	0.35	0.34	0.04	0.23	0.22	0.15	0.30	0.29	0.20	0.35	0.35
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	273	1223	536	71	819	355	260	1069	467	350	1249	547
v/s Ratio Prot	c0.14	c0.28		0.03	c0.13		0.13	0.13		c0.17	0.15	
v/s Ratio Perm			0.04			0.02			0.04			c0.29
v/c Ratio	0.88	0.81	0.12	0.76	0.55	0.07	0.87	0.43	0.12	0.83	0.43	0.83
Uniform Delay, d1	57.9	41.6	32.0	66.5	47.3	42.8	58.4	39.2	36.1	53.9	34.5	42.1
Progression Factor	0.74	0.40	0.12	0.80	0.76	1.26	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.8	2.1	0.2	33.9	2.3	0.3	25.0	1.3	0.5	15.6	1.1	13.9
Delay (s)	53.5	18.7	4.1	87.4	38.4	54.2	83.4	40.5	36.7	69.5	35.6	56.0
Level of Service	D	B	A	F	D	D	F	D	D	E	D	E
Approach Delay (s)		23.2			45.5			50.8			51.6	
Approach LOS		C			D			D			D	

Intersection Summary				
HCM Average Control Delay	41.8	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.78			
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	76.0%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
10: Leland Road & Freed Avenue

YR2030 Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	17	1408	22	43	506	45	10	6	53	45	2	13
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.81	0.81	0.81	0.54	0.54	0.54	0.60	0.60	0.60
Hourly flow rate (vph)	18	1514	24	53	625	56	19	11	98	75	3	22
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												2
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	680			1538			1983	2349	769	1656	2333	340
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	680			1538			1983	2349	769	1656	2333	340
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			88			36	64	71	0	89	97
cM capacity (veh/h)	908			428			29	30	344	30	31	656

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	18	1009	528	53	416	264	128	100
Volume Left	18	0	0	53	0	0	19	75
Volume Right	0	0	24	0	0	56	98	22
cSH	908	1700	1700	428	1700	1700	99	37
Volume to Capacity	0.02	0.59	0.31	0.12	0.24	0.16	1.29	2.67
Queue Length 95th (ft)	2	0	0	11	0	0	224	279
Control Delay (s)	9.0	0.0	0.0	14.6	0.0	0.0	266.2	983.0
Lane LOS	A			B			F	F
Approach Delay (s)	0.1			1.1			266.2	983.0
Approach LOS							F	F

Intersection Summary					
Average Delay	52.9				
Intersection Capacity Utilization	57.1%	ICU Level of Service		B	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
11: Leland Road & Loveridge Road

YR2030 Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	443	659	239	286	489	327	46	235	49	239	573	186
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.91	0.91	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	1770	3380	1441	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	1770	3380	1441	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	482	716	260	311	532	355	50	255	53	260	623	202
RTOR Reduction (vph)	0	0	155	0	0	272	0	2	43	0	0	138
Lane Group Flow (vph)	482	716	105	311	532	83	50	258	5	260	623	64
Turn Type	Prot		Perm	Prot		Perm	Prot		Over	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	11.0	18.5	18.5	7.8	15.3	15.3	2.4	15.7	7.8	8.0	21.3	21.3
Effective Green, g (s)	12.0	19.5	19.5	8.8	16.3	16.3	3.4	16.7	7.8	9.0	22.3	22.3
Actuated g/C Ratio	0.17	0.28	0.28	0.13	0.23	0.23	0.05	0.24	0.11	0.13	0.32	0.32
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	589	986	441	432	824	369	86	806	161	441	1127	504
v/s Ratio Prot	c0.14	c0.20		0.09	c0.15		c0.03	0.08	0.00	0.08	c0.18	
v/s Ratio Perm			0.07			0.05						0.04
v/c Ratio	0.82	0.73	0.24	0.72	0.65	0.22	0.58	0.32	0.03	0.59	0.55	0.13
Uniform Delay, d1	27.9	22.8	19.5	29.4	24.2	21.7	32.6	22.0	27.7	28.8	19.7	16.9
Progression Factor	0.80	0.72	0.94	1.00	1.00	1.00	1.00	1.00	1.00	0.88	0.82	0.43
Incremental Delay, d2	7.1	2.2	0.2	5.7	1.7	0.3	9.6	1.0	0.1	1.9	1.8	0.5
Delay (s)	29.4	18.7	18.6	35.1	26.0	22.0	42.2	23.0	27.8	27.2	18.0	7.7
Level of Service	C	B	B	D	C	C	D	C	C	C	B	A
Approach Delay (s)		22.2			27.2			26.3			18.3	
Approach LOS		C			C			C			B	

Intersection Summary					
HCM Average Control Delay	23.0	HCM Level of Service		C	
HCM Volume to Capacity ratio	0.62				
Actuated Cycle Length (s)	70.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	58.9%	ICU Level of Service		B	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
12: SR-4 EB Ramps & Loveridge Road

YR2030 Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	157	0	216	0	0	0	0	942	135	0	795	121
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0					4.0	4.0		4.0	
Lane Util. Factor	1.00		1.00					0.95	1.00		0.95	
Frt	1.00		0.85					1.00	0.85		0.98	
Flt Protected	0.95		1.00					1.00	1.00		1.00	
Satd. Flow (prot)	1770		1583					3539	1583		3469	
Flt Permitted	0.95		1.00					1.00	1.00		1.00	
Satd. Flow (perm)	1770		1583					3539	1583		3469	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	171	0	235	0	0	0	0	1024	147	0	864	132
RTOR Reduction (vph)	0	0	130	0	0	0	0	0	42	0	12	0
Lane Group Flow (vph)	171	0	105	0	0	0	0	1024	105	0	984	0
Turn Type	Prot		custom						Perm			
Protected Phases	4		4					2			6	
Permitted Phases									2			
Actuated Green, G (s)	12.2		12.2					49.8	49.8		49.8	
Effective Green, g (s)	12.2		12.2					49.8	49.8		49.8	
Actuated g/C Ratio	0.17		0.17					0.71	0.71		0.71	
Clearance Time (s)	4.0		4.0					4.0	4.0		4.0	
Vehicle Extension (s)	3.0		3.0					3.0	3.0		3.0	
Lane Grp Cap (vph)	308		276					2518	1126		2468	
v/s Ratio Prot	c0.10		0.07					c0.29			0.28	
v/s Ratio Perm									0.07			
v/c Ratio	0.56		0.38					0.41	0.09		0.40	
Uniform Delay, d1	26.4		25.6					4.1	3.1		4.1	
Progression Factor	1.00		1.00					0.63	0.69		1.00	
Incremental Delay, d2	2.2		0.9					0.4	0.1		0.5	
Delay (s)	28.6		26.4					3.0	2.3		4.6	
Level of Service	C		C					A	A		A	
Approach Delay (s)		27.3			0.0			2.9			4.6	
Approach LOS		C			A			A			A	

Intersection Summary				
HCM Average Control Delay	7.4	HCM Level of Service		A
HCM Volume to Capacity ratio	0.44			
Actuated Cycle Length (s)	70.0	Sum of lost time (s)		8.0
Intersection Capacity Utilization	45.9%	ICU Level of Service		A
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
13: California Avenue & SR-4 WB Ramps

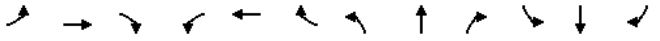
YR2030 Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	1003	11	622	325	5	187	20	610	21	59	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		0.97	0.95	1.00	0.95	0.95	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	0.96	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3533		3433	3539	1583	1681	1701	1583	1770	1791	
Flt Permitted	0.54	1.00		0.95	1.00	1.00	0.95	0.75	1.00	0.68	1.00	
Satd. Flow (perm)	1007	3533		3433	3539	1583	1681	1334	1583	1268	1791	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	1090	12	676	353	5	203	22	663	23	64	22
RTOR Reduction (vph)	0	1	0	0	0	2	0	0	298	0	15	0
Lane Group Flow (vph)	5	1101	0	676	353	3	112	113	365	23	71	0
Turn Type	Perm			Prot		Perm	Prot		Perm	Perm		
Protected Phases		4		3	8		5	2			6	
Permitted Phases	4					8			2	6		
Actuated Green, G (s)	26.0	26.0		17.0	47.0	47.0	8.0	25.8	25.8	13.8	13.8	
Effective Green, g (s)	26.0	26.0		17.0	47.0	47.0	8.0	25.8	25.8	13.8	13.8	
Actuated g/C Ratio	0.32	0.32		0.21	0.58	0.58	0.10	0.32	0.32	0.17	0.17	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	324	1137		722	2059	921	166	462	505	217	306	
v/s Ratio Prot		c0.31		c0.20	0.10		0.07	0.02			0.04	
v/s Ratio Perm	0.00					0.00		0.05	c0.23	0.02		
v/c Ratio	0.02	0.97		0.94	0.17	0.00	0.67	0.24	0.72	0.11	0.23	
Uniform Delay, d1	18.7	27.0		31.4	7.9	7.1	35.1	20.3	24.3	28.3	28.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	19.3		19.4	0.0	0.0	10.3	0.3	8.7	1.0	1.8	
Delay (s)	18.7	46.3		50.8	7.9	7.1	45.5	20.6	33.0	29.3	30.7	
Level of Service	B	D		D	A	A	D	C	C	C	C	
Approach Delay (s)		46.2			35.9			33.0			30.4	
Approach LOS		D			D			C			C	

Intersection Summary				
HCM Average Control Delay	38.5	HCM Level of Service		D
HCM Volume to Capacity ratio	0.87			
Actuated Cycle Length (s)	80.8	Sum of lost time (s)		12.0
Intersection Capacity Utilization	80.2%	ICU Level of Service		D
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
14: California Avenue & Harbor Street

Year 2030Build-PM

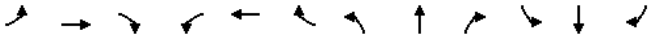


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	24	235	50	635	475	509	64	476	289	430	632	179
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.91	0.91	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.94		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3380	1441	1770	1863	1583	1770	3339		1770	3422	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3380	1441	1770	1863	1583	1770	3339		1770	3422	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	255	54	690	516	553	70	517	314	467	687	195
RTOR Reduction (vph)	0	1	46	0	0	276	0	71	0	0	19	0
Lane Group Flow (vph)	26	259	3	690	516	277	70	760	0	467	863	0
Turn Type	Prot		Over	Prot		Perm	Prot			Prot		
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases						8						
Actuated Green, G (s)	5.1	13.6	8.0	43.0	51.5	51.5	8.0	30.0		29.8	51.8	
Effective Green, g (s)	5.1	13.6	8.0	43.0	51.5	51.5	8.0	30.0		29.8	51.8	
Actuated g/C Ratio	0.04	0.10	0.06	0.32	0.39	0.39	0.06	0.23		0.23	0.39	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	68	347	87	575	725	616	107	757		398	1339	
v/s Ratio Prot	0.01	0.08	0.00	c0.39	c0.28		0.04	c0.23		c0.26	0.25	
v/s Ratio Perm						0.18						
v/c Ratio	0.38	0.75	0.03	1.20	0.71	0.45	0.65	1.00		1.17	0.64	
Uniform Delay, d1	62.1	57.7	58.6	44.7	34.2	30.0	60.8	51.2		51.3	32.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.6	8.5	0.2	106.0	3.3	0.5	13.5	33.6		101.5	2.4	
Delay (s)	65.7	66.2	58.7	150.7	37.5	30.5	74.3	84.8		152.8	35.2	
Level of Service	E	E	E	F	D	C	E	F		F	D	
Approach Delay (s)		65.1			79.7			84.0			75.9	
Approach LOS		E			E			F			E	

Intersection Summary				
HCM Average Control Delay	78.3	HCM Level of Service	E	
HCM Volume to Capacity ratio	1.06			
Actuated Cycle Length (s)	132.4	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	101.8%	ICU Level of Service	G	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
15: Bliss Avenue & Harbor Street

Year 2030Build-PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	46	4	305	9	4	17	143	766	13	5	1238	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85		0.92		1.00	1.00		1.00	0.99	
Flt Protected		0.96	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1781	1583		1695		1770	3530		1770	3509	
Flt Permitted		0.74	1.00		0.92		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1379	1583		1589		1770	3530		1770	3509	
Peak-hour factor, PHF	0.86	0.86	0.86	0.78	0.78	0.78	0.89	0.89	0.89	0.90	0.90	0.90
Adj. Flow (vph)	53	5	355	12	5	22	161	861	15	6	1376	82
RTOR Reduction (vph)	0	0	153	0	18	0	0	1	0	0	5	0
Lane Group Flow (vph)	0	58	202	0	21	0	161	875	0	6	1453	0
Turn Type	Perm		Perm	Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		13.3	13.3		13.3		10.5	53.9		0.8	44.2	
Effective Green, g (s)		13.3	13.3		13.3		10.5	53.9		0.8	44.2	
Actuated g/C Ratio		0.17	0.17		0.17		0.13	0.67		0.01	0.55	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		229	263		264		232	2378		18	1939	
v/s Ratio Prot							c0.09	0.25		0.00	c0.41	
v/s Ratio Perm		0.04	c0.13		0.01							
v/c Ratio		0.25	0.77		0.08		0.69	0.37		0.33	0.75	
Uniform Delay, d1		29.0	31.9		28.2		33.2	5.7		39.3	13.7	
Progression Factor		0.64	0.53		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.4	9.2		0.1		8.7	0.4		10.6	2.7	
Delay (s)		18.9	26.1		28.3		41.9	6.1		50.0	16.4	
Level of Service		B	C		C		D	A		D	B	
Approach Delay (s)		25.1			28.3			11.7			16.5	
Approach LOS		C			C			B			B	

Intersection Summary				
HCM Average Control Delay	16.2	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.74			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	68.8%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
16: Garcia Avenue & Harbor Street

YR2030 Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	88	30	178	97	48	198	147	619	73	398	1114	178
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	96	33	193	105	52	215	160	673	79	433	1211	193
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								663			696	
pX, platoon unblocked	0.80	0.80	0.76	0.80	0.80	0.93	0.76			0.93		
vC, conflicting volume	3070	3245	702	2712	3302	376	1404			752		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2670	2887	0	2224	2958	165	913			571		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	77	0	0	73	72			53		
cM capacity (veh/h)	0	5	829	0	4	787	567			923		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	96	226	105	267	160	449	304	433	807	597
Volume Left	96	0	105	0	160	0	0	433	0	0
Volume Right	0	193	0	215	0	0	79	0	0	193
cSH	0	33	0	22	567	1700	1700	923	1700	1700
Volume to Capacity	Err	6.95	Err	12.25	0.28	0.26	0.18	0.47	0.47	0.35
Queue Length 95th (ft)	Err	Err	Err	Err	29	0	0	64	0	0
Control Delay (s)	Err	Err	Err	Err	13.8	0.0	0.0	12.3	0.0	0.0
Lane LOS	F	F	F	F	B			B		
Approach Delay (s)	Err		Err		2.4			2.9		
Approach LOS	F		F							

Intersection Summary					
Average Delay	Err				
Intersection Capacity Utilization	77.5%	ICU Level of Service		D	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
17: Garcia Avenue & Railroad Avenue

YR2030 Build - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	79	19	38	124	72	120	12	770	84	197	1281	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.96	1.00		0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1791	1583		1806	1583	1770	3487		1770	3520	
Flt Permitted		0.23	1.00		0.97	1.00	0.11	1.00		0.20	1.00	
Satd. Flow (perm)		420	1583		1806	1583	207	3487		376	3520	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	86	21	41	135	78	130	13	837	91	214	1392	52
RTOR Reduction (vph)	0	0	33	0	0	104	0	10	0	0	3	0
Lane Group Flow (vph)	0	107	8	0	213	26	13	918	0	214	1441	0
Turn Type	Perm		Perm	Split		Perm	Perm			Perm		
Protected Phases		4		8	8			2			6	
Permitted Phases	4		4			8	2			6		
Actuated Green, G (s)		16.0	16.0		16.0	16.0	36.0	36.0		36.0	36.0	
Effective Green, g (s)		16.0	16.0		16.0	16.0	36.0	36.0		36.0	36.0	
Actuated g/C Ratio		0.20	0.20		0.20	0.20	0.45	0.45		0.45	0.45	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)		84	317		361	317	93	1569		169	1584	
v/s Ratio Prot					c0.12			0.26			0.41	
v/s Ratio Perm		c0.25	0.01			0.02	0.06			c0.57		
v/c Ratio		1.27	0.03		0.59	0.08	0.14	0.58		1.27	0.91	
Uniform Delay, d1		32.0	25.7		29.0	26.0	12.9	16.4		22.0	20.5	
Progression Factor		1.00	1.00		1.01	1.19	1.00	1.00		1.04	1.06	
Incremental Delay, d2		188.4	0.2		6.6	0.5	3.1	1.6		144.9	6.0	
Delay (s)		220.4	25.9		35.9	31.3	16.0	18.0		167.8	27.7	
Level of Service		F	C		D	C	B	B		F	C	
Approach Delay (s)		166.5			34.2			18.0			45.8	
Approach LOS		F			C			B			D	

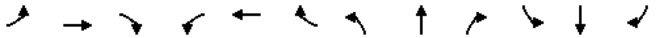
Intersection Summary					
HCM Average Control Delay	41.8	HCM Level of Service		D	
HCM Volume to Capacity ratio	1.11				
Actuated Cycle Length (s)	80.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	67.6%	ICU Level of Service		C	
Analysis Period (min)	15				

c Critical Lane Group

FUTURE YEAR 2015 PROJECT BUILD (ALTERNATIVE 1) CONDITIONS – AM PEAK HOUR

HCM Unsignalized Intersection Capacity Analysis
1: Civic Avenue & Davi Avenue

Year 2015 - ALT 1 AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	11	110	40	105	132	20	2	6	20	4	15	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	120	43	114	143	22	2	7	22	4	16	1

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	175	258	22	9	22	22
Volume Left (vph)	12	114	0	2	0	4
Volume Right (vph)	43	0	22	0	22	1
Hadj (s)	-0.10	0.26	-0.67	0.08	-0.57	0.04
Departure Headway (s)	4.3	5.0	4.0	5.1	3.2	5.0
Degree Utilization, x	0.21	0.35	0.02	0.01	0.02	0.03
Capacity (veh/h)	826	712	873	647	1121	656
Control Delay (s)	8.4	9.5	5.9	8.1	6.3	8.2
Approach Delay (s)	8.4	9.2		6.8		8.2
Approach LOS	A	A		A		A

Intersection Summary				
Delay	8.7			
HCM Level of Service	A			
Intersection Capacity Utilization	40.1%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
3: Civic Avenue & Railroad Avenue

Year 2015 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	29	0	73	7	2	8	245	805	7	1	722	116
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97		1.00		1.00		0.97	0.95		1.00	0.95	1.00
Frt	1.00		0.85		0.94		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95		1.00		0.98		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433		1583		1711		3433	3535		1770	3539	1583
Flt Permitted	0.95		1.00		0.98		0.95	1.00		0.27	1.00	1.00
Satd. Flow (perm)	3433		1583		1711		3433	3535		506	3539	1583
Peak-hour factor, PHF	0.72	0.72	0.72	0.56	0.56	0.56	0.77	0.77	0.77	0.92	0.92	0.92
Adj. Flow (vph)	40	0	101	12	4	14	318	1045	9	1	785	126
RTOR Reduction (vph)	0	0	92	0	13	0	0	0	0	0	0	47
Lane Group Flow (vph)	40	0	9	0	17	0	318	1054	0	1	785	79
Turn Type	Prot		custom	Split			Prot			Perm		Perm
Protected Phases	4		4	8	8		5	2			6	
Permitted Phases										6		6
Actuated Green, G (s)	5.2		5.2		2.5		10.1	37.6		23.5	23.5	23.5
Effective Green, g (s)	5.2		5.2		2.5		10.1	37.6		23.5	23.5	23.5
Actuated g/C Ratio	0.09		0.09		0.04		0.18	0.66		0.41	0.41	0.41
Clearance Time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0		3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	312		144		75		605	2320		208	1451	649
v/s Ratio Prot	c0.01		0.01		c0.01		c0.09	0.30			c0.22	
v/s Ratio Perm										0.00		0.05
v/c Ratio	0.13		0.06		0.22		0.53	0.45		0.00	0.54	0.12
Uniform Delay, d1	24.0		23.8		26.5		21.4	4.8		10.0	12.8	10.5
Progression Factor	1.00		1.00		1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.2		0.2		1.5		0.8	0.6		0.0	1.5	0.4
Delay (s)	24.2		24.0		28.0		22.3	5.5		10.0	14.3	10.9
Level of Service	C		C		C		C	A		B	B	B
Approach Delay (s)		24.1			28.0			9.4			13.8	
Approach LOS		C			C			A			B	

Intersection Summary					
HCM Average Control Delay	12.1	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.47				
Actuated Cycle Length (s)	57.3	Sum of lost time (s)		16.0	
Intersection Capacity Utilization	44.2%	ICU Level of Service		A	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
4: Center Drive & Railroad Avenue

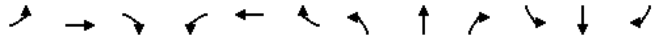
Year 2015 - ALT 1 AM

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	8	385	165	1049	834	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	
Frt	0.86	0.85	1.00	1.00	1.00	
Flt Protected	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1592	1504	1770	3539	3539	
Flt Permitted	1.00	1.00	0.29	1.00	1.00	
Satd. Flow (perm)	1592	1504	547	3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	9	418	179	1140	907	1
RTOR Reduction (vph)	166	170	0	0	0	0
Lane Group Flow (vph)	48	43	179	1140	908	0
Turn Type		Perm	Perm			
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	7.1	7.1	22.3	22.3	22.3	
Effective Green, g (s)	7.1	7.1	22.3	22.3	22.3	
Actuated g/C Ratio	0.19	0.19	0.60	0.60	0.60	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	302	286	326	2110	2110	
v/s Ratio Prot	c0.03			0.32	0.26	
v/s Ratio Perm		0.03	c0.33			
v/c Ratio	0.16	0.15	0.55	0.54	0.43	
Uniform Delay, d1	12.7	12.6	4.5	4.5	4.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	0.2	1.9	0.3	0.1	
Delay (s)	12.9	12.9	6.4	4.8	4.2	
Level of Service	B	B	A	A	A	
Approach Delay (s)	12.9			5.0	4.2	
Approach LOS	B			A	A	

Intersection Summary				
HCM Average Control Delay	6.0	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.45			
Actuated Cycle Length (s)	37.4	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	50.6%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
5: SR-4 WB On-Ramp & Railroad Avenue

Year 2015 - ALT 1 AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	11	327	373	597	841	43	63	592	564
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor					0.95		0.97	0.95		1.00	0.95	1.00
Frt					0.92		1.00	0.99		1.00	1.00	0.85
Flt Protected					1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)					3258		3433	3513		1770	3539	1583
Flt Permitted					1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)					3258		3433	3513		1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.83	0.83	0.83	0.96	0.96	0.96	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	13	394	449	622	876	45	65	610	581
RTOR Reduction (vph)	0	0	0	0	219	0	0	6	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	637	0	622	915	0	65	610	581
Turn Type				Split			Prot			Prot		Free
Protected Phases				8	8		5	2		1	6	
Permitted Phases												Free
Actuated Green, G (s)					14.9		16.6	29.5		3.6	16.5	60.0
Effective Green, g (s)					14.9		16.6	29.5		3.6	16.5	60.0
Actuated g/C Ratio					0.25		0.28	0.49		0.06	0.28	1.00
Clearance Time (s)					4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)					3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)					809		950	1727		106	973	1583
v/s Ratio Prot					c0.20		c0.18	0.26		0.04	c0.17	
v/s Ratio Perm												0.37
v/c Ratio					0.79		0.65	0.53		0.61	0.63	0.37
Uniform Delay, d1					21.1		19.2	10.5		27.5	19.1	0.0
Progression Factor					1.00		0.44	0.18		1.00	1.00	1.00
Incremental Delay, d2					5.1		1.1	0.8		10.1	3.1	0.7
Delay (s)					26.2		9.5	2.7		37.6	22.1	0.7
Level of Service					C		A	A		D	C	A
Approach Delay (s)		0.0			26.2			5.4			13.0	
Approach LOS		A			C			A			B	

Intersection Summary				
HCM Average Control Delay	12.9	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.69			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	64.7%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
6: SR-4 EB Off-Ramp & Railroad Avenue

Year 2015 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	393	1	386	0	0	0	0	1088	151	204	399	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor	0.95	0.91	0.95					0.91		1.00	0.95	
Frt	1.00	0.92	0.85					0.98		1.00	1.00	
Flt Protected	0.95	0.98	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1681	1525	1504					4992		1770	3539	
Flt Permitted	0.95	0.98	1.00					1.00		0.95	1.00	
Satd. Flow (perm)	1681	1525	1504					4992		1770	3539	
Peak-hour factor, PHF	0.88	0.88	0.88	0.92	0.92	0.92	0.89	0.89	0.89	0.90	0.90	0.90
Adj. Flow (vph)	447	1	439	0	0	0	0	1222	170	227	443	0
RTOR Reduction (vph)	0	70	213	0	0	0	0	29	0	0	0	0
Lane Group Flow (vph)	308	228	68	0	0	0	0	1363	0	227	443	0
Turn Type	Split		Prot							Prot		
Protected Phases	4	4	4					2		1	6	
Permitted Phases												
Actuated Green, G (s)	14.6	14.6	14.6					21.4		12.0	37.4	
Effective Green, g (s)	14.6	14.6	14.6					21.4		12.0	37.4	
Actuated g/C Ratio	0.24	0.24	0.24					0.36		0.20	0.62	
Clearance Time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)	409	371	366					1780		354	2206	
v/s Ratio Prot	c0.18	0.15	0.05					c0.27		c0.13	0.13	
v/s Ratio Perm												
v/c Ratio	0.75	0.62	0.19					0.77		0.64	0.20	
Uniform Delay, d1	21.0	20.2	18.0					17.1		22.0	4.9	
Progression Factor	1.00	1.00	1.00					0.57		1.01	0.10	
Incremental Delay, d2	7.7	3.0	0.2					2.8		3.4	0.2	
Delay (s)	28.7	23.2	18.2					12.5		25.7	0.7	
Level of Service	C	C	B					B		C	A	
Approach Delay (s)		23.5			0.0			12.5			9.1	
Approach LOS		C			A			B			A	

Intersection Summary				
HCM Average Control Delay	15.1	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.73			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	60.5%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
7: Bliss Avenue & Railroad Avenue

Year 2015 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	4	4	45	34	216	23	929	86	129	751	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.96	1.00		0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1797	1583		1811	1583	1770	3494		1770	3493	
Flt Permitted		0.79	1.00		0.81	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1478	1583		1517	1583	1770	3494		1770	3493	
Peak-hour factor, PHF	0.68	0.68	0.68	0.91	0.91	0.91	0.85	0.85	0.85	0.91	0.91	0.91
Adj. Flow (vph)	16	6	6	49	37	237	27	1093	101	142	825	79
RTOR Reduction (vph)	0	0	5	0	0	202	0	9	0	0	9	0
Lane Group Flow (vph)	0	22	1	0	86	35	27	1185	0	142	895	0
Turn Type	Perm		Perm	Perm		Perm	Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		8.8	8.8		8.8	8.8	3.0	31.9		7.3	36.2	
Effective Green, g (s)		8.8	8.8		8.8	8.8	3.0	31.9		7.3	36.2	
Actuated g/C Ratio		0.15	0.15		0.15	0.15	0.05	0.53		0.12	0.60	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		217	232		222	232	89	1858		215	2107	
v/s Ratio Prot							0.02	c0.34		c0.08	0.26	
v/s Ratio Perm		0.01	0.00		c0.06	0.02						
v/c Ratio		0.10	0.00		0.39	0.15	0.30	0.64		0.66	0.42	
Uniform Delay, d1		22.2	21.9		23.2	22.3	27.5	10.0		25.2	6.3	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		0.71	0.46	
Incremental Delay, d2		0.2	0.0		1.1	0.3	1.9	1.7		7.2	0.6	
Delay (s)		22.4	21.9		24.3	22.6	29.4	11.6		25.1	3.5	
Level of Service		C	C		C	C	C	B		C	A	
Approach Delay (s)		22.3			23.1			12.0			6.5	
Approach LOS		C			C			B			A	

Intersection Summary				
HCM Average Control Delay	11.3	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.59			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	56.5%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: Leland Road & Railroad Avenue

Year 2015 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	145	234	126	156	802	197	291	800	92	197	623	194
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.88
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	2787
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	158	254	137	170	872	214	316	870	100	214	677	211
RTOR Reduction (vph)	0	0	106	0	0	32	0	0	50	0	0	89
Lane Group Flow (vph)	158	254	31	170	872	182	316	870	50	214	677	122
Turn Type	Prot		Perm	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	7.0	18.3	18.3	9.7	21.0	31.0	15.0	21.0	30.7	10.0	16.0	23.0
Effective Green, g (s)	8.0	19.3	18.3	10.7	22.0	33.0	16.0	23.0	32.7	11.0	18.0	25.0
Actuated g/C Ratio	0.10	0.24	0.23	0.13	0.28	0.41	0.20	0.29	0.41	0.14	0.22	0.31
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.0	5.0	5.0	6.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	177	854	362	237	973	732	354	1017	647	243	796	871
v/s Ratio Prot	c0.09	0.07		0.10	c0.25	0.03	0.18	c0.25	0.01	0.12	c0.19	0.01
v/s Ratio Perm			0.02			0.08			0.02			0.03
v/c Ratio	0.89	0.30	0.09	0.72	0.90	0.25	0.89	0.86	0.08	0.88	0.85	0.14
Uniform Delay, d1	35.6	24.8	24.3	33.2	27.9	15.4	31.2	26.9	14.4	33.9	29.7	19.8
Progression Factor	1.00	1.00	1.00	0.71	0.53	0.22	1.00	1.00	1.00	0.86	0.85	0.83
Incremental Delay, d2	38.7	0.9	0.5	7.0	9.2	0.1	23.5	9.2	0.1	28.4	10.9	0.1
Delay (s)	74.3	25.7	24.7	30.5	24.1	3.5	54.6	36.1	14.5	57.6	36.2	16.4
Level of Service	E	C	C	C	C	A	D	D	B	E	D	B
Approach Delay (s)		39.4			21.5			39.0			36.6	
Approach LOS		D			C			D			D	

Intersection Summary				
HCM Average Control Delay	33.2	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.85			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	76.9%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: Leland Road & Harbor Street

Year 2015 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	186	211	59	40	712	256	71	299	31	176	480	452
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	202	229	64	43	774	278	77	325	34	191	522	491
RTOR Reduction (vph)	0	0	40	0	0	210	0	0	27	0	0	287
Lane Group Flow (vph)	202	229	24	43	774	68	77	325	7	191	522	204
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	13.6	29.6	29.6	3.6	19.6	19.6	4.8	17.4	17.4	11.4	24.0	24.0
Effective Green, g (s)	13.6	30.6	29.6	3.6	20.6	19.6	4.8	18.4	17.4	11.4	25.0	24.0
Actuated g/C Ratio	0.17	0.38	0.37	0.05	0.26	0.25	0.06	0.23	0.22	0.14	0.31	0.30
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	301	1354	586	80	911	388	106	814	344	252	1106	475
v/s Ratio Prot	c0.11	0.06		0.02	c0.22		c0.04	0.09		c0.11	c0.15	
v/s Ratio Perm			0.01			0.04			0.00			0.13
v/c Ratio	0.67	0.17	0.04	0.54	0.85	0.18	0.73	0.40	0.02	0.76	0.47	0.43
Uniform Delay, d1	31.1	16.3	16.1	37.4	28.2	23.8	37.0	26.1	24.6	33.0	22.2	22.5
Progression Factor	0.91	0.71	1.12	1.13	0.56	0.35	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.1	0.2	0.1	6.1	8.8	0.9	21.8	1.5	0.1	12.3	1.4	2.8
Delay (s)	33.4	11.8	18.2	48.4	24.5	9.3	58.7	27.6	24.7	45.2	23.6	25.3
Level of Service	C	B	B	D	C	A	E	C	C	D	C	C
Approach Delay (s)		21.5			21.6			32.9			27.7	
Approach LOS		C			C			C			C	

Intersection Summary				
HCM Average Control Delay	25.4	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.69			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	62.4%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
10: Leland Road & Freed Avenue

Year 2015 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	6	488	5	11	759	21	4	8	33	20	7	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.90	0.90	0.90	0.71	0.71	0.71	0.56	0.56	0.56
Hourly flow rate (vph)	7	595	6	12	843	23	6	11	46	36	12	9
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												2
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	867			601			1065	1504	301	1244	1495	433
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	867			601			1065	1504	301	1244	1495	433
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			96	90	93	68	90	98
cM capacity (veh/h)	773			972			157	118	695	111	119	571

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	7	397	204	12	562	304	63	57
Volume Left	7	0	0	12	0	0	6	36
Volume Right	0	0	6	0	0	23	46	9
cSH	773	1700	1700	972	1700	1700	320	134
Volume to Capacity	0.01	0.23	0.12	0.01	0.33	0.18	0.20	0.43
Queue Length 95th (ft)	1	0	0	1	0	0	18	47
Control Delay (s)	9.7	0.0	0.0	8.8	0.0	0.0	19.0	51.2
Lane LOS	A			A			C	F
Approach Delay (s)	0.1			0.1			19.0	51.2
Approach LOS							C	F

Intersection Summary				
Average Delay	2.7			
Intersection Capacity Utilization	38.3%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
11: Leland Road & Loveridge Road

Year 2015 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	263	179	63	14	438	129	292	569	74	229	152	240
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	286	195	68	15	476	140	317	618	80	249	165	261
RTOR Reduction (vph)	0	0	50	0	0	112	0	0	75	0	0	203
Lane Group Flow (vph)	286	195	18	15	476	28	317	618	5	249	165	58
Turn Type	Prot		Perm	Prot		Perm	Prot		Over	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	9.6	19.7	19.7	4.7	14.8	14.8	18.8	26.8	4.7	8.8	16.8	16.8
Effective Green, g (s)	10.6	20.7	20.7	5.7	15.8	15.8	19.8	27.8	4.7	9.8	17.8	17.8
Actuated g/C Ratio	0.13	0.26	0.26	0.07	0.20	0.20	0.25	0.35	0.06	0.12	0.22	0.22
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	455	916	410	245	699	313	438	1230	93	421	787	352
v/s Ratio Prot	c0.08	0.06		0.00	c0.13		c0.18	c0.17	0.00	0.07	0.05	
v/s Ratio Perm			0.01			0.02						0.04
v/c Ratio	0.63	0.21	0.04	0.06	0.68	0.09	0.72	0.50	0.05	0.59	0.21	0.16
Uniform Delay, d1	32.8	23.3	22.2	34.7	29.8	26.2	27.6	20.6	35.5	33.2	25.4	25.1
Progression Factor	0.83	0.77	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.7	0.1	0.0	0.1	2.7	0.1	5.8	1.5	0.2	2.2	0.6	1.0
Delay (s)	30.1	18.1	20.1	34.8	32.5	26.3	33.4	22.1	35.8	35.4	26.0	26.1
Level of Service	C	B	C	C	C	C	C	C	D	D	C	C
Approach Delay (s)		24.6			31.2			26.7			29.5	
Approach LOS		C			C			C			C	

Intersection Summary				
HCM Average Control Delay	27.9	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.65			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	55.2%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
12: SR-4 EB Ramps & Loveridge Road

Year 2015 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	197	0	428	0	0	0	0	803	223	0	291	203
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0					4.0			4.0	
Lane Util. Factor	1.00		1.00					0.95			0.95	
Frt	1.00		0.85					0.97			0.94	
Flt Protected	0.95		1.00					1.00			1.00	
Satd. Flow (prot)	1770		1583					3424			3321	
Flt Permitted	0.95		1.00					1.00			1.00	
Satd. Flow (perm)	1770		1583					3424			3321	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	214	0	465	0	0	0	0	873	242	0	316	221
RTOR Reduction (vph)	0	0	350	0	0	0	0	39	0	0	91	0
Lane Group Flow (vph)	214	0	115	0	0	0	0	1076	0	0	446	0
Turn Type	Prot		custom									
Protected Phases	4		4					2			6	
Permitted Phases												
Actuated Green, G (s)	11.9		11.9					28.2			28.2	
Effective Green, g (s)	11.9		11.9					28.2			28.2	
Actuated g/C Ratio	0.25		0.25					0.59			0.59	
Clearance Time (s)	4.0		4.0					4.0			4.0	
Vehicle Extension (s)	3.0		3.0					3.0			3.0	
Lane Grp Cap (vph)	438		392					2007			1947	
v/s Ratio Prot	c0.12		0.07					c0.31			0.13	
v/s Ratio Perm												
v/c Ratio	0.49		0.29					0.54			0.23	
Uniform Delay, d1	15.5		14.7					6.0			4.8	
Progression Factor	1.00		1.00					1.00			1.00	
Incremental Delay, d2	0.9		0.4					1.0			0.3	
Delay (s)	16.4		15.1					7.0			5.0	
Level of Service	B		B					A			A	
Approach Delay (s)		15.5			0.0			7.0			5.0	
Approach LOS		B			A			A			A	

Intersection Summary				
HCM Average Control Delay	9.0	HCM Level of Service		A
HCM Volume to Capacity ratio	0.52			
Actuated Cycle Length (s)	48.1	Sum of lost time (s)		8.0
Intersection Capacity Utilization	47.7%	ICU Level of Service		A
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
13: California Avenue & SR-4 WB Ramps

Year 2015 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	37	201	1	299	234	28	92	35	127	20	7	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		0.97	0.95	1.00	0.95	0.95	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	0.98	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3537		3433	3539	1583	1681	1730	1583	1770	1787	
Flt Permitted	0.59	1.00		0.95	1.00	1.00	0.95	0.92	1.00	0.71	1.00	
Satd. Flow (perm)	1107	3537		3433	3539	1583	1681	1626	1583	1321	1787	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	40	218	1	325	254	30	100	38	138	22	8	3
RTOR Reduction (vph)	0	1	0	0	0	17	0	0	83	0	2	0
Lane Group Flow (vph)	40	218	0	325	254	13	68	70	55	22	9	0
Turn Type	Perm			Prot		Perm	Prot		Perm	Perm		
Protected Phases		4		3	8		5	2			6	
Permitted Phases	4					8			2	6		
Actuated Green, G (s)	8.4	8.4		9.8	22.2	22.2	3.0	19.8	19.8	12.8	12.8	
Effective Green, g (s)	8.4	8.4		9.8	22.2	22.2	3.0	19.8	19.8	12.8	12.8	
Actuated g/C Ratio	0.17	0.17		0.20	0.44	0.44	0.06	0.40	0.40	0.26	0.26	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	186	594		673	1571	703	101	650	627	338	457	
v/s Ratio Prot		c0.06		c0.09	0.07		c0.04	0.01			0.00	
v/s Ratio Perm	0.04					0.01		c0.04	0.03	0.02		
v/c Ratio	0.22	0.37		0.48	0.16	0.02	0.67	0.11	0.09	0.07	0.02	
Uniform Delay, d1	18.0	18.4		17.8	8.3	7.8	23.0	9.5	9.4	14.1	13.9	
Progression Factor	0.90	0.89		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.5	0.4		0.5	0.0	0.0	16.3	0.1	0.3	0.4	0.1	
Delay (s)	16.7	16.9		18.4	8.4	7.8	39.3	9.6	9.7	14.4	14.0	
Level of Service	B	B		B	A	A	D	A	A	B	B	
Approach Delay (s)		16.8			13.7			17.0			14.3	
Approach LOS		B			B			B			B	

Intersection Summary				
HCM Average Control Delay	15.2	HCM Level of Service		B
HCM Volume to Capacity ratio	0.33			
Actuated Cycle Length (s)	50.0	Sum of lost time (s)		16.0
Intersection Capacity Utilization	34.3%	ICU Level of Service		A
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
14: California Avenue & Harbor Street

Year 2015 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	97	71	99	583	390	300	95	542	52	46	580	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.91		1.00	1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1700		1770	1863	1583	1770	3492		1770	3506	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1700		1770	1863	1583	1770	3492		1770	3506	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	105	77	108	634	424	326	103	589	57	50	630	42
RTOR Reduction (vph)	0	53	0	0	0	155	0	6	0	0	5	0
Lane Group Flow (vph)	105	132	0	634	424	171	103	640	0	50	667	0
Turn Type	Prot			Prot		Perm	Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						
Actuated Green, G (s)	8.9	12.2		39.8	43.1	43.1	7.8	28.0		4.0	24.2	
Effective Green, g (s)	8.9	12.2		39.8	43.1	43.1	7.8	28.0		4.0	24.2	
Actuated g/C Ratio	0.09	0.12		0.40	0.43	0.43	0.08	0.28		0.04	0.24	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	158	207		704	803	682	138	978		71	848	
v/s Ratio Prot	0.06	c0.08		c0.36	c0.23		c0.06	0.18		0.03	c0.19	
v/s Ratio Perm						0.11						
v/c Ratio	0.66	0.64		0.90	0.53	0.25	0.75	0.65		0.70	0.79	
Uniform Delay, d1	44.1	41.8		28.2	21.0	18.1	45.1	31.7		47.4	35.5	
Progression Factor	1.00	1.00		0.98	0.98	0.87	0.95	0.93		1.00	1.00	
Incremental Delay, d2	10.1	6.3		14.6	0.6	0.2	19.1	3.3		27.1	7.3	
Delay (s)	54.2	48.2		42.2	21.1	16.0	61.9	32.7		74.5	42.8	
Level of Service	D	D		D	C	B	E	C		E	D	
Approach Delay (s)		50.3			29.6			36.7			45.0	
Approach LOS		D			C			D			D	

Intersection Summary				
HCM Average Control Delay	36.7	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.85			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	20.0	
Intersection Capacity Utilization	78.0%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
15: Bliss Avenue & Harbor Street

Year 2015 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	8	122	3	7	1	121	673	4	3	1224	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	*0.95		1.00	*0.95	
Frt		1.00	0.85		0.99		1.00	1.00		1.00	1.00	
Flt Protected		0.97	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1804	1583		1822		1770	3536		1770	3524	
Flt Permitted		0.83	1.00		0.94		0.11	1.00		0.33	1.00	
Satd. Flow (perm)		1553	1583		1738		211	3536		614	3524	
Peak-hour factor, PHF	0.90	0.90	0.90	0.67	0.67	0.67	0.81	0.81	0.81	0.73	0.73	0.73
Adj. Flow (vph)	17	9	136	4	10	1	149	831	5	4	1677	48
RTOR Reduction (vph)	0	0	60	0	4	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	26	76	0	11	0	149	836	0	4	1721	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		10.2	10.2		10.2		81.8	81.8		81.8	81.8	
Effective Green, g (s)		10.2	10.2		10.2		81.8	81.8		81.8	81.8	
Actuated g/C Ratio		0.10	0.10		0.10		0.82	0.82		0.82	0.82	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		158	161		177		173	2892		502	2883	
v/s Ratio Prot								0.24			0.49	
v/s Ratio Perm		0.02	c0.05		0.01		c0.71			0.01		
v/c Ratio		0.16	0.47		0.06		0.86	0.29		0.01	0.60	
Uniform Delay, d1		41.0	42.4		40.6		5.6	2.2		1.7	3.2	
Progression Factor		1.00	1.00		1.00		1.00	1.00		0.31	0.32	
Incremental Delay, d2		0.5	2.2		0.2		39.5	0.3		0.0	0.7	
Delay (s)		41.5	44.5		40.7		45.2	2.4		0.5	1.8	
Level of Service		D	D		D		D	A		A	A	
Approach Delay (s)		44.0			40.7			8.9			1.7	
Approach LOS		D			D			A			A	

Intersection Summary				
HCM Average Control Delay	6.8	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.82			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	55.8%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
16: Garcia Ave & Harbor Street

Year 2015 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	11	1	163	54	8	72	154	709	61	113	1047	45
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	1	177	59	9	78	167	771	66	123	1138	49
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								663			696	
pX, platoon unblocked	0.95	0.95	0.95	0.95	0.95		0.95					
vC, conflicting volume	2211	2580	593	2131	2571	418	1187			837		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2166	2556	458	2082	2547	418	1085			837		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	93	66	0	43	87	72			85		
cM capacity (veh/h)	9	15	521	13	15	583	605			793		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	12	178	59	87	167	514	323	123	759	428
Volume Left	12	0	59	0	167	0	0	123	0	0
Volume Right	0	177	0	78	0	0	66	0	0	49
cSH	9	432	13	124	605	1700	1700	793	1700	1700
Volume to Capacity	1.39	0.41	4.65	0.70	0.28	0.30	0.19	0.15	0.45	0.25
Queue Length 95th (ft)	58	50	Err	96	28	0	0	14	0	0
Control Delay (s)	1028.0	19.0	Err	84.0	13.2	0.0	0.0	10.4	0.0	0.0
Lane LOS	F	C	F	F	B			B		
Approach Delay (s)	82.5		4079.6		2.2			1.0		
Approach LOS	F		F							

Intersection Summary					
Average Delay	231.5				
Intersection Capacity Utilization	65.7%	ICU Level of Service		C	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
17: Garcia Ave & Railroad Avenue

Year 2015 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	11	9	68	15	194	10	879	46	111	685	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.97	1.00		0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1812	1583		1789	1583	1770	3513		1770	3525	
Flt Permitted		0.58	1.00		0.96	1.00	0.34	1.00		0.25	1.00	
Satd. Flow (perm)		1073	1583		1789	1583	626	3513		460	3525	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	15	12	10	74	16	211	11	955	50	121	745	21
RTOR Reduction (vph)	0	0	9	0	0	186	0	3	0	0	1	0
Lane Group Flow (vph)	0	27	1	0	90	25	11	1002	0	121	765	0
Turn Type	Perm		Perm	Split		Perm	Perm			Perm		
Protected Phases		4		8	8			2			6	
Permitted Phases	4		4			8	2			6		
Actuated Green, G (s)		5.4	5.4		9.3	9.3	53.3	53.3		53.3	53.3	
Effective Green, g (s)		5.4	5.4		9.3	9.3	53.3	53.3		53.3	53.3	
Actuated g/C Ratio		0.07	0.07		0.12	0.12	0.67	0.67		0.67	0.67	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		72	107		208	184	417	2341		306	2349	
v/s Ratio Prot					c0.05			c0.29			0.22	
v/s Ratio Perm		c0.03	0.00			0.02	0.02			0.26		
v/c Ratio		0.38	0.01		0.43	0.13	0.03	0.43		0.40	0.33	
Uniform Delay, d1		35.7	34.8		32.9	31.7	4.5	6.2		6.0	5.7	
Progression Factor		1.00	1.00		1.00	1.30	0.27	0.21		1.00	1.00	
Incremental Delay, d2		3.3	0.0		1.4	0.3	0.1	0.4		3.8	0.4	
Delay (s)		38.9	34.8		34.5	41.7	1.3	1.7		9.8	6.1	
Level of Service		D	C		C	D	A	A		A	A	
Approach Delay (s)		37.8			39.5			1.6			6.6	
Approach LOS		D			D			A			A	

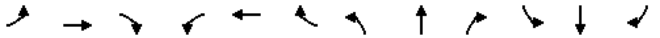
Intersection Summary					
HCM Average Control Delay	9.3	HCM Level of Service		A	
HCM Volume to Capacity ratio	0.42				
Actuated Cycle Length (s)	80.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	53.1%	ICU Level of Service		A	
Analysis Period (min)	15				

c Critical Lane Group

FUTURE YEAR 2015 PROJECT BUILD (ALTERNATIVE 1) CONDITIONS – PM PEAK HOUR

HCM Unsignalized Intersection Capacity Analysis
1: Civic Avenue & Davi Avenue

YR2015 ALT 1 - PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	2	88	27	69	133	3	7	2	40	6	23	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	96	29	75	145	3	8	2	43	7	25	2

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	127	220	3	10	43	34
Volume Left (vph)	2	75	0	8	0	7
Volume Right (vph)	29	0	3	0	43	2
Hadj (s)	-0.10	0.20	-0.67	0.19	-0.57	0.03
Departure Headway (s)	4.3	4.9	4.0	5.0	3.2	4.8
Degree Utilization, x	0.15	0.30	0.00	0.01	0.04	0.04
Capacity (veh/h)	828	718	871	670	1121	699
Control Delay (s)	8.0	8.8	5.8	8.0	6.3	8.0
Approach Delay (s)	8.0	8.7		6.6		8.0
Approach LOS	A	A		A		A

Intersection Summary				
Delay	8.2			
HCM Level of Service	A			
Intersection Capacity Utilization	32.7%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
3: Civic Avenue & Railroad Avenue

YR2015 ALT 1 - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	62	0	77	2	2	1	182	542	2	2	645	130
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97		1.00		1.00		0.97	0.95		1.00	0.95	1.00
Frt	1.00		0.85		0.97		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95		1.00		0.98		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433		1583		1777		3433	3537		1770	3539	1583
Flt Permitted	0.62		1.00		0.98		0.95	1.00		0.44	1.00	1.00
Satd. Flow (perm)	2224		1583		1777		3433	3537		813	3539	1583
Peak-hour factor, PHF	0.77	0.77	0.77	0.50	0.50	0.50	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	81	0	100	4	4	2	192	571	2	2	701	141
RTOR Reduction (vph)	0	0	89	0	2	0	0	0	0	0	0	54
Lane Group Flow (vph)	81	0	11	0	8	0	192	573	0	2	701	87
Turn Type	custom		custom	Split			Prot			Perm		Perm
Protected Phases				8	8		5	2			6	
Permitted Phases	4		4							6		6
Actuated Green, G (s)	6.5		6.5		1.1		8.4	39.4		27.0	27.0	27.0
Effective Green, g (s)	6.5		6.5		1.1		8.4	39.4		27.0	27.0	27.0
Actuated g/C Ratio	0.11		0.11		0.02		0.14	0.67		0.46	0.46	0.46
Clearance Time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0		3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	245		174		33		489	2362		372	1620	724
v/s Ratio Prot					c0.00		c0.06	0.16			c0.20	
v/s Ratio Perm	c0.04		0.01							0.00		0.06
v/c Ratio	0.33		0.06		0.24		0.39	0.24		0.01	0.43	0.12
Uniform Delay, d1	24.2		23.5		28.5		23.0	3.9		8.7	10.8	9.2
Progression Factor	1.00		1.00		1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.8		0.2		3.8		0.5	0.2		0.0	0.8	0.3
Delay (s)	25.0		23.7		32.4		23.5	4.1		8.7	11.7	9.5
Level of Service	C		C		C		C	A		A	B	A
Approach Delay (s)		24.3			32.4			9.0			11.3	
Approach LOS		C			C			A			B	

Intersection Summary					
HCM Average Control Delay	11.7	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.40				
Actuated Cycle Length (s)	59.0	Sum of lost time (s)		16.0	
Intersection Capacity Utilization	36.8%	ICU Level of Service		A	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
4: Center Drive & Railroad Avenue

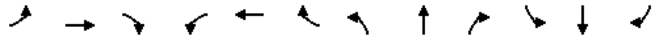
YR2015 ALT 1 - PM

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	5	477	276	721	781	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	
Frt	0.85	0.85	1.00	1.00	1.00	
Flt Protected	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1587	1504	1770	3539	3538	
Flt Permitted	1.00	1.00	0.32	1.00	1.00	
Satd. Flow (perm)	1587	1504	588	3539	3538	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	518	300	784	849	2
RTOR Reduction (vph)	183	183	0	0	0	0
Lane Group Flow (vph)	81	76	300	784	851	0
Turn Type		Perm	Perm			
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	9.0	9.0	32.5	32.5	32.5	
Effective Green, g (s)	9.0	9.0	32.5	32.5	32.5	
Actuated g/C Ratio	0.18	0.18	0.66	0.66	0.66	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	289	273	386	2324	2323	
v/s Ratio Prot	c0.05			0.22	0.24	
v/s Ratio Perm		0.05	c0.51			
v/c Ratio	0.28	0.28	0.78	0.34	0.37	
Uniform Delay, d1	17.5	17.4	6.0	3.7	3.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.5	0.6	9.5	0.1	0.1	
Delay (s)	18.0	18.0	15.4	3.8	3.9	
Level of Service	B	B	B	A	A	
Approach Delay (s)	18.0			7.0	3.9	
Approach LOS	B			A	A	

Intersection Summary				
HCM Average Control Delay	8.3	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.67			
Actuated Cycle Length (s)	49.5	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	57.1%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
5: SR-4 WB On-Ramp & Railroad Avenue

YR2015 ALT 1 - PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	57	107	269	222	728	120	97	768	393
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor					0.95		0.97	0.95		1.00	0.95	1.00
Frt					0.91		1.00	0.98		1.00	1.00	0.85
Flt Protected					0.99		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)					3189		3433	3464		1770	3539	1583
Flt Permitted					0.99		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)					3189		3433	3464		1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.88	0.88	0.88	0.93	0.93	0.93	0.83	0.83	0.83
Adj. Flow (vph)	0	0	0	65	122	306	239	783	129	117	925	473
RTOR Reduction (vph)	0	0	0	0	258	0	0	17	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	235	0	239	895	0	117	925	473
Turn Type				Split			Prot			Prot		Free
Protected Phases				8	8		5	2		1	6	
Permitted Phases												Free
Actuated Green, G (s)					9.5		8.8	30.9		7.6	29.7	60.0
Effective Green, g (s)					9.5		8.8	30.9		7.6	29.7	60.0
Actuated g/C Ratio					0.16		0.15	0.51		0.13	0.49	1.00
Clearance Time (s)					4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)					3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)					505		504	1784		224	1752	1583
v/s Ratio Prot					c0.07		0.07	c0.26		0.07	c0.26	
v/s Ratio Perm												0.30
v/c Ratio					0.47		0.47	0.50		0.52	0.53	0.30
Uniform Delay, d1					22.9		23.5	9.5		24.5	10.4	0.0
Progression Factor					1.00		0.71	0.44		1.00	1.00	1.00
Incremental Delay, d2					0.7		0.5	0.8		2.2	1.1	0.5
Delay (s)					23.6		17.1	4.9		26.7	11.5	0.5
Level of Service					C		B	A		C	B	A
Approach Delay (s)		0.0			23.6			7.4			9.2	
Approach LOS		A			C			A			A	

Intersection Summary				
HCM Average Control Delay	10.8	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.50			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	52.6%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
6: SR-4 EB Off-Ramp & Railroad Avenue

YR2015 ALT 1 - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	366	0	799	0	0	0	0	704	446	167	658	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor	0.95	0.91	0.95					0.91		1.00	0.95	
Frt	1.00	0.86	0.85					0.94		1.00	1.00	
Flt Protected	0.95	1.00	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1681	1457	1504					4789		1770	3539	
Flt Permitted	0.95	1.00	1.00					1.00		0.95	1.00	
Satd. Flow (perm)	1681	1457	1504					4789		1770	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93	0.88	0.88	0.88
Adj. Flow (vph)	398	0	868	0	0	0	0	757	480	190	748	0
RTOR Reduction (vph)	0	113	113	0	0	0	0	179	0	0	0	0
Lane Group Flow (vph)	358	344	338	0	0	0	0	1058	0	190	748	0
Turn Type	Split		Prot							Prot		
Protected Phases	4	4	4					2		1	6	
Permitted Phases												
Actuated Green, G (s)	18.4	18.4	18.4					20.6		9.0	33.6	
Effective Green, g (s)	18.4	18.4	18.4					20.6		9.0	33.6	
Actuated g/C Ratio	0.31	0.31	0.31					0.34		0.15	0.56	
Clearance Time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)	516	447	461					1644		266	1982	
v/s Ratio Prot	0.21	c0.24	0.22					c0.22		c0.11	0.21	
v/s Ratio Perm												
v/c Ratio	0.69	0.77	0.73					0.64		0.71	0.38	
Uniform Delay, d1	18.3	18.9	18.6					16.6		24.3	7.4	
Progression Factor	1.00	1.00	1.00					0.30		0.89	0.42	
Incremental Delay, d2	4.0	7.8	5.9					1.5		7.7	0.5	
Delay (s)	22.3	26.7	24.6					6.4		29.4	3.6	
Level of Service	C	C	C					A		C	A	
Approach Delay (s)		24.7			0.0			6.4			8.8	
Approach LOS		C			A			A			A	

Intersection Summary				
HCM Average Control Delay	13.8	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.71			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	61.1%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
7: Bliss Avenue & Railroad Avenue

YR2015 ALT 1 - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	130	11	26	99	29	119	7	901	41	172	1226	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.96	1.00		0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1781	1583		1794	1583	1770	3516		1770	3515	
Flt Permitted		0.58	1.00		0.63	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1085	1583		1168	1583	1770	3516		1770	3515	
Peak-hour factor, PHF	0.84	0.84	0.84	0.75	0.75	0.75	0.88	0.88	0.88	0.92	0.92	0.92
Adj. Flow (vph)	155	13	31	132	39	159	8	1024	47	187	1333	64
RTOR Reduction (vph)	0	0	24	0	0	124	0	6	0	0	5	0
Lane Group Flow (vph)	0	168	7	0	171	35	8	1065	0	187	1392	0
Turn Type	Perm		Perm	Perm		Perm	Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		13.2	13.2		13.2	13.2	0.8	22.6		12.2	34.0	
Effective Green, g (s)		13.2	13.2		13.2	13.2	0.8	22.6		12.2	34.0	
Actuated g/C Ratio		0.22	0.22		0.22	0.22	0.01	0.38		0.20	0.57	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		239	348		257	348	24	1324		360	1992	
v/s Ratio Prot							0.00	c0.30		0.11	c0.40	
v/s Ratio Perm		c0.15	0.00		0.15	0.02						
v/c Ratio		0.70	0.02		0.67	0.10	0.33	0.80		0.52	0.70	
Uniform Delay, d1		21.6	18.3		21.4	18.7	29.3	16.7		21.3	9.3	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		0.75	0.52	
Incremental Delay, d2		9.0	0.0		6.4	0.1	8.0	5.3		1.1	1.7	
Delay (s)		30.6	18.4		27.7	18.8	37.4	22.0		17.1	6.6	
Level of Service		C	B		C	B	D	C		B	A	
Approach Delay (s)		28.7			23.4			22.1			7.8	
Approach LOS		C			C			C			A	

Intersection Summary				
HCM Average Control Delay	15.6	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.73			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	63.5%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: Leland Road & Railroad Avenue

YR2015 ALT 1 - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	228	544	549	177	308	126	307	887	113	509	612	98
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.88
Frt	1.00	0.96	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3246	1441	1770	3539	1583	1770	3539	1583	1770	3539	2787
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3246	1441	1770	3539	1583	1770	3539	1583	1770	3539	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	248	591	597	192	335	137	334	964	123	553	665	107
RTOR Reduction (vph)	0	26	277	0	0	34	0	0	45	0	0	55
Lane Group Flow (vph)	248	798	87	192	335	103	334	964	78	553	665	52
Turn Type	Prot		Perm	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	25.0	36.0	36.0	14.0	25.0	68.0	32.9	36.0	50.0	43.0	46.1	71.1
Effective Green, g (s)	26.0	37.0	36.0	15.0	26.0	70.0	33.9	38.0	52.0	44.0	48.1	73.1
Actuated g/C Ratio	0.17	0.25	0.24	0.10	0.17	0.47	0.23	0.25	0.35	0.29	0.32	0.49
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.0	5.0	5.0	6.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	307	801	346	177	613	739	400	897	549	519	1135	1358
v/s Ratio Prot	0.14	c0.25		c0.11	0.09	0.04	0.19	c0.27	0.01	c0.31	0.19	0.01
v/s Ratio Perm			0.06			0.02			0.04			0.01
v/c Ratio	0.81	1.00	0.25	1.08	0.55	0.14	0.83	1.07	0.14	1.07	0.59	0.04
Uniform Delay, d1	59.6	56.4	46.1	67.5	56.6	22.8	55.4	56.0	33.7	53.0	42.6	20.1
Progression Factor	1.00	1.00	1.00	1.07	0.86	0.31	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	14.4	31.0	1.7	89.9	3.3	0.1	14.0	52.2	0.1	58.1	2.2	0.0
Delay (s)	74.0	87.5	47.9	162.4	51.7	7.1	69.3	108.2	33.8	111.1	44.8	20.1
Level of Service	E	F	D	F	D	A	E	F	C	F	D	C
Approach Delay (s)		75.1			74.5			92.6			70.5	
Approach LOS		E			E			F			E	

Intersection Summary				
HCM Average Control Delay	78.9	HCM Level of Service	E	
HCM Volume to Capacity ratio	1.05			
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	96.7%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: Leland Road & Harbor Street

YR2015 ALT 1 - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	166	843	118	33	177	55	154	412	201	222	394	242
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	180	916	128	36	192	60	167	448	218	241	428	263
RTOR Reduction (vph)	0	0	84	0	0	47	0	0	155	0	0	205
Lane Group Flow (vph)	180	916	44	36	192	13	167	448	63	241	428	58
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	12.1	25.6	25.6	2.4	15.9	15.9	12.5	16.5	16.5	12.5	16.5	16.5
Effective Green, g (s)	12.1	26.6	25.6	2.4	16.9	15.9	12.5	17.5	16.5	12.5	17.5	16.5
Actuated g/C Ratio	0.16	0.35	0.34	0.03	0.23	0.21	0.17	0.23	0.22	0.17	0.23	0.22
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	286	1255	540	57	797	336	295	826	348	295	826	348
v/s Ratio Prot	c0.10	c0.26		0.02	0.05		0.09	c0.13		c0.14	0.12	
v/s Ratio Perm			0.03			0.01			0.04			0.04
v/c Ratio	0.63	0.73	0.08	0.63	0.24	0.04	0.57	0.54	0.18	0.82	0.52	0.17
Uniform Delay, d1	29.4	21.1	16.7	35.9	23.8	23.5	28.8	25.2	23.8	30.1	25.1	23.7
Progression Factor	0.83	0.55	0.76	0.83	0.70	0.71	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.4	1.2	0.1	20.3	0.7	0.2	2.5	2.6	1.1	15.9	2.3	1.0
Delay (s)	25.8	12.7	12.8	49.9	17.4	17.0	31.2	27.8	24.9	46.0	27.4	24.7
Level of Service	C	B	B	D	B	B	C	C	C	D	C	C
Approach Delay (s)		14.7			21.3			27.7			31.5	
Approach LOS		B			C			C			C	

Intersection Summary				
HCM Average Control Delay	23.3	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.67			
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	63.7%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
10: Leland Road & Freed Avenue

YR2015 ALT 1 - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	20	1322	20	20	221	27	5	4	30	40	1	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.81	0.81	0.81	0.54	0.54	0.54	0.60	0.60	0.60
Hourly flow rate (vph)	22	1422	22	25	273	33	9	7	56	67	2	17
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												2
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	306			1443			1662	1831	722	1152	1825	153
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	306			1443			1662	1831	722	1152	1825	153
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			95			84	89	85	41	98	98
cM capacity (veh/h)	1251			466			58	70	369	113	71	866

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	22	948	495	25	182	124	72	85
Volume Left	22	0	0	25	0	0	9	67
Volume Right	0	0	22	0	0	33	56	17
cSH	1251	1700	1700	466	1700	1700	174	139
Volume to Capacity	0.02	0.56	0.29	0.05	0.11	0.07	0.41	0.61
Queue Length 95th (ft)	1	0	0	4	0	0	46	80
Control Delay (s)	7.9	0.0	0.0	13.2	0.0	0.0	39.6	64.4
Lane LOS	A			B			E	F
Approach Delay (s)	0.1			1.0			39.6	64.4
Approach LOS							E	F

Intersection Summary					
Average Delay	4.5				
Intersection Capacity Utilization	52.8%	ICU Level of Service		A	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
11: Leland Road & Loveridge Road

YR2015 ALT 1 - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	437	537	253	171	210	182	45	300	52	192	599	139
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.91	0.91	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	1770	3381	1441	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	1770	3381	1441	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	475	584	275	186	228	198	49	326	57	209	651	151
RTOR Reduction (vph)	0	0	175	0	0	161	0	1	45	0	0	99
Lane Group Flow (vph)	475	584	100	186	228	37	49	331	6	209	651	52
Turn Type	Prot		Perm	Prot		Perm	Prot		Over	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	14.0	18.8	18.8	8.3	13.1	13.1	3.0	18.9	8.3	9.0	24.9	24.9
Effective Green, g (s)	15.0	19.8	19.8	9.3	14.1	14.1	4.0	19.9	8.3	10.0	25.9	25.9
Actuated g/C Ratio	0.20	0.26	0.26	0.12	0.19	0.19	0.05	0.27	0.11	0.13	0.35	0.35
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	687	934	418	426	665	298	94	897	159	458	1222	547
v/s Ratio Prot	c0.14	c0.17		c0.05	0.06		0.03	0.10	0.00	c0.06	c0.18	
v/s Ratio Perm			0.06			0.02						0.03
v/c Ratio	0.69	0.63	0.24	0.44	0.34	0.12	0.52	0.37	0.04	0.46	0.53	0.10
Uniform Delay, d1	27.9	24.3	21.7	30.4	26.4	25.3	34.6	22.4	29.8	30.0	19.7	16.6
Progression Factor	0.70	0.48	0.19	1.00	1.00	1.00	1.00	1.00	1.00	0.92	0.85	0.50
Incremental Delay, d2	2.5	1.1	0.2	0.7	0.3	0.2	5.1	1.2	0.1	0.7	1.6	0.3
Delay (s)	21.9	12.7	4.4	31.1	26.7	25.5	39.7	23.6	29.9	28.1	18.3	8.6
Level of Service	C	B	A	C	C	C	D	C	C	C	B	A
Approach Delay (s)		14.3			27.7			26.2			18.9	
Approach LOS		B			C			C			B	

Intersection Summary					
HCM Average Control Delay	19.6	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.53				
Actuated Cycle Length (s)	75.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	52.9%	ICU Level of Service		A	
Analysis Period (min)	15				

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
12: SR-4 EB Ramps & Loveridge Road

YR2015 ALT 1 - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	142	0	196	0	0	0	0	938	51	0	744	142
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0					4.0			4.0	
Lane Util. Factor	1.00		1.00					0.95			0.95	
Frt	1.00		0.85					0.99			0.98	
Flt Protected	0.95		1.00					1.00			1.00	
Satd. Flow (prot)	1770		1583					3512			3454	
Flt Permitted	0.95		1.00					1.00			1.00	
Satd. Flow (perm)	1770		1583					3512			3454	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	154	0	213	0	0	0	0	1020	55	0	809	154
RTOR Reduction (vph)	0	0	150	0	0	0	0	3	0	0	14	0
Lane Group Flow (vph)	154	0	63	0	0	0	0	1072	0	0	949	0
Turn Type	Prot		custom									
Protected Phases	4		4					2			6	
Permitted Phases												
Actuated Green, G (s)	12.0		12.0					55.0			55.0	
Effective Green, g (s)	12.0		12.0					55.0			55.0	
Actuated g/C Ratio	0.16		0.16					0.73			0.73	
Clearance Time (s)	4.0		4.0					4.0			4.0	
Vehicle Extension (s)	3.0		3.0					3.0			3.0	
Lane Grp Cap (vph)	283		253					2575			2533	
v/s Ratio Prot	c0.09		0.04					c0.31			0.27	
v/s Ratio Perm												
v/c Ratio	0.54		0.25					0.42			0.37	
Uniform Delay, d1	29.0		27.6					3.8			3.7	
Progression Factor	1.00		1.00					0.39			1.00	
Incremental Delay, d2	2.1		0.5					0.4			0.4	
Delay (s)	31.1		28.1					1.9			4.1	
Level of Service	C		C					A			A	
Approach Delay (s)		29.3			0.0			1.9			4.1	
Approach LOS		C			A			A			A	

Intersection Summary					
HCM Average Control Delay	7.0	HCM Level of Service		A	
HCM Volume to Capacity ratio	0.44				
Actuated Cycle Length (s)	75.0	Sum of lost time (s)		8.0	
Intersection Capacity Utilization	43.9%	ICU Level of Service		A	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
13: California Avenue & SR-4 WB Ramps

YR2015 ALT 1 - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	370	4	546	306	5	189	23	564	20	60	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		0.97	0.95	1.00	0.95	0.95	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	0.96	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3534		3433	3539	1583	1681	1703	1583	1770	1792	
Flt Permitted	0.55	1.00		0.95	1.00	1.00	0.95	0.53	1.00	0.80	1.00	
Satd. Flow (perm)	1026	3534		3433	3539	1583	1681	937	1583	1490	1792	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	402	4	593	333	5	205	25	613	22	65	22
RTOR Reduction (vph)	0	2	0	0	0	2	0	0	373	0	20	0
Lane Group Flow (vph)	2	404	0	593	333	3	115	115	240	22	67	0
Turn Type	Perm			Prot		Perm	Prot		Perm	Perm		
Protected Phases		4		3	8		5	2			6	
Permitted Phases	4					8			2	6		
Actuated Green, G (s)	10.4	10.4		9.0	23.4	23.4	4.0	13.0	13.0	5.0	5.0	
Effective Green, g (s)	10.4	10.4		9.0	23.4	23.4	4.0	13.0	13.0	5.0	5.0	
Actuated g/C Ratio	0.23	0.23		0.20	0.53	0.53	0.09	0.29	0.29	0.11	0.11	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	240	828		696	1865	834	151	343	463	168	202	
v/s Ratio Prot		c0.11		c0.17	0.09		c0.07	0.03			0.04	
v/s Ratio Perm	0.00					0.00		0.07	c0.15	0.01		
v/c Ratio	0.01	0.49		0.85	0.18	0.00	0.76	0.34	0.52	0.13	0.33	
Uniform Delay, d1	13.0	14.7		17.1	5.5	5.0	19.7	12.3	13.1	17.7	18.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	0.5		9.9	0.0	0.0	20.0	0.6	4.1	1.6	4.4	
Delay (s)	13.1	15.2		26.9	5.5	5.0	39.8	12.9	17.2	19.4	22.6	
Level of Service	B	B		C	A	A	D	B	B	B	C	
Approach Delay (s)		15.1			19.1			19.7			21.9	
Approach LOS		B			B			B			C	

Intersection Summary					
HCM Average Control Delay	18.8	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.61				
Actuated Cycle Length (s)	44.4	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	59.7%	ICU Level of Service		B	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
14: California Avenue & Harbor Street

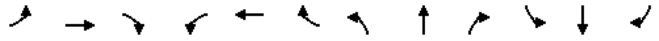
YR2015 ALT 1 - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	27	97	57	476	439	368	86	426	116	108	398	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.94		1.00	1.00	0.85	1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1759		1770	1863	1583	1770	3426		1770	3468	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1759		1770	1863	1583	1770	3426		1770	3468	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	29	105	62	517	477	400	93	463	126	117	433	67
RTOR Reduction (vph)	0	27	0	0	0	218	0	30	0	0	15	0
Lane Group Flow (vph)	29	140	0	517	477	182	93	559	0	117	485	0
Turn Type	Prot			Prot		Perm	Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						
Actuated Green, G (s)	2.0	13.7		24.7	36.4	36.4	6.6	18.9		6.7	19.0	
Effective Green, g (s)	2.0	13.7		24.7	36.4	36.4	6.6	18.9		6.7	19.0	
Actuated g/C Ratio	0.02	0.17		0.31	0.45	0.45	0.08	0.24		0.08	0.24	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	44	301		546	848	720	146	809		148	824	
v/s Ratio Prot	0.02	0.08		c0.29	c0.26		0.05	c0.16		0.07	c0.14	
v/s Ratio Perm						0.11						
v/c Ratio	0.66	0.46		0.95	0.56	0.25	0.64	0.69		0.79	0.59	
Uniform Delay, d1	38.7	29.8		27.0	16.0	13.4	35.5	27.9		36.0	27.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00	0.95	0.90		1.00	1.00	
Incremental Delay, d2	30.4	1.1		25.6	0.9	0.2	8.6	4.7		24.3	3.1	
Delay (s)	69.0	31.0		52.6	16.8	13.6	42.6	29.9		60.3	30.1	
Level of Service	E	C		D	B	B	D	C		E	C	
Approach Delay (s)		36.6			29.2			31.7			35.8	
Approach LOS		D			C			C			D	

Intersection Summary				
HCM Average Control Delay	31.7	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.71			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	69.7%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
15: Bliss Avenue & Harbor Street

YR2015 ALT 1 - PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	4	236	9	4	16	134	578	14	4	872	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85		0.93		1.00	1.00		1.00	0.99	
Flt Protected		0.96	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1783	1583		1697		1770	3526		1770	3508	
Flt Permitted		0.72	1.00		0.91		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1346	1583		1560		1770	3526		1770	3508	
Peak-hour factor, PHF	0.86	0.86	0.86	0.78	0.78	0.78	0.89	0.89	0.89	0.90	0.90	0.90
Adj. Flow (vph)	40	5	274	12	5	21	151	649	16	4	969	61
RTOR Reduction (vph)	0	0	244	0	19	0	0	1	0	0	5	0
Lane Group Flow (vph)	0	45	30	0	19	0	151	664	0	4	1025	0
Turn Type	Perm		Perm	Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		8.7	8.7		8.7		15.1	58.0		1.3	44.2	
Effective Green, g (s)		8.7	8.7		8.7		15.1	58.0		1.3	44.2	
Actuated g/C Ratio		0.11	0.11		0.11		0.19	0.72		0.02	0.55	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		146	172		170		334	2556		29	1938	
v/s Ratio Prot							c0.09	0.19		0.00	c0.29	
v/s Ratio Perm		c0.03	0.02		0.01							
v/c Ratio		0.31	0.17		0.11		0.45	0.26		0.14	0.53	
Uniform Delay, d1		32.9	32.4		32.2		28.8	3.7		38.8	11.3	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.12	0.42	
Incremental Delay, d2		1.2	0.5		0.3		1.0	0.2		1.5	0.7	
Delay (s)		34.1	32.9		32.5		29.8	4.0		44.8	5.5	
Level of Service		C	C		C		C	A		D	A	
Approach Delay (s)		33.0			32.5			8.7			5.6	
Approach LOS		C			C			A			A	

Intersection Summary				
HCM Average Control Delay	11.2	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.48			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	53.8%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
16: Garcia Avenue & Harbor Street

YR2015 ALT 1 - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	73	35	169	53	39	171	117	524	86	345	796	104
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	79	38	184	58	42	186	127	570	93	375	865	113
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								663			696	
pX, platoon unblocked	0.96	0.96	0.93	0.96	0.96	0.96	0.93			0.96		
vC, conflicting volume	2418	2589	489	2256	2599	332	978			663		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2194	2373	313	2024	2383	215	837			561		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	71	0	0	75	83			61		
cM capacity (veh/h)	0	17	638	0	16	757	741			964		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	79	222	58	228	127	380	283	375	577	401
Volume Left	79	0	58	0	127	0	0	375	0	0
Volume Right	0	184	0	186	0	0	93	0	0	113
cSH	0	86	0	80	741	1700	1700	964	1700	1700
Volume to Capacity	Err	2.58	Err	2.84	0.17	0.22	0.17	0.39	0.34	0.24
Queue Length 95th (ft)	Err	524	Err	558	15	0	0	47	0	0
Control Delay (s)	Err	822.4	Err	943.2	10.9	0.0	0.0	11.1	0.0	0.0
Lane LOS	F	F	F	F	B			B		
Approach Delay (s)	Err		Err		1.7			3.1		
Approach LOS	F		F							

Intersection Summary					
Average Delay	Err				
Intersection Capacity Utilization	66.3%	ICU Level of Service		C	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
17: Garcia Avenue & Railroad Avenue

YR2015 ALT 1 - PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	82	17	27	69	50	99	10	771	70	228	1192	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.96	1.00		0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1788	1583		1810	1583	1770	3495		1770	3515	
Flt Permitted		0.23	1.00		0.97	1.00	0.11	1.00		0.21	1.00	
Satd. Flow (perm)		427	1583		1810	1583	207	3495		387	3515	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	89	18	29	75	54	108	11	838	76	248	1296	61
RTOR Reduction (vph)	0	0	23	0	0	86	0	8	0	0	4	0
Lane Group Flow (vph)	0	107	6	0	129	22	11	906	0	248	1353	0
Turn Type	Perm		Perm	Split		Perm	Perm			Perm		
Protected Phases		4		8	8			2			6	
Permitted Phases	4		4			8	2			6		
Actuated Green, G (s)		16.0	16.0		16.0	16.0	36.0	36.0		36.0	36.0	
Effective Green, g (s)		16.0	16.0		16.0	16.0	36.0	36.0		36.0	36.0	
Actuated g/C Ratio		0.20	0.20		0.20	0.20	0.45	0.45		0.45	0.45	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)		85	317		362	317	93	1573		174	1582	
v/s Ratio Prot					c0.07			0.26			0.38	
v/s Ratio Perm		c0.25	0.00			0.01	0.05			c0.64		
v/c Ratio		1.26	0.02		0.36	0.07	0.12	0.58		1.43	0.85	
Uniform Delay, d1		32.0	25.7		27.6	26.0	12.8	16.3		22.0	19.7	
Progression Factor		1.00	1.00		0.84	0.56	1.00	1.00		1.00	1.00	
Incremental Delay, d2		182.3	0.1		2.7	0.4	2.6	1.5		221.4	6.1	
Delay (s)		214.3	25.8		26.0	14.9	15.4	17.9		243.4	25.8	
Level of Service		F	C		C	B	B	B		F	C	
Approach Delay (s)		174.1			20.9			17.8			59.4	
Approach LOS		F			C			B			E	

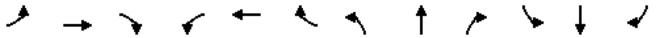
Intersection Summary					
HCM Average Control Delay	48.4	HCM Level of Service		D	
HCM Volume to Capacity ratio	1.13				
Actuated Cycle Length (s)	80.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	61.2%	ICU Level of Service		B	
Analysis Period (min)	15				

c Critical Lane Group

FUTURE YEAR 2030 PROJECT BUILD (ALTERNATIVE 1) CONDITIONS – AM PEAK HOUR

HCM Unsignalized Intersection Capacity Analysis
1: Civic Avenue & Davi Avenue

Year 2030 - ALT 1 AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	3	115	54	486	142	20	5	2	28	8	41	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	125	59	528	154	22	5	2	30	9	45	5

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	187	683	22	8	30	59
Volume Left (vph)	3	528	0	5	0	9
Volume Right (vph)	59	0	22	0	30	5
Hadj (s)	-0.15	0.42	-0.67	0.18	-0.57	0.01
Departure Headway (s)	4.9	5.3	4.2	6.4	3.2	6.1
Degree Utilization, x	0.26	1.00	0.03	0.01	0.03	0.10
Capacity (veh/h)	727	670	843	540	1121	572
Control Delay (s)	9.6	56.9	6.1	9.5	6.3	9.8
Approach Delay (s)	9.6	55.3		6.9		9.8
Approach LOS	A	F		A		A

Intersection Summary				
Delay	42.1			
HCM Level of Service	E			
Intersection Capacity Utilization	65.8%	ICU Level of Service	C	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
3: Civic Avenue & Railroad Avenue

Year 2030 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	0	89	8	3	5	566	748	8	2	512	136
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97		1.00		1.00		0.97	0.95		1.00	0.95	1.00
Frt	1.00		0.85		0.96		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95		1.00		0.98		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433		1583		1738		3433	3534		1770	3539	1583
Flt Permitted	0.95		1.00		0.98		0.95	1.00		0.26	1.00	1.00
Satd. Flow (perm)	3433		1583		1738		3433	3534		477	3539	1583
Peak-hour factor, PHF	0.72	0.72	0.72	0.56	0.56	0.56	0.77	0.77	0.77	0.92	0.92	0.92
Adj. Flow (vph)	32	0	124	14	5	9	735	971	10	2	557	148
RTOR Reduction (vph)	0	0	114	0	9	0	0	0	0	0	0	65
Lane Group Flow (vph)	32	0	10	0	19	0	735	981	0	2	557	83
Turn Type	Prot		custom	Split			Prot			Perm		Perm
Protected Phases	4		4	8	8		5	2			6	
Permitted Phases										6		6
Actuated Green, G (s)	7.2		7.2		3.2		23.0	67.6		40.6	40.6	40.6
Effective Green, g (s)	7.2		7.2		3.2		23.0	67.6		40.6	40.6	40.6
Actuated g/C Ratio	0.08		0.08		0.04		0.26	0.75		0.45	0.45	0.45
Clearance Time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0		3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	275		127		62		877	2654		215	1596	714
v/s Ratio Prot	c0.01		0.01		c0.01		c0.21	c0.28			0.16	
v/s Ratio Perm										0.00		0.05
v/c Ratio	0.12		0.08		0.31		0.84	0.37		0.01	0.35	0.12
Uniform Delay, d1	38.4		38.3		42.3		31.7	3.9		13.6	16.1	14.3
Progression Factor	1.00		1.00		1.00		0.71	0.33		1.00	1.00	1.00
Incremental Delay, d2	0.2		0.3		2.9		6.6	0.4		0.1	0.6	0.3
Delay (s)	38.6		38.6		45.2		29.2	1.6		13.7	16.7	14.6
Level of Service	D		D		D		C	A		B	B	B
Approach Delay (s)		38.6			45.2			13.5			16.3	
Approach LOS		D			D			B			B	

Intersection Summary					
HCM Average Control Delay	16.1	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.50				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		16.0	
Intersection Capacity Utilization	47.9%	ICU Level of Service		A	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
4: Center Drive & Railroad Avenue

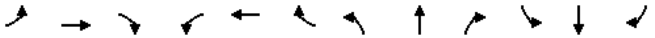
Year 2030 - ALT 1 AM

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	18	409	211	1304	640	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	
Frt	0.86	0.85	1.00	1.00	1.00	
Flt Protected	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1600	1504	1770	3539	3538	
Flt Permitted	1.00	1.00	0.38	1.00	1.00	
Satd. Flow (perm)	1600	1504	717	3539	3538	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	20	445	229	1417	696	2
RTOR Reduction (vph)	194	209	0	0	0	0
Lane Group Flow (vph)	40	22	229	1417	698	0
Turn Type		Perm	Perm			
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	8.6	8.6	73.4	73.4	73.4	
Effective Green, g (s)	8.6	8.6	73.4	73.4	73.4	
Actuated g/C Ratio	0.10	0.10	0.82	0.82	0.82	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	153	144	585	2886	2885	
v/s Ratio Prot	c0.03			c0.40	0.20	
v/s Ratio Perm		0.01	0.32			
v/c Ratio	0.26	0.15	0.39	0.49	0.24	
Uniform Delay, d1	37.8	37.4	2.2	2.6	1.9	
Progression Factor	1.00	1.00	0.53	0.47	0.43	
Incremental Delay, d2	0.9	0.5	1.3	0.4	0.2	
Delay (s)	38.7	37.9	2.4	1.6	1.0	
Level of Service	D	D	A	A	A	
Approach Delay (s)	38.3			1.7	1.0	
Approach LOS	D			A	A	

Intersection Summary				
HCM Average Control Delay	7.6	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.47			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	52.1%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
5: SR-4 WB On-Ramp & Railroad Avenue

Year 2030 - ALT 1 AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	42	429	558	593	957	58	38	758	253
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor					0.95	1.00	0.97	0.95		1.00	0.95	1.00
Frt					1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected					1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)					3523	1583	3433	3509		1770	3539	1583
Flt Permitted					1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)					3523	1583	3433	3509		1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.83	0.83	0.83	0.96	0.96	0.96	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	51	517	672	618	997	60	39	781	261
RTOR Reduction (vph)	0	0	0	0	0	96	0	4	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	568	576	618	1053	0	39	781	261
Turn Type				Split		Prot	Prot			Prot		Free
Protected Phases				8	8	8	5	2		1	6	
Permitted Phases												Free
Actuated Green, G (s)					34.9	34.9	17.3	40.7		2.4	25.8	90.0
Effective Green, g (s)					34.9	34.9	17.3	40.7		2.4	25.8	90.0
Actuated g/C Ratio					0.39	0.39	0.19	0.45		0.03	0.29	1.00
Clearance Time (s)					4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)					1366	614	660	1587		47	1015	1583
v/s Ratio Prot					0.16	c0.36	c0.18	0.30		0.02	c0.22	
v/s Ratio Perm												0.16
v/c Ratio					0.42	0.94	0.94	0.66		0.83	0.77	0.16
Uniform Delay, d1					20.1	26.5	35.8	19.3		43.6	29.4	0.0
Progression Factor					0.56	0.53	0.81	0.64		0.80	0.76	1.00
Incremental Delay, d2					0.2	18.7	13.3	1.2		67.8	5.4	0.2
Delay (s)					11.5	32.8	42.3	13.5		102.8	27.8	0.2
Level of Service					B	C	D	B		F	C	A
Approach Delay (s)		0.0			23.0			24.1			23.8	
Approach LOS		A			C			C			C	

Intersection Summary				
HCM Average Control Delay	23.7	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.88			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	69.5%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
6: SR-4 EB Off-Ramp & Railroad Avenue

Year 2030 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	436	3	389	0	0	0	0	1172	240	359	441	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor	0.95	0.91	0.95					0.91		1.00	0.95	
Frt	1.00	0.93	0.85					0.97		1.00	1.00	
Flt Protected	0.95	0.97	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1681	1537	1504					4956		1770	3539	
Flt Permitted	0.95	0.97	1.00					1.00		0.95	1.00	
Satd. Flow (perm)	1681	1537	1504					4956		1770	3539	
Peak-hour factor, PHF	0.88	0.88	0.88	0.92	0.92	0.92	0.89	0.89	0.89	0.90	0.90	0.90
Adj. Flow (vph)	495	3	442	0	0	0	0	1317	270	399	490	0
RTOR Reduction (vph)	0	35	229	0	0	0	0	33	0	0	0	0
Lane Group Flow (vph)	327	282	67	0	0	0	0	1554	0	399	490	0
Turn Type	Split		Prot							Prot		
Protected Phases	4	4	4					2		1	6	
Permitted Phases												
Actuated Green, G (s)	20.5	20.5	20.5					34.3		23.2	61.5	
Effective Green, g (s)	20.5	20.5	20.5					34.3		23.2	61.5	
Actuated g/C Ratio	0.23	0.23	0.23					0.38		0.26	0.68	
Clearance Time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)	383	350	343					1889		456	2418	
v/s Ratio Prot	c0.19	0.18	0.04					c0.31		c0.23	0.14	
v/s Ratio Perm												
v/c Ratio	0.85	0.81	0.20					0.82		0.88	0.20	
Uniform Delay, d1	33.3	32.9	28.1					25.1		32.0	5.2	
Progression Factor	1.00	1.00	1.00					0.53		0.32	0.26	
Incremental Delay, d2	16.6	12.7	0.3					3.2		12.6	0.1	
Delay (s)	50.0	45.6	28.4					16.4		22.7	1.5	
Level of Service	D	D	C					B		C	A	
Approach Delay (s)		41.7			0.0			16.4			11.0	
Approach LOS		D			A			B			B	

Intersection Summary				
HCM Average Control Delay	22.0	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.85			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	74.0%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
7: Bliss Avenue & Railroad Avenue

Year 2030 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	2	4	80	106	148	133	1181	115	80	786	132
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected		0.97	1.00		0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1800	1583		1823	1583	1770	3492		1770	3463	
Flt Permitted		0.83	1.00		0.86	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1553	1583		1595	1583	1770	3492		1770	3463	
Peak-hour factor, PHF	0.68	0.68	0.68	0.91	0.91	0.91	0.85	0.85	0.85	0.91	0.91	0.91
Adj. Flow (vph)	7	3	6	88	116	163	156	1389	135	88	864	145
RTOR Reduction (vph)	0	0	5	0	0	134	0	7	0	0	14	0
Lane Group Flow (vph)	0	10	1	0	204	29	156	1517	0	88	995	0
Turn Type	Perm		Perm	Perm		Perm	Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		15.8	15.8		15.8	15.8	15.8	55.0		7.2	46.4	
Effective Green, g (s)		15.8	15.8		15.8	15.8	15.8	55.0		7.2	46.4	
Actuated g/C Ratio		0.18	0.18		0.18	0.18	0.18	0.61		0.08	0.52	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		273	278		280	278	311	2134		142	1785	
v/s Ratio Prot							0.09	c0.43		0.05	c0.29	
v/s Ratio Perm		0.01	0.00		c0.13	0.02						
v/c Ratio		0.04	0.00		0.73	0.10	0.50	0.71		0.62	0.56	
Uniform Delay, d1		30.8	30.6		35.1	31.1	33.5	12.0		40.1	14.8	
Progression Factor		1.00	1.00		1.01	1.25	0.68	0.25		1.21	0.50	
Incremental Delay, d2		0.1	0.0		9.0	0.2	1.1	1.8		7.5	1.2	
Delay (s)		30.8	30.6		44.4	39.0	23.9	4.7		56.2	8.6	
Level of Service		C	C		D	D	C	A		E	A	
Approach Delay (s)		30.8			42.0			6.5			12.4	
Approach LOS		C			D			A			B	

Intersection Summary				
HCM Average Control Delay	12.8	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.71			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	67.4%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: Leland Road & Railroad Avenue

Year 2030 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	198	638	267	186	736	236	410	1003	159	146	663	268
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.88
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	2787
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	215	693	290	202	800	257	446	1090	173	159	721	291
RTOR Reduction (vph)	0	0	226	0	0	27	0	0	49	0	0	80
Lane Group Flow (vph)	215	693	64	202	800	230	446	1090	124	159	721	211
Turn Type	Prot		Perm	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	10.0	20.0	20.0	10.0	20.0	29.8	22.0	29.2	39.2	9.8	17.0	27.0
Effective Green, g (s)	11.0	21.0	20.0	11.0	21.0	31.8	23.0	31.2	41.2	10.8	19.0	29.0
Actuated g/C Ratio	0.12	0.23	0.22	0.12	0.23	0.35	0.26	0.35	0.46	0.12	0.21	0.32
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.0	5.0	5.0	6.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	216	826	352	216	826	630	452	1227	725	212	747	898
v/s Ratio Prot	c0.12	0.20		0.11	c0.23	0.04	c0.25	0.31	0.02	0.09	c0.20	0.03
v/s Ratio Perm			0.04			0.10			0.06			0.05
v/c Ratio	1.00	0.84	0.18	0.94	0.97	0.36	0.99	0.89	0.17	0.75	0.97	0.23
Uniform Delay, d1	39.5	32.9	28.4	39.1	34.2	21.6	33.3	27.8	14.4	38.3	35.2	22.4
Progression Factor	1.00	1.00	1.00	0.55	0.48	0.32	1.00	1.00	1.00	0.69	0.79	1.10
Incremental Delay, d2	59.6	10.0	1.1	33.0	18.9	0.2	38.5	9.8	0.1	13.5	25.0	0.1
Delay (s)	99.0	42.9	29.5	54.5	35.3	7.3	71.8	37.5	14.5	40.0	52.7	24.7
Level of Service	F	D	C	D	D	A	E	D	B	D	D	C
Approach Delay (s)		49.7			32.7			44.1			44.0	
Approach LOS		D			C			D			D	

Intersection Summary				
HCM Average Control Delay	42.7	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.98			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	85.7%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: Leland Road & Harbor Street

Year 2030 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	289	473	124	59	834	276	74	289	44	162	415	316
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	314	514	135	64	907	300	80	314	48	176	451	343
RTOR Reduction (vph)	0	0	78	0	0	214	0	0	39	0	0	264
Lane Group Flow (vph)	314	514	57	64	907	86	80	314	9	176	451	79
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	18.3	37.8	37.8	6.4	25.9	25.9	7.2	17.0	17.0	10.8	20.6	20.6
Effective Green, g (s)	18.3	38.8	37.8	6.4	26.9	25.9	7.2	18.0	17.0	10.8	21.6	20.6
Actuated g/C Ratio	0.20	0.43	0.42	0.07	0.30	0.29	0.08	0.20	0.19	0.12	0.24	0.23
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	360	1526	665	126	1058	456	142	708	299	212	849	362
v/s Ratio Prot	c0.18	0.15		0.04	c0.26		0.05	c0.09		c0.10	c0.13	
v/s Ratio Perm			0.04			0.05			0.01			0.05
v/c Ratio	0.87	0.34	0.09	0.51	0.86	0.19	0.56	0.44	0.03	0.83	0.53	0.22
Uniform Delay, d1	34.7	17.0	15.7	40.3	29.7	24.1	39.9	31.6	29.8	38.7	29.8	28.2
Progression Factor	0.50	0.60	0.33	0.66	0.56	0.34	1.00	1.00	1.00	0.91	0.88	0.99
Incremental Delay, d2	14.6	0.4	0.2	2.6	7.6	0.8	5.0	2.0	0.2	22.0	2.2	1.3
Delay (s)	32.1	10.6	5.4	29.4	24.2	9.0	44.9	33.6	30.0	57.3	28.5	29.2
Level of Service	C	B	A	C	C	A	D	C	C	E	C	C
Approach Delay (s)		16.9			20.9			35.3			34.0	
Approach LOS		B			C			D			C	

Intersection Summary				
HCM Average Control Delay	25.0	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.73			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	69.4%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
10: Leland Road & Freed Avenue

Year 2030 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	8	742	10	25	914	29	5	10	49	26	12	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.90	0.90	0.90	0.71	0.71	0.71	0.56	0.56	0.56
Hourly flow rate (vph)	10	905	12	28	1016	32	7	14	69	46	21	7
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												2
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1048			917			1505	2034	459	1635	2024	524
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1048			917			1505	2034	459	1635	2024	524
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			96			87	74	87	0	60	99
cM capacity (veh/h)	660			740			55	53	549	45	54	498

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	10	603	314	28	677	371	90	75
Volume Left	10	0	0	28	0	0	7	46
Volume Right	0	0	12	0	0	32	69	7
cSH	660	1700	1700	740	1700	1700	174	52
Volume to Capacity	0.01	0.35	0.18	0.04	0.40	0.22	0.52	1.44
Queue Length 95th (ft)	1	0	0	3	0	0	65	173
Control Delay (s)	10.5	0.0	0.0	10.1	0.0	0.0	45.9	407.8
Lane LOS	B			B			E	F
Approach Delay (s)	0.1			0.3			45.9	407.8
Approach LOS							E	F

Intersection Summary					
Average Delay	16.2				
Intersection Capacity Utilization	43.3%	ICU Level of Service		A	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
11: Leland Road & Loveridge Road

Year 2030 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	368	366	46	8	517	132	319	538	103	378	91	314
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	400	398	50	9	562	143	347	585	112	411	99	341
RTOR Reduction (vph)	0	0	36	0	0	115	0	0	105	0	0	274
Lane Group Flow (vph)	400	398	14	9	562	28	347	585	7	411	99	67
Turn Type	Prot		Perm	Prot		Perm	Prot		Over	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	13.7	25.0	25.0	5.3	16.6	16.6	23.0	24.9	5.3	14.8	16.7	16.7
Effective Green, g (s)	14.7	26.0	26.0	6.3	17.6	17.6	24.0	25.9	5.3	15.8	17.7	17.7
Actuated g/C Ratio	0.16	0.29	0.29	0.07	0.20	0.20	0.27	0.29	0.06	0.18	0.20	0.20
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	561	1022	457	240	692	310	472	1018	93	603	696	311
v/s Ratio Prot	c0.12	0.11		0.00	c0.16		c0.20	0.17	0.00	c0.12	0.03	
v/s Ratio Perm			0.01			0.02						0.04
v/c Ratio	0.71	0.39	0.03	0.04	0.81	0.09	0.74	0.57	0.07	0.68	0.14	0.22
Uniform Delay, d1	35.7	25.6	23.0	39.0	34.6	29.6	30.1	27.3	40.0	34.7	29.9	30.3
Progression Factor	0.79	0.69	0.49	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.13
Incremental Delay, d2	4.1	0.2	0.0	0.1	7.2	0.1	5.9	2.4	0.3	2.8	0.4	1.4
Delay (s)	32.2	18.0	11.2	39.1	41.8	29.8	36.0	29.7	40.3	35.7	28.7	35.6
Level of Service	C	B	B	D	D	C	D	C	D	D	C	D
Approach Delay (s)		24.3			39.4			32.9			34.9	
Approach LOS		C			D			C			C	

Intersection Summary					
HCM Average Control Delay	32.6	HCM Level of Service		C	
HCM Volume to Capacity ratio	0.72				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		16.0	
Intersection Capacity Utilization	63.8%	ICU Level of Service		B	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
12: SR-4 EB Ramps & Loveridge Road

Year 2030 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	388	0	459	0	0	0	0	766	337	0	420	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0					4.0	4.0		4.0	
Lane Util. Factor	1.00		1.00					0.95	1.00		0.95	
Frt	1.00		0.85					1.00	0.85		0.95	
Flt Protected	0.95		1.00					1.00	1.00		1.00	
Satd. Flow (prot)	1770		1583					3539	1583		3351	
Flt Permitted	0.95		1.00					1.00	1.00		1.00	
Satd. Flow (perm)	1770		1583					3539	1583		3351	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	422	0	499	0	0	0	0	833	366	0	457	250
RTOR Reduction (vph)	0	0	159	0	0	0	0	0	194	0	133	0
Lane Group Flow (vph)	422	0	340	0	0	0	0	833	172	0	574	0
Turn Type	Prot		custom						Perm			
Protected Phases	4		4					2			6	
Permitted Phases									2			
Actuated Green, G (s)	15.9		15.9					21.1	21.1		21.1	
Effective Green, g (s)	15.9		15.9					21.1	21.1		21.1	
Actuated g/C Ratio	0.35		0.35					0.47	0.47		0.47	
Clearance Time (s)	4.0		4.0					4.0	4.0		4.0	
Vehicle Extension (s)	3.0		3.0					3.0	3.0		3.0	
Lane Grp Cap (vph)	625		559					1659	742		1571	
v/s Ratio Prot	c0.24		0.21					c0.24			0.17	
v/s Ratio Perm									0.11			
v/c Ratio	0.68		0.61					0.50	0.23		0.37	
Uniform Delay, d1	12.4		12.0					8.3	7.1		7.7	
Progression Factor	1.00		1.00					0.26	0.09		1.00	
Incremental Delay, d2	2.9		1.9					0.9	0.6		0.7	
Delay (s)	15.2		13.9					3.0	1.3		8.3	
Level of Service	B		B					A	A		A	
Approach Delay (s)		14.5			0.0			2.5			8.3	
Approach LOS		B			A			A			A	

Intersection Summary				
HCM Average Control Delay	7.9	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.58			
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	54.1%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
13: California Avenue & SR-4 WB Ramps

Year 2030 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	173	5	359	648	30	290	40	154	15	6	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		0.97	0.95	1.00	0.95	0.95	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	0.96	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3525		3433	3539	1583	1681	1705	1583	1770	1698	
Flt Permitted	0.67	1.00		0.95	1.00	1.00	0.95	0.59	1.00	0.64	1.00	
Satd. Flow (perm)	1242	3525		3433	3539	1583	1681	1045	1583	1191	1698	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	33	188	5	390	704	33	315	43	167	16	7	10
RTOR Reduction (vph)	0	4	0	0	0	19	0	0	102	0	8	0
Lane Group Flow (vph)	33	189	0	390	704	14	180	178	65	16	9	0
Turn Type	Perm			Prot		Perm	Prot		Perm	Perm		
Protected Phases		4		3	8		5	2			6	
Permitted Phases	4					8			2	6		
Actuated Green, G (s)	6.0	6.0		7.5	17.5	17.5	5.3	16.1	16.1	6.8	6.8	
Effective Green, g (s)	6.0	6.0		7.5	17.5	17.5	5.3	16.1	16.1	6.8	6.8	
Actuated g/C Ratio	0.14	0.14		0.18	0.42	0.42	0.13	0.39	0.39	0.16	0.16	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	179	508		619	1489	666	214	489	613	195	278	
v/s Ratio Prot		0.05		0.11	c0.20		c0.11	0.05			0.01	
v/s Ratio Perm	0.03					0.01		c0.09	0.04	0.01		
v/c Ratio	0.18	0.37		0.63	0.47	0.02	0.84	0.36	0.11	0.08	0.03	
Uniform Delay, d1	15.6	16.1		15.8	8.7	7.0	17.7	9.1	8.1	14.8	14.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.5	0.5		2.1	0.2	0.0	24.6	0.5	0.3	0.8	0.2	
Delay (s)	16.1	16.6		17.9	9.0	7.1	42.4	9.6	8.5	15.6	14.8	
Level of Service	B	B		B	A	A	D	A	A	B	B	
Approach Delay (s)		16.5			12.0			20.5			15.2	
Approach LOS		B			B			C			B	

Intersection Summary				
HCM Average Control Delay	14.9	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.48			
Actuated Cycle Length (s)	41.6	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	47.0%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
14: California Avenue & Harbor Street

Year 2030 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	129	54	74	561	640	514	127	752	41	43	529	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	1863	1583	1770	3512		1770	3485	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3539	1583	1770	1863	1583	1770	3512		1770	3485	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	140	59	80	610	696	559	138	817	45	47	575	66
RTOR Reduction (vph)	0	0	72	0	0	114	0	4	0	0	10	0
Lane Group Flow (vph)	140	59	8	610	696	445	138	858	0	47	631	0
Turn Type	Prot		Over	Prot		Perm	Prot			Prot		
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases						8						
Actuated Green, G (s)	8.9	5.8	8.6	41.2	38.1	38.1	8.6	23.5		3.5	18.4	
Effective Green, g (s)	8.9	5.8	8.6	41.2	38.1	38.1	8.6	23.5		3.5	18.4	
Actuated g/C Ratio	0.10	0.06	0.10	0.46	0.42	0.42	0.10	0.26		0.04	0.20	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	175	228	151	810	789	670	169	917		69	712	
v/s Ratio Prot	c0.08	0.02	0.00	c0.34	c0.37		c0.08	c0.24		0.03	0.18	
v/s Ratio Perm						0.28						
v/c Ratio	0.80	0.26	0.05	0.75	0.88	0.66	0.82	0.94		0.68	0.89	
Uniform Delay, d1	39.7	40.1	37.0	20.2	23.9	20.8	39.9	32.5		42.7	34.8	
Progression Factor	0.98	0.99	1.34	1.00	1.00	1.00	0.98	0.80		1.00	1.00	
Incremental Delay, d2	22.2	0.6	0.1	4.0	11.4	2.5	24.3	17.0		24.2	15.3	
Delay (s)	61.0	40.4	49.6	24.2	35.2	23.3	63.4	43.1		66.9	50.0	
Level of Service	E	D	D	C	D	C	E	D		E	D	
Approach Delay (s)		53.4			28.0			45.9			51.2	
Approach LOS		D			C			D			D	

Intersection Summary				
HCM Average Control Delay	38.7	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.90			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	79.6%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
15: Bliss Avenue & Harbor Street

Year 2030 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	53	9	71	1	9	4	72	863	2	5	1093	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	*0.95		1.00	*0.95	
Frt		1.00	0.85		0.96		1.00	1.00		1.00	0.99	
Flt Protected		0.96	1.00		1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1786	1583		1783		1770	3538		1770	3509	
Flt Permitted		0.74	1.00		0.99		0.14	1.00		0.26	1.00	
Satd. Flow (perm)		1384	1583		1765		253	3538		475	3509	
Peak-hour factor, PHF	0.90	0.90	0.90	0.67	0.67	0.67	0.81	0.81	0.81	0.73	0.73	0.73
Adj. Flow (vph)	59	10	79	1	13	6	89	1065	2	7	1497	90
RTOR Reduction (vph)	0	0	61	0	4	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	69	18	0	16	0	89	1067	0	7	1583	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		8.7	8.7		8.7		73.3	73.3		73.3	73.3	
Effective Green, g (s)		8.7	8.7		8.7		73.3	73.3		73.3	73.3	
Actuated g/C Ratio		0.10	0.10		0.10		0.81	0.81		0.81	0.81	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		134	153		171		206	2882		387	2858	
v/s Ratio Prot								0.30			c0.45	
v/s Ratio Perm		c0.05	0.01		0.01		0.35			0.01		
v/c Ratio		0.51	0.12		0.10		0.43	0.37		0.02	0.55	
Uniform Delay, d1		38.6	37.2		37.1		2.4	2.2		1.6	2.8	
Progression Factor		1.16	1.78		1.00		0.73	0.60		1.26	0.99	
Incremental Delay, d2		2.6	0.3		0.2		6.2	0.3		0.1	0.6	
Delay (s)		47.4	66.3		37.3		7.9	1.7		2.1	3.4	
Level of Service		D	E		D		A	A		A	A	
Approach Delay (s)		57.5			37.3			2.2			3.4	
Approach LOS		E			D			A			A	

Intersection Summary				
HCM Average Control Delay	5.9	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.55			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	56.4%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
16: Garcia Ave & Harbor Street

Year 2030 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	33	5	239	39	13	103	199	776	70	169	766	78
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	36	5	260	42	14	112	216	843	76	184	833	85
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								663			696	
pX, platoon unblocked	0.99	0.99		0.99	0.99	0.99				0.99		
vC, conflicting volume	2216	2595	459	2360	2599	460	917			920		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2211	2592	459	2356	2596	443	917			906		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	58	53	0	0	80	71			75		
cM capacity (veh/h)	0	13	549	4	13	559	739			742		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	36	265	42	126	216	562	357	184	555	362
Volume Left	36	0	42	0	216	0	0	184	0	0
Volume Right	0	260	0	112	0	0	76	0	0	85
cSH	0	299	4	98	739	1700	1700	742	1700	1700
Volume to Capacity	Err	0.89	9.71	1.29	0.29	0.33	0.21	0.25	0.33	0.21
Queue Length 95th (ft)	Err	203	Err	221	30	0	0	24	0	0
Control Delay (s)	Err	65.8	Err	266.1	11.9	0.0	0.0	11.4	0.0	0.0
Lane LOS	F	F	F	F	B			B		
Approach Delay (s)	Err		2715.0		2.3			1.9		
Approach LOS	F		F							

Intersection Summary					
Average Delay	Err				
Intersection Capacity Utilization	66.4%	ICU Level of Service		C	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
17: Garcia Ave & Railroad Avenue

Year 2030 - ALT 1 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	21	26	21	109	22	207	18	1122	88	113	702	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1822	1583		1788	1583	1770	3500		1770	3526	
Flt Permitted		0.24	1.00		0.96	1.00	0.31	1.00		0.14	1.00	
Satd. Flow (perm)		447	1583		1788	1583	579	3500		254	3526	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	23	28	23	118	24	225	20	1220	96	123	763	20
RTOR Reduction (vph)	0	0	20	0	0	195	0	5	0	0	2	0
Lane Group Flow (vph)	0	51	3	0	142	30	20	1311	0	123	781	0
Turn Type	Perm		Perm	Split		Perm	Perm			Perm		
Protected Phases		4		8	8			2			6	
Permitted Phases	4		4			8	2			6		
Actuated Green, G (s)		12.1	12.1		12.1	12.1	53.8	53.8		53.8	53.8	
Effective Green, g (s)		12.1	12.1		12.1	12.1	53.8	53.8		53.8	53.8	
Actuated g/C Ratio		0.13	0.13		0.13	0.13	0.60	0.60		0.60	0.60	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		60	213		240	213	346	2092		152	2108	
v/s Ratio Prot					c0.08			0.37			0.22	
v/s Ratio Perm		c0.11	0.00			0.02	0.03			c0.48		
v/c Ratio		0.85	0.01		0.59	0.14	0.06	0.63		0.81	0.37	
Uniform Delay, d1		38.1	33.8		36.6	34.4	7.5	11.6		14.1	9.4	
Progression Factor		1.00	1.00		1.04	1.25	0.45	0.67		0.33	0.15	
Incremental Delay, d2		64.6	0.0		3.6	0.3	0.2	0.8		31.0	0.4	
Delay (s)		102.7	33.8		41.8	43.1	3.6	8.6		35.7	1.8	
Level of Service		F	C		D	D	A	A		D	A	
Approach Delay (s)		81.3			42.6			8.5			6.4	
Approach LOS		F			D			A			A	

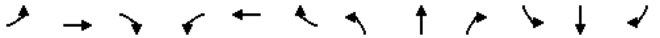
Intersection Summary					
HCM Average Control Delay	14.5	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.78				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	63.9%	ICU Level of Service		B	
Analysis Period (min)	15				

c Critical Lane Group

FUTURE YEAR 2030 PROJECT BUILD (ALTERNATIVE 1) CONDITIONS – PM PEAK HOUR

HCM Unsignalized Intersection Capacity Analysis
1: Civic Avenue & Davi Avenue

YR2030 ALT-1 PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	2	117	22	115	140	5	11	1	148	14	31	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	127	24	125	152	5	12	1	161	15	34	2

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	153	277	5	13	161	51
Volume Left (vph)	2	125	0	12	0	15
Volume Right (vph)	24	0	5	0	161	2
Hadj (s)	-0.06	0.26	-0.67	0.22	-0.57	0.07
Departure Headway (s)	4.4	5.0	4.1	5.2	3.2	5.0
Degree Utilization, x	0.19	0.39	0.01	0.02	0.14	0.07
Capacity (veh/h)	789	697	850	623	1121	654
Control Delay (s)	8.5	10.0	5.9	8.3	6.7	8.4
Approach Delay (s)	8.5	9.9		6.9		8.4
Approach LOS	A	A		A		A

Intersection Summary				
Delay	8.7			
HCM Level of Service	A			
Intersection Capacity Utilization	43.5%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
3: Civic Avenue & Railroad Avenue

YR2030 ALT-1 PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	128	0	127	2	2	1	223	617	2	2	745	162
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97		1.00		1.00		0.97	0.95		1.00	0.95	1.00
Frt	1.00		0.85		0.97		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95		1.00		0.98		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433		1583		1777		3433	3538		1770	3539	1583
Flt Permitted	0.42		1.00		0.98		0.95	1.00		0.36	1.00	1.00
Satd. Flow (perm)	1533		1583		1777		3433	3538		674	3539	1583
Peak-hour factor, PHF	0.77	0.77	0.77	0.50	0.50	0.50	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	166	0	165	4	4	2	235	649	2	2	810	176
RTOR Reduction (vph)	0	0	135	0	2	0	0	0	0	0	0	78
Lane Group Flow (vph)	166	0	30	0	8	0	235	651	0	2	810	98
Turn Type	custom		custom	Split			Prot			Perm		Perm
Protected Phases				8	8		5	2			6	
Permitted Phases	4		4							6		6
Actuated Green, G (s)	11.2		11.2		1.1		16.3	36.5		16.2	16.2	16.2
Effective Green, g (s)	11.2		11.2		1.1		16.3	36.5		16.2	16.2	16.2
Actuated g/C Ratio	0.18		0.18		0.02		0.27	0.60		0.27	0.27	0.27
Clearance Time (s)	4.0		4.0		4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0		3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	282		292		32		920	2124		180	943	422
v/s Ratio Prot					c0.00		0.07	c0.18			c0.23	
v/s Ratio Perm	c0.11		0.02							0.00		0.06
v/c Ratio	0.59		0.10		0.25		0.26	0.31		0.01	0.86	0.23
Uniform Delay, d1	22.7		20.6		29.4		17.5	6.0		16.4	21.2	17.4
Progression Factor	1.00		1.00		1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	3.1		0.2		4.1		0.1	0.4		0.1	10.0	1.3
Delay (s)	25.8		20.8		33.5		17.6	6.3		16.5	31.3	18.7
Level of Service	C		C		C		B	A		B	C	B
Approach Delay (s)		23.3			33.5			9.3			29.0	
Approach LOS		C			C			A			C	

Intersection Summary					
HCM Average Control Delay	20.3	HCM Level of Service		C	
HCM Volume to Capacity ratio	0.54				
Actuated Cycle Length (s)	60.8	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	44.8%	ICU Level of Service		A	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
4: Center Drive & Railroad Avenue

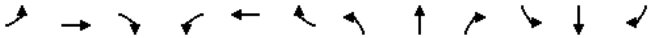
YR2030 ALT-1 PM

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	10	605	287	832	929	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	
Frt	0.85	0.85	1.00	1.00	1.00	
Flt Protected	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1590	1504	1770	3539	3537	
Flt Permitted	1.00	1.00	0.26	1.00	1.00	
Satd. Flow (perm)	1590	1504	480	3539	3537	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	658	312	904	1010	5
RTOR Reduction (vph)	164	164	0	0	0	0
Lane Group Flow (vph)	169	172	312	904	1015	0
Turn Type		Perm	Perm			
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	14.2	14.2	62.1	62.1	62.1	
Effective Green, g (s)	14.2	14.2	62.1	62.1	62.1	
Actuated g/C Ratio	0.17	0.17	0.74	0.74	0.74	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	268	253	354	2607	2606	
v/s Ratio Prot	0.11			0.26	0.29	
v/s Ratio Perm		c0.11	c0.65			
v/c Ratio	0.63	0.68	0.88	0.35	0.39	
Uniform Delay, d1	32.6	32.9	8.3	3.9	4.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.8	7.3	21.7	0.1	0.1	
Delay (s)	37.4	40.2	30.0	4.0	4.2	
Level of Service	D	D	C	A	A	
Approach Delay (s)	38.8			10.7	4.2	
Approach LOS	D			B	A	

Intersection Summary				
HCM Average Control Delay	14.9	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.84			
Actuated Cycle Length (s)	84.3	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	64.8%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
5: SR-4 WB On-Ramp & Railroad Avenue

YR2030 ALT-1 PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	118	111	270	269	849	207	103	1137	294
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor					0.95	1.00	0.97	0.95		1.00	0.95	1.00
Frt					1.00	0.85	1.00	0.97		1.00	1.00	0.85
Flt Protected					0.97	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)					3450	1583	3433	3435		1770	3539	1583
Flt Permitted					0.97	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)					3450	1583	3433	3435		1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.88	0.88	0.88	0.93	0.93	0.93	0.83	0.83	0.83
Adj. Flow (vph)	0	0	0	134	126	307	289	913	223	124	1370	354
RTOR Reduction (vph)	0	0	0	0	0	262	0	23	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	260	45	289	1113	0	124	1370	354
Turn Type				Split		Prot	Prot			Prot		Free
Protected Phases				8	8	8	5	2		1	6	
Permitted Phases												Free
Actuated Green, G (s)					11.8	11.8	11.1	46.6		9.6	45.1	80.0
Effective Green, g (s)					11.8	11.8	11.1	46.6		9.6	45.1	80.0
Actuated g/C Ratio					0.15	0.15	0.14	0.58		0.12	0.56	1.00
Clearance Time (s)					4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)					509	233	476	2001		212	1995	1583
v/s Ratio Prot					c0.08	0.03	0.08	c0.32		0.07	c0.39	
v/s Ratio Perm												0.22
v/c Ratio					0.51	0.19	0.61	0.56		0.58	0.69	0.22
Uniform Delay, d1					31.4	29.9	32.4	10.3		33.3	12.4	0.0
Progression Factor					1.00	1.00	0.85	0.41		1.00	1.00	1.00
Incremental Delay, d2					0.9	0.4	1.2	0.6		4.1	2.0	0.3
Delay (s)					32.3	30.3	28.6	4.8		37.4	14.4	0.3
Level of Service					C	C	C	A		D	B	A
Approach Delay (s)		0.0			31.2			9.6			13.2	
Approach LOS		A			C			A			B	

Intersection Summary				
HCM Average Control Delay	14.6	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.65			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	55.6%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
6: SR-4 EB Off-Ramp & Railroad Avenue

YR2030 ALT-1 PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	470	0	671	0	0	0	0	855	466	316	939	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor	0.95	0.91	0.95					0.91		1.00	0.95	
Frt	1.00	0.88	0.85					0.95		1.00	1.00	
Flt Protected	0.95	0.99	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1681	1477	1504					4816		1770	3539	
Flt Permitted	0.95	0.99	1.00					1.00		0.95	1.00	
Satd. Flow (perm)	1681	1477	1504					4816		1770	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93	0.88	0.88	0.88
Adj. Flow (vph)	511	0	729	0	0	0	0	919	501	359	1067	0
RTOR Reduction (vph)	0	73	73	0	0	0	0	119	0	0	0	0
Lane Group Flow (vph)	429	337	328	0	0	0	0	1301	0	359	1067	0
Turn Type	Split		Prot							Prot		
Protected Phases	4	4	4					2		1	6	
Permitted Phases												
Actuated Green, G (s)	23.1	23.1	23.1					26.6		18.3	48.9	
Effective Green, g (s)	23.1	23.1	23.1					26.6		18.3	48.9	
Actuated g/C Ratio	0.29	0.29	0.29					0.33		0.23	0.61	
Clearance Time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)	485	426	434					1601		405	2163	
v/s Ratio Prot	c0.26	0.23	0.22					c0.27		c0.20	0.30	
v/s Ratio Perm												
v/c Ratio	0.88	0.79	0.76					0.81		0.89	0.49	
Uniform Delay, d1	27.2	26.2	25.9					24.4		29.8	8.7	
Progression Factor	1.00	1.00	1.00					0.53		0.67	0.96	
Incremental Delay, d2	17.2	9.6	7.3					2.8		15.9	0.6	
Delay (s)	44.4	35.9	33.2					15.6		35.9	8.9	
Level of Service	D	D	C					B		D	A	
Approach Delay (s)		38.0			0.0			15.6			15.7	
Approach LOS		D			A			B			B	

Intersection Summary				
HCM Average Control Delay	22.4	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.86			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	74.3%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
7: Bliss Avenue & Railroad Avenue

YR2030 ALT-1 PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	250	29	84	125	24	100	9	971	50	155	1407	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.96	1.00		0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1783	1583		1788	1583	1770	3513		1770	3522	
Flt Permitted		0.56	1.00		0.39	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1036	1583		726	1583	1770	3513		1770	3522	
Peak-hour factor, PHF	0.84	0.84	0.84	0.75	0.75	0.75	0.88	0.88	0.88	0.92	0.92	0.92
Adj. Flow (vph)	298	35	100	167	32	133	10	1103	57	168	1529	52
RTOR Reduction (vph)	0	0	67	0	0	88	0	5	0	0	3	0
Lane Group Flow (vph)	0	333	34	0	199	45	10	1155	0	168	1578	0
Turn Type	Perm		Perm	Perm		Perm	Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		26.8	26.8		26.8	26.8	0.8	32.1		9.1	40.4	
Effective Green, g (s)		26.8	26.8		26.8	26.8	0.8	32.1		9.1	40.4	
Actuated g/C Ratio		0.34	0.34		0.34	0.34	0.01	0.40		0.11	0.50	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		347	530		243	530	18	1410		201	1779	
v/s Ratio Prot							0.01	c0.33		0.09	c0.45	
v/s Ratio Perm		c0.32	0.02		0.27	0.03						
v/c Ratio		0.96	0.06		0.82	0.08	0.56	0.82		0.84	0.89	
Uniform Delay, d1		26.1	18.1		24.4	18.2	39.4	21.4		34.7	17.8	
Progression Factor		1.00	1.00		1.00	1.00	0.75	0.62		1.14	0.57	
Incremental Delay, d2		37.2	0.1		18.9	0.1	27.8	4.6		20.6	5.7	
Delay (s)		63.3	18.1		43.3	18.3	57.6	17.9		60.3	15.7	
Level of Service		E	B		D	B	E	B		E	B	
Approach Delay (s)		52.9			33.3			18.2			20.0	
Approach LOS		D			C			B			B	

Intersection Summary				
HCM Average Control Delay	24.5	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.89			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	75.8%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: Leland Road & Railroad Avenue

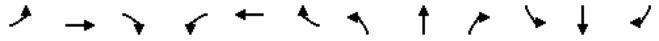
YR2030 ALT-1 PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	176	922	436	269	657	186	441	881	247	183	1010	234
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.88
Frt	1.00	0.99	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3367	1441	1770	3539	1583	1770	3539	1583	1770	3539	2787
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3367	1441	1770	3539	1583	1770	3539	1583	1770	3539	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	191	1002	474	292	714	202	479	958	268	199	1098	254
RTOR Reduction (vph)	0	2	252	0	0	35	0	0	32	0	0	51
Lane Group Flow (vph)	191	1047	175	292	714	167	479	958	236	199	1098	203
Turn Type	Prot		Perm	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	18.0	41.0	41.0	19.0	42.0	61.1	32.0	49.9	68.9	19.1	37.0	55.0
Effective Green, g (s)	19.0	42.0	41.0	20.0	43.0	63.1	33.0	51.9	70.9	20.1	39.0	57.0
Actuated g/C Ratio	0.13	0.28	0.27	0.13	0.29	0.42	0.22	0.35	0.47	0.13	0.26	0.38
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.0	5.0	5.0	6.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	224	943	394	236	1015	666	389	1224	748	237	920	1059
v/s Ratio Prot	0.11	c0.31		c0.17	0.20	0.03	c0.27	0.27	0.04	0.11	c0.31	0.02
v/s Ratio Perm			0.12			0.07			0.11			0.05
v/c Ratio	0.85	1.11	0.44	1.24	0.70	0.25	1.23	0.78	0.32	0.84	1.19	0.19
Uniform Delay, d1	64.1	54.0	45.1	65.0	47.8	28.1	58.5	44.0	24.5	63.4	55.5	31.1
Progression Factor	1.00	1.00	1.00	1.11	0.97	0.64	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	25.5	64.4	3.6	132.1	3.2	0.2	124.7	5.0	0.2	22.2	97.8	0.1
Delay (s)	89.7	118.4	48.7	204.0	49.8	18.2	183.2	49.0	24.8	85.5	153.3	31.2
Level of Service	F	F	D	F	D	B	F	D	C	F	F	C
Approach Delay (s)		97.2			81.8			82.9			124.6	
Approach LOS		F			F			F			F	

Intersection Summary				
HCM Average Control Delay	97.1	HCM Level of Service	F	
HCM Volume to Capacity ratio	1.15			
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	110.7%	ICU Level of Service	H	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: Leland Road & Harbor Street

YR2030 ALT-1 PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	210	949	141	57	415	98	204	416	181	273	516	439
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	228	1032	153	62	451	107	222	452	197	297	561	477
RTOR Reduction (vph)	0	0	104	0	0	85	0	0	142	0	0	316
Lane Group Flow (vph)	228	1032	49	62	451	22	222	452	55	297	561	161
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	11.8	23.8	23.8	3.2	15.2	15.2	12.3	16.0	16.0	14.0	17.7	17.7
Effective Green, g (s)	11.8	24.8	23.8	3.2	16.2	15.2	12.3	17.0	16.0	14.0	18.7	17.7
Actuated g/C Ratio	0.16	0.33	0.32	0.04	0.22	0.20	0.16	0.23	0.21	0.19	0.25	0.24
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	278	1170	502	76	764	321	290	802	338	330	882	374
v/s Ratio Prot	0.13	c0.29		0.04	c0.13		c0.13	c0.13		c0.17	0.16	
v/s Ratio Perm			0.03			0.01			0.03			0.10
v/c Ratio	0.82	0.88	0.10	0.82	0.59	0.07	0.77	0.56	0.16	0.90	0.64	0.43
Uniform Delay, d1	30.6	23.7	18.0	35.6	26.4	24.2	30.0	25.7	24.0	29.8	25.1	24.4
Progression Factor	0.86	0.82	1.53	0.51	0.69	0.76	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.1	3.9	0.1	41.6	2.9	0.3	11.4	2.9	1.0	26.1	3.5	3.6
Delay (s)	33.4	23.2	27.7	59.7	21.0	18.6	41.4	28.6	25.1	55.9	28.6	27.9
Level of Service	C	C	C	E	C	B	D	C	C	E	C	C
Approach Delay (s)		25.4			24.4			31.0			34.4	
Approach LOS		C			C			C			C	

Intersection Summary				
HCM Average Control Delay	29.3	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.82			
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	69.5%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
10: Leland Road & Freed Avenue

YR2030 ALT-1 PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	7	1475	19	47	526	25	9	3	58	22	1	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.81	0.81	0.81	0.54	0.54	0.54	0.60	0.60	0.60
Hourly flow rate (vph)	8	1586	20	58	649	31	17	6	107	37	2	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												2
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	680			1606			2053	2408	803	1699	2402	340
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	680			1606			2053	2408	803	1699	2402	340
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			86			38	80	67	0	94	99
cM capacity (veh/h)	908			403			27	28	326	30	28	656

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	8	1057	549	58	433	247	130	47
Volume Left	8	0	0	58	0	0	17	37
Volume Right	0	0	20	0	0	31	107	8
cSH	908	1700	1700	403	1700	1700	113	36
Volume to Capacity	0.01	0.62	0.32	0.14	0.25	0.15	1.15	1.29
Queue Length 95th (ft)	1	0	0	12	0	0	203	122
Control Delay (s)	9.0	0.0	0.0	15.4	0.0	0.0	204.0	417.4
Lane LOS	A			C			F	F
Approach Delay (s)	0.0			1.2			204.0	417.4
Approach LOS							F	F

Intersection Summary					
Average Delay	18.5				
Intersection Capacity Utilization	58.9%	ICU Level of Service		B	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
11: Leland Road & Loveridge Road

YR2030 ALT-1 PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	474	647	266	271	491	297	50	234	45	197	537	185
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.91	0.91	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	1770	3380	1441	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	1770	3380	1441	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	515	703	289	295	534	323	54	254	49	214	584	201
RTOR Reduction (vph)	0	0	175	0	0	254	0	1	38	0	0	138
Lane Group Flow (vph)	515	703	114	295	534	69	54	258	6	214	584	63
Turn Type	Prot		Perm	Prot		Perm	Prot		Over	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	14.4	19.8	19.8	9.7	15.1	15.1	3.0	18.3	9.7	7.2	22.5	22.5
Effective Green, g (s)	15.4	20.8	20.8	10.7	16.1	16.1	4.0	19.3	9.7	8.2	23.5	23.5
Actuated g/C Ratio	0.21	0.28	0.28	0.14	0.21	0.21	0.05	0.26	0.13	0.11	0.31	0.31
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	705	981	439	490	760	340	94	870	186	375	1109	496
v/s Ratio Prot	0.15	c0.20		0.09	c0.15		c0.03	0.08	0.00	0.06	c0.17	
v/s Ratio Perm			0.07			0.04						0.04
v/c Ratio	0.73	0.72	0.26	0.60	0.70	0.20	0.57	0.30	0.03	0.57	0.53	0.13
Uniform Delay, d1	27.9	24.4	21.1	30.2	27.2	24.2	34.7	22.4	28.5	31.7	21.2	18.4
Progression Factor	0.57	0.52	0.26	1.00	1.00	1.00	1.00	1.00	1.00	0.93	0.92	1.42
Incremental Delay, d2	2.8	1.8	0.2	2.1	3.0	0.3	8.2	0.9	0.1	2.0	1.7	0.5
Delay (s)	18.7	14.5	5.7	32.2	30.2	24.5	42.9	23.3	28.6	31.4	21.1	26.7
Level of Service	B	B	A	C	C	C	D	C	C	C	C	C
Approach Delay (s)		14.2			29.1			26.9			24.4	
Approach LOS		B			C			C			C	

Intersection Summary					
HCM Average Control Delay	22.2	HCM Level of Service		C	
HCM Volume to Capacity ratio	0.62				
Actuated Cycle Length (s)	75.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	58.6%	ICU Level of Service		B	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
12: SR-4 EB Ramps & Loveridge Road

YR2030 ALT-1 PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	82	0	132	0	0	0	0	939	135	0	799	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0					4.0	4.0		4.0	
Lane Util. Factor	1.00		1.00					0.95	1.00		0.95	
Frt	1.00		0.85					1.00	0.85		0.98	
Flt Protected	0.95		1.00					1.00	1.00		1.00	
Satd. Flow (prot)	1770		1583					3539	1583		3482	
Flt Permitted	0.95		1.00					1.00	1.00		1.00	
Satd. Flow (perm)	1770		1583					3539	1583		3482	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	89	0	143	0	0	0	0	1021	147	0	868	105
RTOR Reduction (vph)	0	0	126	0	0	0	0	0	34	0	8	0
Lane Group Flow (vph)	89	0	17	0	0	0	0	1021	113	0	965	0
Turn Type	Prot		custom						Perm			
Protected Phases	4		4					2			6	
Permitted Phases									2			
Actuated Green, G (s)	9.1		9.1					57.9	57.9		57.9	
Effective Green, g (s)	9.1		9.1					57.9	57.9		57.9	
Actuated g/C Ratio	0.12		0.12					0.77	0.77		0.77	
Clearance Time (s)	4.0		4.0					4.0	4.0		4.0	
Vehicle Extension (s)	3.0		3.0					3.0	3.0		3.0	
Lane Grp Cap (vph)	215		192					2732	1222		2688	
v/s Ratio Prot	c0.05		0.01					c0.29			0.28	
v/s Ratio Perm									0.07			
v/c Ratio	0.41		0.09					0.37	0.09		0.36	
Uniform Delay, d1	30.5		29.3					2.7	2.1		2.7	
Progression Factor	1.00		1.00					0.41	0.25		1.00	
Incremental Delay, d2	1.3		0.2					0.3	0.1		0.4	
Delay (s)	31.8		29.5					1.5	0.7		3.1	
Level of Service	C		C					A	A		A	
Approach Delay (s)		30.4			0.0			1.4			3.1	
Approach LOS		C			A			A			A	

Intersection Summary				
HCM Average Control Delay	4.9	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.38			
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	40.0%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
13: California Avenue & SR-4 WB Ramps

YR2030 ALT-1 PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	1031	10	616	327	5	195	20	596	22	58	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		0.97	0.95	1.00	0.95	0.95	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	0.96	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3534		3433	3539	1583	1681	1701	1583	1770	1790	
Flt Permitted	0.54	1.00		0.95	1.00	1.00	0.95	0.75	1.00	0.62	1.00	
Satd. Flow (perm)	1005	3534		3433	3539	1583	1681	1321	1583	1159	1790	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	1121	11	670	355	5	212	22	648	24	63	22
RTOR Reduction (vph)	0	1	0	0	0	2	0	0	296	0	11	0
Lane Group Flow (vph)	5	1131	0	670	355	3	117	117	352	24	74	0
Turn Type	Perm			Prot		Perm	Prot		Perm	Perm		
Protected Phases		4		3	8		5	2			6	
Permitted Phases	4					8			2	6		
Actuated Green, G (s)	37.6	37.6		24.2	65.8	65.8	15.0	36.2	36.2	17.2	17.2	
Effective Green, g (s)	37.6	37.6		24.2	65.8	65.8	15.0	36.2	36.2	17.2	17.2	
Actuated g/C Ratio	0.34	0.34		0.22	0.60	0.60	0.14	0.33	0.33	0.16	0.16	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	344	1208		755	2117	947	229	487	521	181	280	
v/s Ratio Prot		c0.32		c0.20	0.10		0.07	0.03			0.04	
v/s Ratio Perm	0.00					0.00		0.05	c0.22	0.02		
v/c Ratio	0.01	0.94		0.89	0.17	0.00	0.51	0.24	0.68	0.13	0.26	
Uniform Delay, d1	23.9	35.0		41.6	9.9	8.9	44.1	26.9	31.8	40.0	40.8	
Progression Factor	0.26	0.36		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	1.7		12.2	0.0	0.0	1.9	0.3	6.9	1.5	2.3	
Delay (s)	6.1	14.2		53.8	9.9	8.9	46.0	27.1	38.7	41.5	43.1	
Level of Service	A	B		D	A	A	D	C	D	D	D	
Approach Delay (s)		14.2			38.5			38.1			42.8	
Approach LOS		B			D			D			D	

Intersection Summary				
HCM Average Control Delay	29.8	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.83			
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	80.0%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
14: California Avenue & Harbor Street

YR2030 ALT-1PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	199	42	595	493	543	58	392	238	545	726	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.91	0.91	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.94		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3379	1441	1770	1863	1583	1770	3338		1770	3474	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3379	1441	1770	1863	1583	1770	3338		1770	3474	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	25	216	46	647	536	590	63	426	259	592	789	110
RTOR Reduction (vph)	0	2	39	0	0	334	0	85	0	0	10	0
Lane Group Flow (vph)	25	219	2	647	536	256	63	600	0	592	889	0
Turn Type	Prot		Over	Prot		Perm	Prot			Prot		
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases						8						
Actuated Green, G (s)	4.8	12.4	6.4	34.2	41.8	41.8	6.4	20.6		26.8	41.0	
Effective Green, g (s)	4.8	12.4	6.4	34.2	41.8	41.8	6.4	20.6		26.8	41.0	
Actuated g/C Ratio	0.04	0.11	0.06	0.31	0.38	0.38	0.06	0.19		0.24	0.37	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	77	381	84	550	708	602	103	625		431	1295	
v/s Ratio Prot	0.01	c0.06	0.00	c0.37	c0.29		0.04	c0.18		c0.33	0.26	
v/s Ratio Perm						0.16						
v/c Ratio	0.32	0.58	0.03	1.18	0.76	0.43	0.61	0.96		1.37	0.69	
Uniform Delay, d1	51.0	46.3	48.9	37.9	29.7	25.2	50.6	44.3		41.6	29.1	
Progression Factor	1.00	1.00	1.00	0.87	0.85	0.36	0.93	1.06		1.00	1.00	
Incremental Delay, d2	2.5	2.1	0.1	97.2	4.6	0.5	10.1	27.0		182.3	3.0	
Delay (s)	53.5	48.4	49.0	130.0	29.8	9.6	57.0	74.1		223.9	32.1	
Level of Service	D	D	D	F	C	A	E	E		F	C	
Approach Delay (s)		48.9			59.6			72.7			108.2	
Approach LOS		D			E			E			F	

Intersection Summary				
HCM Average Control Delay	78.0	HCM Level of Service	E	
HCM Volume to Capacity ratio	1.16			
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	20.0	
Intersection Capacity Utilization	100.9%	ICU Level of Service	G	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
15: Bliss Avenue & Harbor Street

YR2030 ALT-1PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	32	3	274	10	4	15	143	641	14	4	1294	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85		0.93		1.00	1.00		1.00	0.99	
Flt Protected		0.96	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1780	1583		1704		1770	3528		1770	3514	
Flt Permitted		0.82	1.00		0.90		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1524	1583		1556		1770	3528		1770	3514	
Peak-hour factor, PHF	0.86	0.86	0.86	0.78	0.78	0.78	0.89	0.89	0.89	0.90	0.90	0.90
Adj. Flow (vph)	37	3	319	13	5	19	161	720	16	4	1438	72
RTOR Reduction (vph)	0	0	266	0	17	0	0	1	0	0	3	0
Lane Group Flow (vph)	0	40	53	0	20	0	161	735	0	4	1507	0
Turn Type	Perm		Perm	Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		10.3	10.3		10.3		17.8	86.4		1.3	69.9	
Effective Green, g (s)		10.3	10.3		10.3		17.8	86.4		1.3	69.9	
Actuated g/C Ratio		0.09	0.09		0.09		0.16	0.79		0.01	0.64	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		143	148		146		286	2771		21	2233	
v/s Ratio Prot							c0.09	0.21		0.00	c0.43	
v/s Ratio Perm		0.03	c0.03		0.01							
v/c Ratio		0.28	0.36		0.14		0.56	0.27		0.19	0.68	
Uniform Delay, d1		46.4	46.8		45.8		42.5	3.2		53.8	12.8	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.21	0.40	
Incremental Delay, d2		1.1	1.5		0.4		2.5	0.2		2.0	0.8	
Delay (s)		47.5	48.3		46.2		45.0	3.4		67.1	5.8	
Level of Service		D	D		D		D	A		E	A	
Approach Delay (s)		48.2			46.2			10.9			6.0	
Approach LOS		D			D			B			A	

Intersection Summary				
HCM Average Control Delay	13.5	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.62			
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	68.1%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
16: Garcia Avenue & Harbor Street

YR2030 ALT-1 PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	97	39	229	64	77	203	202	541	75	398	1094	232
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	105	42	249	70	84	221	220	588	82	433	1189	252
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								663			696	
pX, platoon unblocked	0.79	0.79	0.78	0.79	0.79	0.98	0.78			0.98		
vC, conflicting volume	3176	3289	721	2798	3374	335	1441			670		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	3138	3282	72	2657	3390	294	998			634		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	67	0	0	68	59			54		
cM capacity (veh/h)	0	2	759	0	2	692	537			931		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	105	291	70	304	220	392	278	433	793	649
Volume Left	105	0	70	0	220	0	0	433	0	0
Volume Right	0	249	0	221	0	0	82	0	0	252
cSH	0	15	0	7	537	1700	1700	931	1700	1700
Volume to Capacity	Err	19.99	Err	46.23	0.41	0.23	0.16	0.46	0.47	0.38
Queue Length 95th (ft)	Err	Err	Err	Err	49	0	0	63	0	0
Control Delay (s)	Err	Err	Err	Err	16.3	0.0	0.0	12.2	0.0	0.0
Lane LOS	F	F	F	F	C			B		
Approach Delay (s)	Err		Err		4.0			2.8		
Approach LOS	F		F							

Intersection Summary					
Average Delay	Err				
Intersection Capacity Utilization	84.1%	ICU Level of Service		E	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
17: Garcia Avenue & Railroad Avenue

YR2030 ALT-1 PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	76	26	38	160	82	148	10	727	110	266	1295	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.98		1.00	1.00	
Flt Protected		0.96	1.00		0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1796	1583		1803	1583	1770	3469		1770	3522	
Flt Permitted		0.21	1.00		0.97	1.00	0.11	1.00		0.20	1.00	
Satd. Flow (perm)		383	1583		1803	1583	213	3469		378	3522	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	83	28	41	174	89	161	11	790	120	289	1408	47
RTOR Reduction (vph)	0	0	32	0	0	129	0	15	0	0	3	0
Lane Group Flow (vph)	0	111	9	0	263	32	11	895	0	289	1452	0
Turn Type	Perm		Perm	Split		Perm	Perm			Perm		
Protected Phases		4		8	8			2			6	
Permitted Phases	4		4			8	2			6		
Actuated Green, G (s)		17.0	17.0		16.0	16.0	35.0	35.0		35.0	35.0	
Effective Green, g (s)		17.0	17.0		16.0	16.0	35.0	35.0		35.0	35.0	
Actuated g/C Ratio		0.21	0.21		0.20	0.20	0.44	0.44		0.44	0.44	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)		81	336		361	317	93	1518		165	1541	
v/s Ratio Prot					c0.15			0.26			0.41	
v/s Ratio Perm		c0.29	0.01			0.02	0.05			c0.76		
v/c Ratio		1.37	0.03		0.73	0.10	0.12	0.59		1.75	0.94	
Uniform Delay, d1		31.5	24.9		30.0	26.1	13.3	17.1		22.5	21.5	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		0.42	0.40	
Incremental Delay, d2		227.0	0.1		12.2	0.6	2.6	1.7		352.7	8.5	
Delay (s)		258.5	25.1		42.1	26.8	15.9	18.7		362.2	17.2	
Level of Service		F	C		D	C	B	B		F	B	
Approach Delay (s)		195.6			36.3			18.7			74.3	
Approach LOS		F			D			B			E	

Intersection Summary					
HCM Average Control Delay	59.2	HCM Level of Service		E	
HCM Volume to Capacity ratio	1.41				
Actuated Cycle Length (s)	80.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	70.3%	ICU Level of Service		C	
Analysis Period (min)	15				

c Critical Lane Group

Appendix B
PEDESTRIAN/BICYCLE COUNTS

STREET	A.M.	P.M.
Railroad Ave./Civic Ave.	X	X
Railroad Ave./SR4 WB Ramp/California Ave.	X	X
Railroad Ave./SR4 EB Ramps	X	X
Railroad Ave./ Bliss Ave.	X	X
Harbor St./California Ave.	X	X
Harbor St./Bliss Ave.	XX	X

City of Pittsburg
Pedestrian / Bicycle Count
Field Sheet

LOCATION: Railroad Ave @ Civic Avenue | OBSERVER: Ted Moss | DATE: 9/16/2008

OBSERVATIONS: Students cutting through traffic and over median on north leg of intersection. Very disruptive ar hazardous. Need a barrier (ornamental fence) in median to prevent mid-block crossing.

Note: There is no Pedestrian Crossing on north leg across Railroad Avenue.

	DIRECTION										
TIME	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		TOTAL		HOUR
(15 MIN)	PEDS	BIKES	PEDS	BIKES	PEDS	BIKES	PEDS	BIKES	PEDS	BIKES	TOTAL
									0	0	
									0	0	
0630-0645	0	0	5	1	0	0	0	0	5	1	
0645-0700	0	0	3	0	2	0	0	0	5	0	
0630-0700	0	0	8	1	2	0	0	0	10	1	11
0700-0715	0	0	10	0	8	0	0	0	18	0	
0715-0730	0	0	19	0	21	1	1	1	41	2	
0730-0745	0	0	48	1	70	1	4	0	122	2	
0745-0800	0	0	51	1	78	2	3	0	132	3	
0700-0800	0	0	128	2	177	4	8	1	313	7	320
0800-0815	0	0	4	0	9	0	2	1	15	1	
08015-0830	0	0	4	0	5	0	2	0	11	0	
									0	0	
									0	0	
0800-0830	0	0	8	0	14	0	4	1	26	1	27
									0	0	
									0	0	
									0	0	
									0	0	
	0	0	0	0	0	0	0	0	0	0	0
1500-1515	0	0	78	1	147	3	6	2	231	6	
1515-1530	0	0	108	0	161	2	2	1	271	3	
1530-1545	0	0	11	1	32	3	2	0	45	4	
1545-1600	0	0	2	0	17	0	0	1	19	1	
1500-1600	0	0	199	2	357	8	10	4	566	14	580
1600-1615	0	0	0	1	7	0	0	1	7	2	
1615-1630	0	0	2	0	8	0	1	0	11	0	
1630-1645	0	0	2	0	2	2	1	0	5	2	
1645-1700	0	0	3	0	7	1	3	0	13	1	
1600-1700	0	0	7	1	24	3	5	1	36	5	41
1700-1715	0	0	6	2	7	1	2	0	15	3	
1715-1730	0	0	4	1	4	0	2	0	10	1	
									0	0	
									0	0	
1700-1730	0	0	10	3	11	1	4	0	25	4	29
									0	0	
									0	0	
									0	0	
									0	0	
	0	0	0	0	0	0	0	0	0	0	0

City of Pittsburg
Pedestrian / Bicycle Count
Field Sheet

LOCATION: Railroad Ave @ SR-4 W.B. Ramps OBSERVER: Ted Moss DATE: 9/15/2008

OBSERVATIONS: SV-3-T signal hardware @ N.W. signal pole is tilting (it appears to have been hit).
Many red light runners at this intersection as well as pedestrian red light violations.
Bus stop on fwy on ramp is used periodically (see below).

Note: There is no Pedestrian Crossing on south leg across Railroad Avenue.

	DIRECTION										
TIME	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		TOTAL		HOUR
(15 MIN)	PEDS	BIKES	Fwy Bus	BIKES	PEDS	BIKES	PEDS	BIKES	PEDS	BIKES	TOTAL
									0	0	
									0	0	
0630-0645	0	0	0	0	1	0	1	0	2	0	
0645-0700	1	0	1	0	3	0	0	0	5	0	
0630-0700	1	0	0	0	4	0	1	0	7	0	6
0700-0715	1	0	0	0	2	0	6	0	9	0	
0715-0730	2	0	1	0	9	1	14	1	26	2	
0730-0745	7	1	1	0	14	0	28	3	50	4	
0745-0800	1	0	1	0	9	0	8	2	19	2	
0700-0800	11	1	3	0	34	1	56	6	104	8	112
0800-0815	0	1	0	0	3	0	3	0	6	1	
08015-0830	1	0	1	0	3	1	4	0	9	1	
									0	0	
									0	0	
0800-0830	1	1	1	0	6	1	7	0	15	2	17
									0	0	
									0	0	
									0	0	
									0	0	
	0	0	0	0	0	0	0	0	0	0	0
1500-1515	1	0	0	0	9	0	6	5	16	5	
1515-1530	1	0	1	0	86	0	43	0	131	0	
1530-1545	3	1	1	0	32	2	15	0	51	3	
1545-1600	0	0	1	0	8	0	8	2	17	2	
1500-1600	5	1	3	0	135	2	72	7	215	10	225
1600-1615	1	0	0	0	3	1	7	0	11	1	
1615-1630	0	0	1	0	7	0	14	1	22	1	
1630-1645	0	0	0	0	2	1	4	1	6	2	
1645-1700	1	0	1	0	1	1	5	0	8	1	
1600-1700	2	0	2	0	13	3	30	2	47	5	52
1700-1715	0	0	1	0	1	1	2	0	4	1	
1715-1730	0	0	0	0	4	0	5	1	9	1	
									0	0	
									0	0	
1700-1730	0	0	1	0	5	1	7	1	13	2	15
									0	0	
									0	0	
									0	0	
									0	0	
	0	0	0	0	0	0	0	0	0	0	0

City of Pittsburg
Pedestrian / Bicycle Count
Field Sheet

LOCATION: Railroad Ave @ SR-4 E.B. Ramps OBSERVER: Ted Moss DATE: 9/12/2008

OBSERVATIONS: Majority of Peds crossing west leg arrive via path along off ramp from the west (~95%). Signal at Bliss could be coordinated better with E.B. ramp green. Vehicles back into the intersection from the Bliss signal. Dual right turn from east to south conflicts with peds crossing south leg (afternoon).

Note: There is no Pedestrian Crossing on north leg across Railroad Avenue.

	DIRECTION										
TIME	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		TOTAL		HOUR
(15 MIN)	PEDS	BIKES	PEDS	BIKES	PEDS	BIKES	PEDS	BIKES	PEDS	BIKES	TOTAL
									0	0	
									0	0	
0630-0645	0	0	0	0	2	0	1	0	3	0	
0645-0700	0	0	0	1	2	0	3	0	5	1	
0630-0700	0	0	0	1	4	0	4	0	8	1	9
0700-0715	0	0	0	0	3	0	5	1	8	1	
0715-0730	0	0	0	0	9	0	19	1	28	1	
0730-0745	0	0	0	0	14	1	26	0	40	1	
0745-0800	0	0	0	0	7	0	21	1	28	1	
0700-0800	0	0	0	0	33	1	71	3	104	4	108
0800-0815	0	0	0	0	4	0	7	1	11	1	
08015-0830	0	0	1	0	2	0	1	0	4	0	
									0	0	
									0	0	
0800-0830	0	0	1	0	6	0	8	1	15	1	16
									0	0	
									0	0	
									0	0	
									0	0	
	0	0	0	0	0	0	0	0	0	0	0
1500-1515	0	0	1	0	8	2	4	0	13	2	
1515-1530	0	0	9	0	64	0	63	1	136	1	
1530-1545	0	0	9	1	54	1	16	0	79	2	
1545-1600	0	0	0	0	10	0	7	1	17	1	
1500-1600	0	0	19	1	136	3	90	2	245	6	251
1600-1615	0	0	0	0	4	1	8	0	12	1	
1615-1630	0	0	1	0	6	1	9	3	16	4	
1630-1645	0	0	0	0	2	0	1	1	3	1	
1645-1700	0	0	0	0	6	0	2	2	8	2	
1600-1700	0	0	1	0	18	2	20	6	39	8	47
1700-1715	0	0	0	0	4	0	4	1	8	1	
1715-1730	0	0	0	0	3	0	2	0	5	0	
									0	0	
									0	0	
1700-1730	0	0	0	0	7	0	6	1	13	1	14
									0	0	
									0	0	
									0	0	
									0	0	
	0	0	0	0	0	0	0	0	0	0	0

City of Pittsburg
Pedestrian / Bicycle Count
Field Sheet

LOCATION: Railroad Ave @ Bliss Ave OBSERVER: Ted Moss DATE: 9/11/2008

OBSERVATIONS: Need additional green time for Bliss Avenue in A.M. There is only time for 3-4 vehicles and cuts off 2-4 vehicles. Bad loop on eastbound Bliss?

Note: There is no Pedestrian Crossing on north leg across Railroad Avenue.

	DIRECTION										
TIME	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		TOTAL		HOUR
(15 MIN)	PEDS	BIKES	PEDS	BIKES	PEDS	BIKES	PEDS	BIKES	PEDS	BIKES	TOTAL
									0	0	
									0	0	
0630-0645	0	0	0	0	0	0	0	0	0	0	
0645-0700	0	0	1	0	1	0	1	1	3	1	
0630-0700	0	0	1	0	1	0	1	1	3	1	4
0700-0715	0	0	3	1	5	1	0	0	8	2	
0715-0730	0	0	8	0	7	0	6	2	21	2	
0730-0745	0	0	6	0	23	1	9	0	38	1	
0745-0800	0	0	2	0	17	0	3	0	22	0	
0700-0800	0	0	19	1	52	2	18	2	89	5	94
0800-0815	0	0	3	0	4	0	2	0	9	0	
08015-0830	0	0	2	0	4	0	1	0	7	0	
									0	0	
									0	0	
0800-0830	0	0	5	0	8	0	3	0	16	0	16
									0	0	
									0	0	
									0	0	
									0	0	
	0	0	0	0	0	0	0	0	0	0	0
1500-1515	0	0	2	0	3	2	2	0	7	2	
1515-1530	0	0	5	0	55	0	9	0	69	0	
1530-1545	0	0	5	1	44	1	5	0	54	2	
1545-1600	0	0	1	0	9	0	3	1	13	1	
1500-1600	0	0	13	1	111	3	19	1	143	5	148
1600-1615	0	0	1	0	5	2	5	0	11	2	
1615-1630	0	0	1	1	6	1	6	2	13	4	
1630-1645	0	0	2	2	3	0	1	1	6	3	
1645-1700	0	0	1	0	5	0	2	1	8	1	
1600-1700	0	0	5	3	19	3	14	4	38	10	48
1700-1715	0	0	2	0	3	0	2	0	7	0	
1715-1730	0	0	1	0	3	0	1	0	5	0	
									0	0	
									0	0	
1700-1730	0	0	3	0	6	0	3	0	12	0	12
									0	0	
									0	0	
									0	0	
									0	0	
	0	0	0	0	0	0	0	0	0	0	0

LOCATION: Railroad Ave./Bliss Ave. OBSERVER: Paul Fuentes DATE: 12 Sep 2008

OBSERVATIONS: Count taken from 06:30-08:30

* 1 Mortorized wheelchair observered passing east leg of intersectioin
* Pedestrian traffic prodominantly students
* No crosswalk on north leg of intersection

END	DIRECTION										
TIME	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		TOTAL		HOUR
(15 MIN)	PEDS	BIKES	PEDS	BIKES	PEDS	BIKES	PEDS	BIKES	PEDS	BIKES	TOTAL
6:45	0	0	0	0	3	0	0	0	3	0	
7:00	0	0	3	0	4	0	3	0	10	0	34 PEDS
7:15	0	0	0	0	4	0	3	1	7	1	1 BIKES
7:30	0	0	4	0	7	0	3	0	14	0	
7:45	0	0	2	0	17	1	7	0	26	1	
8:00	0	0	3	0	7	1	11	0	21	1	55 PEDS
8:15	0	0	0	0	3	0	4	0	7	0	2 BIKES
8:30	0	0	0	0	1	0	0	0	1	0	

LOCATION: California Ave. & Harbor St. OBSERVER: Paul Fuentes DATE: 17 Sep 2008

OBSERVATIONS: 06:30-08:30

* 1 Motorized wheelchair crossed west leg of intersection

END	DIRECTION										
TIME	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		TOTAL		HOUR
(15 MIN)	PEDS	BIKES	PEDS	BIKES	PEDS	BIKES	PEDS	BIKES	PEDS	BIKES	TOTAL
6:45	0	1	0	0	0	0	0	0	0	1	
7:00	0	0	0	1	1	1	4	0	5	2	14 Peds
7:15	1	0	0	0	0	0	2	0	3	0	4 Bikes
7:30	2	0	0	0	1	1	3	0	6	1	
7:45	2	0	0	0	5	0	26	1	33	1	
8:00	3	0	0	0	7	3	15	2	25	5	69 Peds
8:15	1	1	0	0	2	0	6	3	9	4	10 Bikes
8:30	0	0	0	0	0	0	2	0	2	0	

LOCATION: California/Harbor | OBSERVER: Krystal Hinojosa | DATE: 9/18/2008

OBSERVATIONS: 3:00 pm - 5:30 pm

	DIRECTION										
TIME	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		TOTAL		HOUR
(15 MIN)	PEDS	BIKES	PEDS	BIKES	PEDS	BIKES	PEDS	BIKES	PEDS	BIKES	TOTAL
3:00-3:15	1	0	1	0	2	0	15	0	**19**	**0**	
3:15-3:30	4	1	9	0	1	0	65	4	**79**	**5**	
3:30-3:45	2	0	0	1	5	0	29	0	**36**	**1**	
3:45-4:00	0	0	0	0	0	0	25	3	**25**	**3**	
3:00-4:00	**7**	**1**	**10**	**1**	**8**	**0**	**134**	**7**	**159**	**9**	**168**
4:00-4:15	0	0	0	0	0	0	4	2	**4**	**2**	
4:15-4:30	4	1	1	0	2	1	27	1	**34**	**3**	
4:30-4:45	1	0	0	0	1	0	8	0	**10**	**0**	
4:45-5:00	0	0	0	0	3	1	4	3	**7**	**4**	
4:00-5:00	**5**	**1**	**1**	**0**	**6**	**2**	**43**	**6**	**55**	**9**	**64**
5:00-5:15	0	0	0	0	1	2	1	4	**2**	**6**	
5:15-5:30	0	1	0	0	2	1	5	0	**7**	**2**	
5:00-5:30	**0**	**1**	**0**	**0**	**3**	**3**	**6**	**4**	**9**	**8**	**17**

Totals									**223**	**26**	**249**

LOCATION: Harbor St./Bliss Ave. OBSERVER: Paul Fuentes DATE: 19 Sep 2008

OBSERVATIONS: Count taken from 06:30-08:30

END	DIRECTION										
TIME	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		TOTAL		HOUR
(15 MIN)	PEDS	BIKES	PEDS	BIKES	PEDS	BIKES	PEDS	BIKES	PEDS	BIKES	TOTAL
6:45	0	0	0	0	1	0	1	0	2	0	
7:00	0	0	0	0	0	1	0	0	0	1	18 PEDS
7:15	1	0	0	0	0	0	0	0	1	0	5 BIKES
7:30	3	2	0	0	8	1	4	1	15	4	
7:45	3	0	0	0	2	0	14	0	19	0	
8:00	0	0	0	1	10	1	2	0	12	2	39 PEDS
8:15	3	1	0	0	0	2	5	2	8	5	10 BIKES
8:30	0	0	0	1	0	1	0	1	0	3	

LOCATION: Harbor St. / Bliss Ave. OBSERVER: Jason Burke DATE: 9/10/08

OBSERVATIONS:

No crosswalk on south leg, but 1 bike was observed in the area where a crosswalk would be on the south leg

3:00 p.m. to 5:30 p.m.

	DIRECTION										
TIME	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		TOTAL		HOUR
(15 MIN)	PEDS	BIKES	PEDS	BIKES	PEDS	BIKES	PEDS	BIKES	PEDS	BIKES	TOTAL
3-3:15 pm	2	0	0	0	2	3	5	1	9	4	
3:15-3:30	5	1	0	1	13	2	27	2	45	6	
3:30-3:45	3	0	0	0	5	0	10	1	18	1	
3:45-4:00	5	0	0	0	7	1	5	2	17	3	103
4:00-4:15	1	0	0	0	7	3	2	1	10	4	
4:15-4:30	0	0	0	0	1	0	2	3	3	3	
4:30-4:45	1	0	0	0	1	0	11	1	13	1	
4:45-5:00	0	1	0	0	0	0	1	0	1	1	36
5:00-5:15	0	0	0	0	0	0	9	0	9	0	
5:15-5:30	0	0	0	0	0	0	0	1	0	1	

Appendix C
SIGNAL WARRANT ANALYSIS

2015 PROJECT BUILD PM PEAK HOUR

Garcia Ave. / Hewlett St.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 4)

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☐**

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More				Hour
Both Approaches - Major Street						
Higher Approach - Minor Street						

*All plotted points fall above the curves in Figure 4C-1. (URBAN AREAS)	Yes ☐ No ☐
OR, All plotted points fall above the curves in Figure 4C-2. (RURAL AREAS)	Yes ☐ No ☐

WARRANT 3 - Peak Hour **SATISFIED YES ☒ NO ☐**
(Part A or Part B must be satisfied)

PART A **SATISFIED YES ☐ NO ☒**

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced for traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐ No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☒ No ☐
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☒ No ☐

PART B **SATISFIED YES ☒ NO ☐**

APPROACH LANES	One	2 or More	PM Hour
Both Approaches - Major Street		X	1864
Higher Approach - Minor Street		X	503

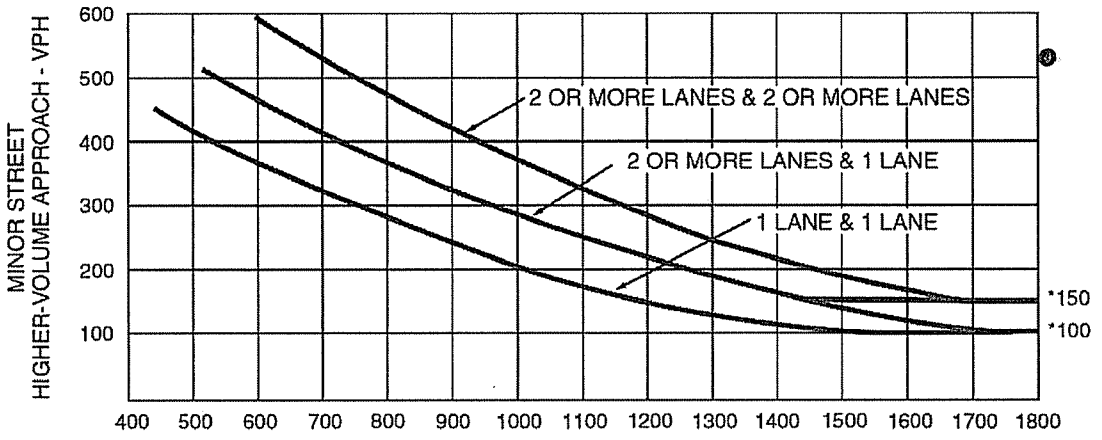
The plotted point falls above the curve in Figure 4C-3.	Yes ☒ No ☐
OR, The plotted point falls above the curve in Figure 4C-4.	Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

2015 PROJECT BUILD PM PEAK HOUR

Garcia Ave. / Harbor St.

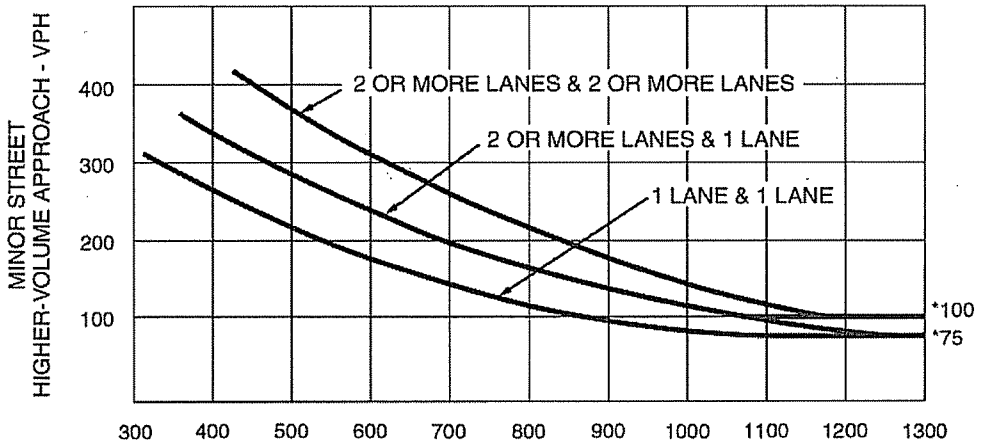
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE ~~70~~ 64 km/h OR ABOVE 40 mph ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

2030 PROJECT BUILD AM PEAK HOUR

Garcia Ave. / Harbor St.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 4)

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☐**

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More				Hour
Both Approaches - Major Street						
Higher Approach - Minor Street						

*All plotted points fall above the curves in Figure 4C-1. (URBAN AREAS)	Yes ☐ No ☐
OR, All plotted points fall above the curves in Figure 4C-2. (RURAL AREAS)	Yes ☐ No ☐

WARRANT 3 - Peak Hour
(Part A or Part B must be satisfied) **SATISFIED YES ☒ NO ☐**

PART A **SATISFIED YES ☐ NO ☒**

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced for traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐ No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☒ No ☐
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☒ No ☐

PART B **SATISFIED YES ☒ NO ☐**

APPROACH LANES	One	2 or More	AM Hour
Both Approaches - Major Street		X	2149
Higher Approach - Minor Street		X	393

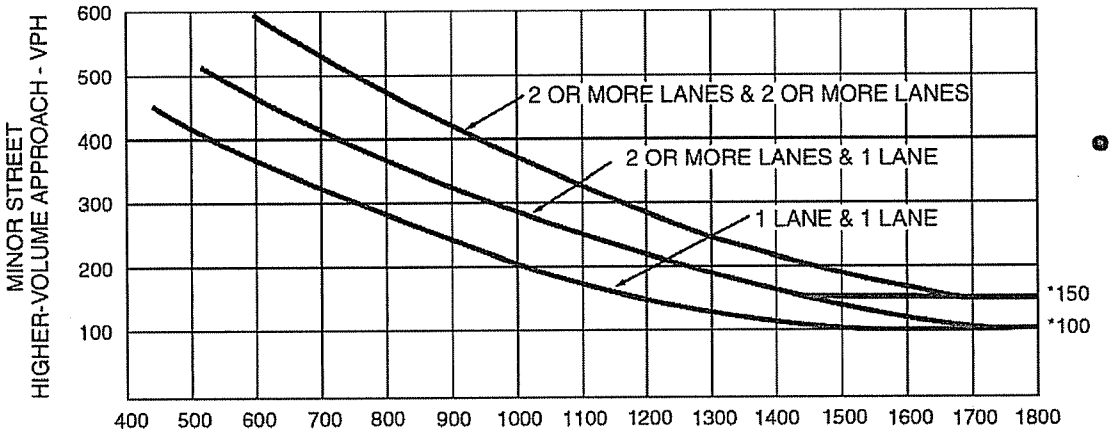
The plotted point falls above the curve in Figure 4C-3.	Yes ☒ No ☐
OR, The plotted point falls above the curve in Figure 4C-4.	Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

2030 PROJECT BUILD AM PEAK HOUR

Garcia Ave / Harbor St.

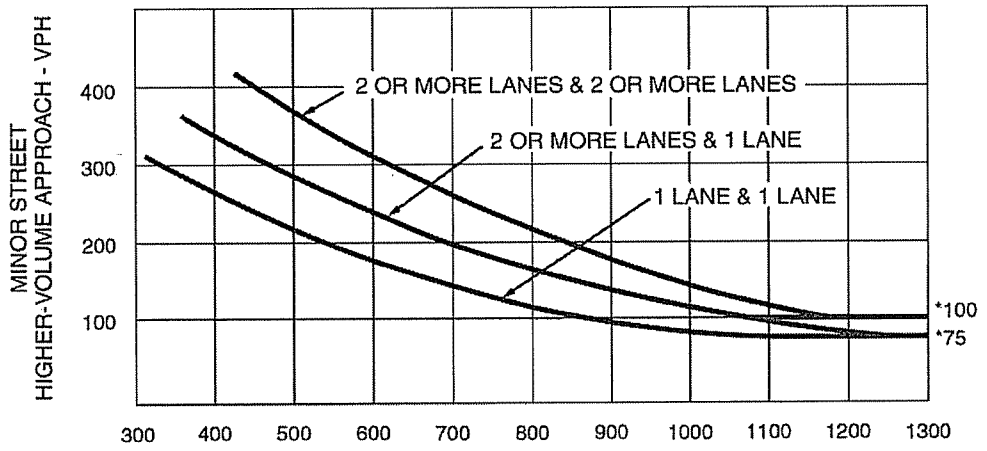
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE ~~70~~ 64 km/h OR ABOVE 40 mph ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

2030 PROJECT BUILD PM PEAK HOUR

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 4)

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☐**

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More				Hour
Both Approaches - Major Street						
Higher Approach - Minor Street						

*All plotted points fall above the curves in Figure 4C-1. (URBAN AREAS)	Yes ☐ No ☐
OR, All plotted points fall above the curves in Figure 4C-2. (RURAL AREAS)	Yes ☐ No ☐

WARRANT 3 - Peak Hour **SATISFIED YES ☒ NO ☐**
(Part A or Part B must be satisfied)

PART A **SATISFIED YES ☐ NO ☒**

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced for traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐ No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☒ No ☐
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☒ No ☐

PART B **SATISFIED YES ☒ NO ☐**

APPROACH LANES	One	2 or More	PM Hour
Both Approaches - Major Street		X	2529
Higher Approach - Minor Street		X	639

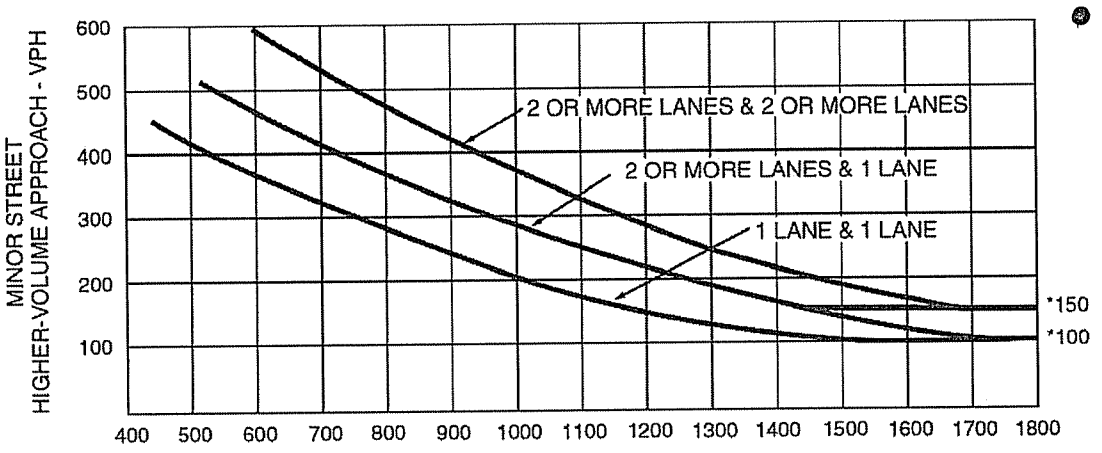
The plotted point falls above the curve in Figure 4C-3.	Yes ☒ No ☐
OR, The plotted point falls above the curve in Figure 4C-4.	Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

2030 PROJECT BUILD PM PEAK HOUR

Garcia Ave. / Harbor St.

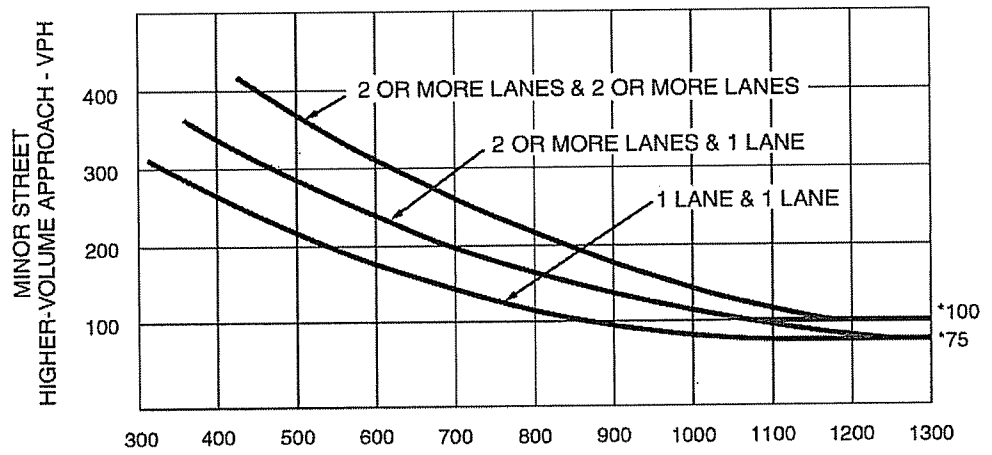
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE ~~70~~ 64 km/h OR ABOVE 40 mph ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

2015 PROJECT BUILD (ALTERNATIVE 1)

AM PEAK HOUR

Garcia Ave. / Harbor St.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 4)

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☐**

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More				Hour
Both Approaches - Major Street						
Higher Approach - Minor Street						

*All plotted points fall above the curves in Figure 4C-1. (URBAN AREAS)	Yes ☐ No ☐
OR, All plotted points fall above the curves in Figure 4C-2. (RURAL AREAS)	Yes ☐ No ☐

WARRANT 3 - Peak Hour
(Part A or Part B must be satisfied) **SATISFIED YES ☒ NO ☐**

PART A **SATISFIED YES ☐ NO ☒**

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced for traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐ No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☒ No ☐
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☒ No ☐

PART B **SATISFIED YES ☒ NO ☐**

APPROACH LANES	One	2 or More	AM Hour
Both Approaches - Major Street		X	2129
Higher Approach - Minor Street		X	309

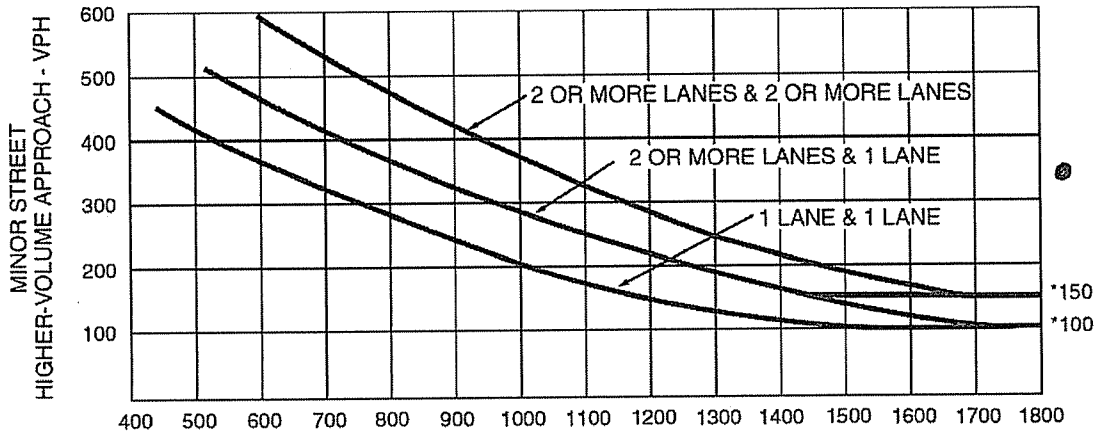
The plotted point falls above the curve in Figure 4C-3.	Yes ☒ No ☐
OR, The plotted point falls above the curve in Figure 4C-4.	Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

2015 PROJECT BUILD (ALTERNATIVE 1)
AM PEAK HOUR

Garcia / Harbor Ave. St.

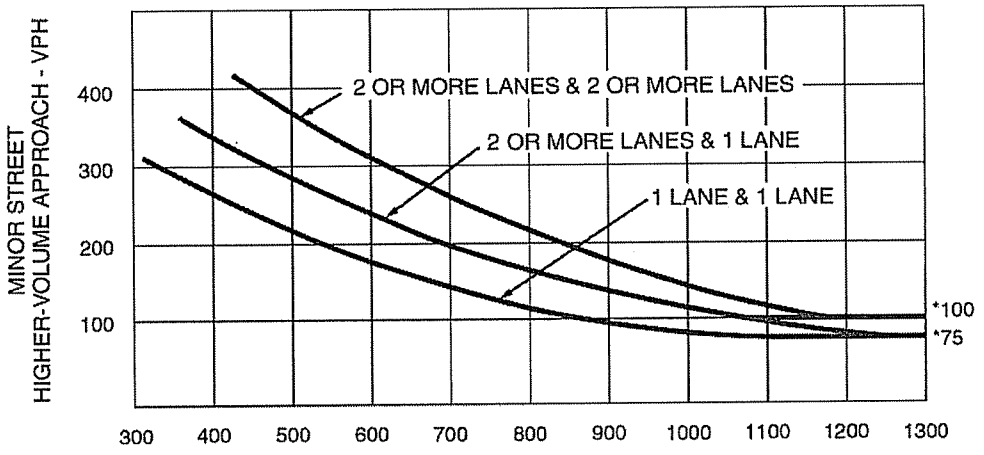
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE ~~70~~ 64 km/h OR ABOVE 40 mph ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

2015 PROJECT BUILD (ALTERNATIVE 1)
PM PEAK HOUR

Garciatte / Harbor St.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 4)

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☐**

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More				Hour
Both Approaches - Major Street						
Higher Approach - Minor Street						

*All plotted points fall above the curves in Figure 4C-1. (URBAN AREAS)	Yes ☐ No ☐
OR, All plotted points fall above the curves in Figure 4C-2. (RURAL AREAS)	Yes ☐ No ☐

WARRANT 3 - Peak Hour
(Part A or Part B must be satisfied) **SATISFIED YES ☒ NO ☐**

PART A **SATISFIED YES ☐ NO ☒**

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced for traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐ No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☒ No ☐
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☒ No ☐

PART B **SATISFIED YES ☒ NO ☐**

APPROACH LANES	One	2 or More	PM Hour
Both Approaches - Major Street		X	1972
Higher Approach - Minor Street		X	540

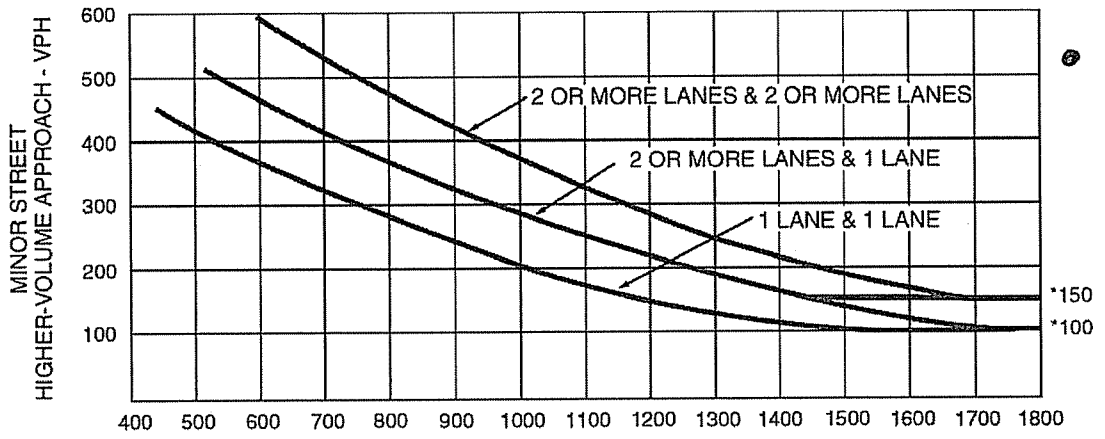
The plotted point falls above the curve in Figure 4C-3.	Yes ☒ No ☐
OR, The plotted point falls above the curve in Figure 4C-4.	Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

2015 PROJECT BUILD (ALTERNATIVE 1)
PM PEAK HOUR

Garcia Ave / Harbor St.

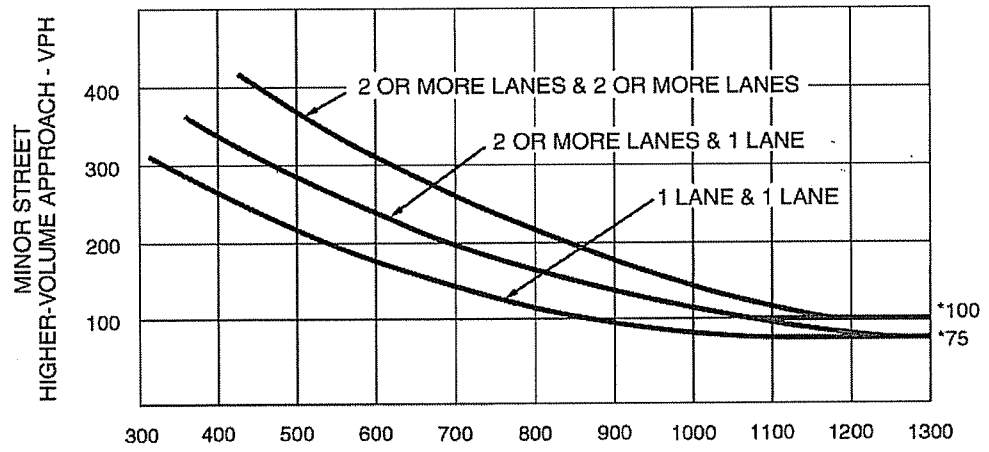
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE ~~70~~ 64 km/h OR ABOVE 40 mph ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

2030 PROJECT BUILD (ALTERNATIVE 1)
AM PEAK HOUR

Garcia Ave / Harbor St.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 4)

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☐**

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More				Hour
Both Approaches - Major Street						
Higher Approach - Minor Street						

*All plotted points fall above the curves in Figure 4C-1. (URBAN AREAS)	Yes ☐ No ☐
OR, All plotted points fall above the curves in Figure 4C-2. (RURAL AREAS)	Yes ☐ No ☐

WARRANT 3 - Peak Hour
(Part A or Part B must be satisfied) **SATISFIED YES ☒ NO ☐**

PART A **SATISFIED YES ☐ NO ☒**

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced for traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐ No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☒ No ☐
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☒ No ☐

PART B **SATISFIED YES ☒ NO ☐**

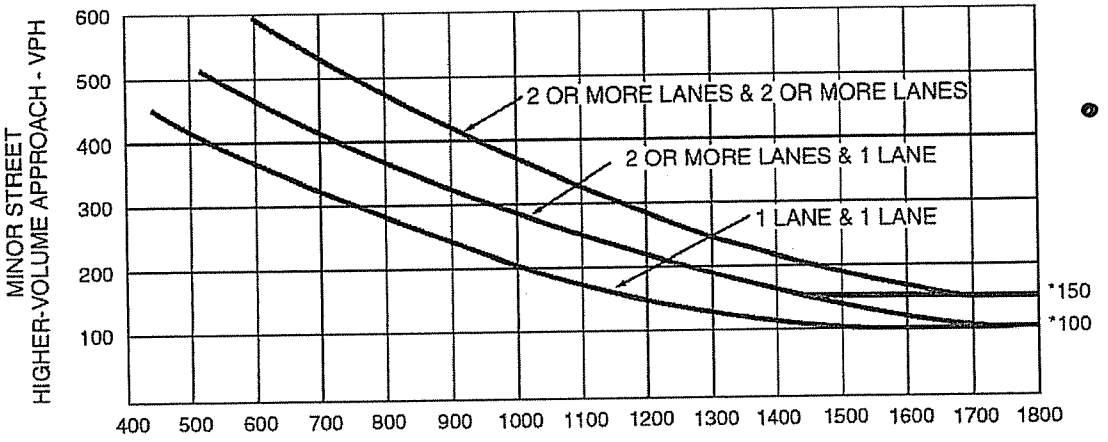
APPROACH LANES	One	2 or More	AM Hour
Both Approaches - Major Street		X	2058
Higher Approach - Minor Street		X	432

The plotted point falls above the curve in Figure 4C-3.	Yes ☒ No ☐
OR, The plotted point falls above the curve in Figure 4C-4.	Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

2030 PROJECT BUILD (ALTERNATIVE 1)
AM PEAK HOUR
Garcia Ave. / Harbor St.

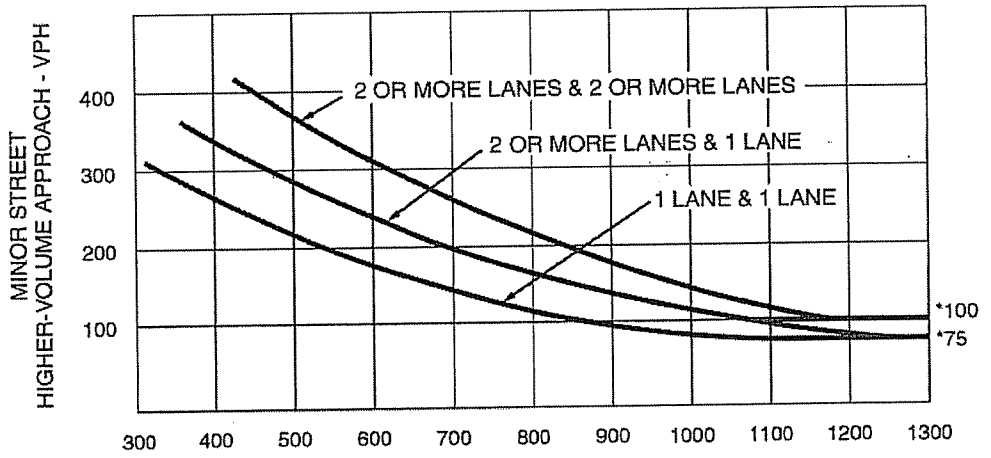
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE ~~70~~ 64 km/h OR ABOVE 40 mph ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

2030 PROJECT BUILD (ALTERNATIVE 2)
PM PEAK HOUR

Garcia Ave. / Harbor St.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 4)

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☐**

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More				Hour
Both Approaches - Major Street						
Higher Approach - Minor Street						

*All plotted points fall above the curves in Figure 4C-1. (URBAN AREAS)	Yes ☐ No ☐
OR, All plotted points fall above the curves in Figure 4C-2. (RURAL AREAS)	Yes ☐ No ☐

WARRANT 3 - Peak Hour
(Part A or Part B must be satisfied) **SATISFIED YES ☒ NO ☐**

PART A **SATISFIED YES ☐ NO ☒**

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced for traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐ No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☒ No ☐
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☒ No ☐

PART B **SATISFIED YES ☒ NO ☐**

APPROACH LANES	One	2 or More	PM Hour
Both Approaches - Major Street		X	2542
Higher Approach - Minor Street		X	709

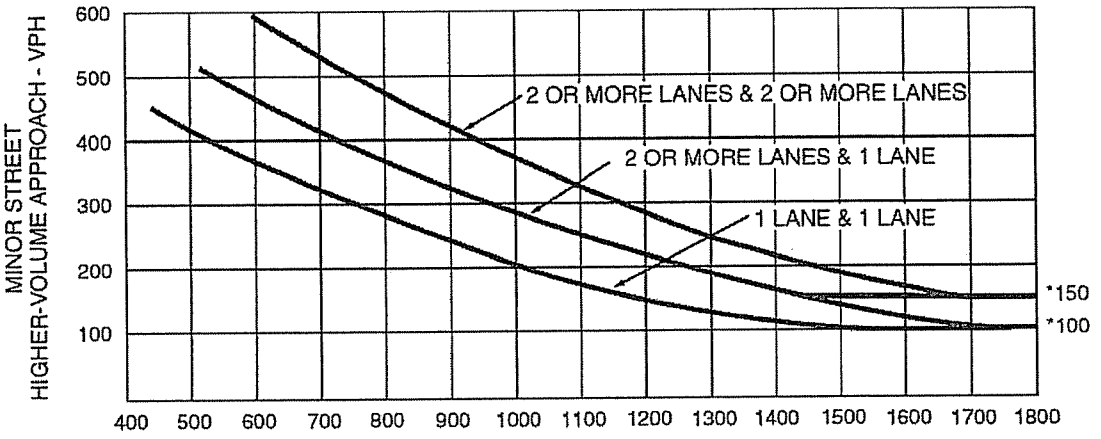
The plotted point falls above the curve in Figure 4C-3.	Yes ☒ No ☐
OR, The plotted point falls above the curve in Figure 4C-4.	Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

2030 PROJECT BUILD (ALTERNATIVE 1)
PM PEAK HOUR

Garcia Ave / Harbor St.

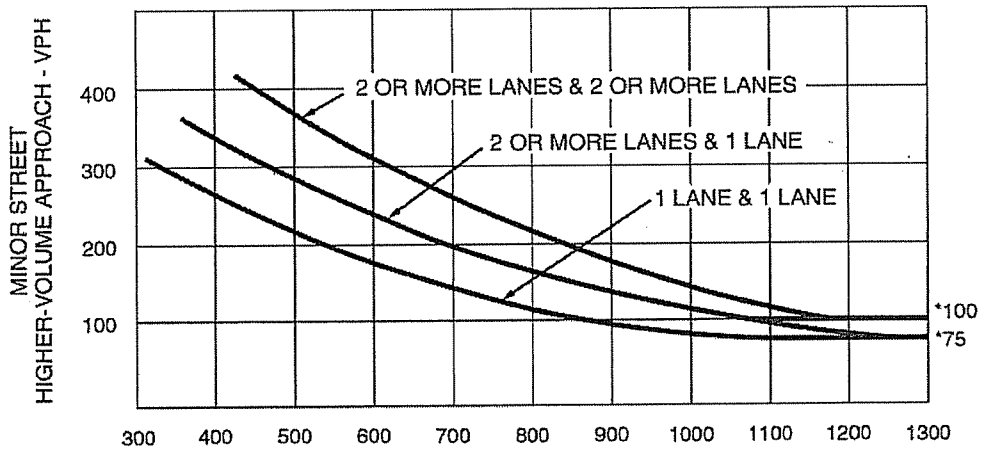
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

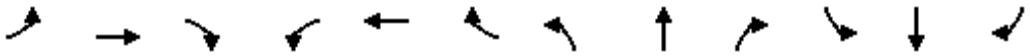
Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE ~~70~~ 64 km/h OR ABOVE 40 mph ON MAJOR STREET)



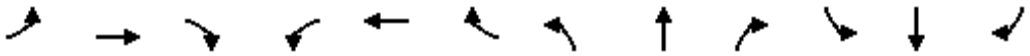
*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Appendix D
TRAFFIC MITIGATION OUTPUTS



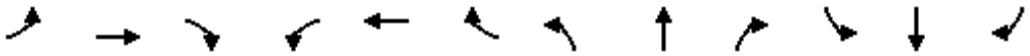
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	62	32	147	55	34	173	96	492	88	347	757	84
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.88		1.00	0.87		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1633		1770	1629		1770	3458		1770	3486	
Flt Permitted	0.49	1.00		0.56	1.00		0.29	1.00		0.41	1.00	
Satd. Flow (perm)	908	1633		1040	1629		538	3458		766	3486	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	67	35	160	60	37	188	104	535	96	377	823	91
RTOR Reduction (vph)	0	129	0	0	152	0	0	21	0	0	12	0
Lane Group Flow (vph)	67	66	0	60	73	0	104	610	0	377	902	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	10.2	10.2		10.2	10.2		35.1	35.1		35.1	35.1	
Effective Green, g (s)	10.2	10.2		10.2	10.2		35.1	35.1		35.1	35.1	
Actuated g/C Ratio	0.19	0.19		0.19	0.19		0.66	0.66		0.66	0.66	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	174	313		199	312		354	2277		504	2296	
v/s Ratio Prot		0.04			0.04			0.18			0.26	
v/s Ratio Perm	c0.07			0.06			0.19			c0.49		
v/c Ratio	0.39	0.21		0.30	0.23		0.29	0.27		0.75	0.39	
Uniform Delay, d1	18.8	18.2		18.5	18.2		3.9	3.8		6.1	4.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.4	0.3		0.9	0.4		0.5	0.1		6.0	0.1	
Delay (s)	20.2	18.5		19.3	18.6		4.3	3.8		12.1	4.3	
Level of Service	C	B		B	B		A	A		B	A	
Approach Delay (s)		18.9			18.8			3.9			6.6	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM Average Control Delay	8.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	53.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	64.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



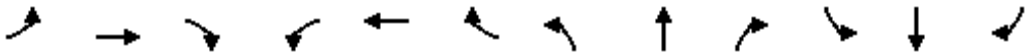
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	1	163	54	8	72	154	709	61	113	1047	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.85		1.00	0.87		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1585		1770	1612		1770	3497		1770	3517	
Flt Permitted	0.67	1.00		0.34	1.00		0.22	1.00		0.33	1.00	
Satd. Flow (perm)	1252	1585		631	1612		407	3497		609	3517	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	1	177	59	9	78	167	771	66	123	1138	49
RTOR Reduction (vph)	0	134	0	0	69	0	0	5	0	0	3	0
Lane Group Flow (vph)	12	44	0	59	18	0	167	832	0	123	1184	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	11.8	11.8		11.8	11.8		80.2	80.2		80.2	80.2	
Effective Green, g (s)	11.8	11.8		11.8	11.8		80.2	80.2		80.2	80.2	
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.80	0.80		0.80	0.80	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	148	187		74	190		326	2805		488	2821	
v/s Ratio Prot		0.03			0.01			0.24			0.34	
v/s Ratio Perm	0.01			c0.09			c0.41			0.20		
v/c Ratio	0.08	0.23		0.80	0.10		0.51	0.30		0.25	0.42	
Uniform Delay, d1	39.3	40.0		42.9	39.3		3.3	2.6		2.5	3.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.09	1.02	
Incremental Delay, d2	0.2	0.6		43.2	0.2		5.7	0.3		1.0	0.4	
Delay (s)	39.5	40.7		86.2	39.6		9.0	2.8		3.7	3.4	
Level of Service	D	D		F	D		A	A		A	A	
Approach Delay (s)		40.6			58.4			3.9			3.4	
Approach LOS		D			E			A			A	

Intersection Summary			
HCM Average Control Delay	9.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



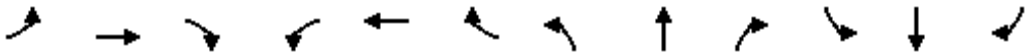
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	73	35	169	53	39	171	117	524	86	345	796	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.88		1.00	0.88		1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1631		1770	1635		1770	3465		1770	3478	
Flt Permitted	0.33	1.00		0.34	1.00		0.27	1.00		0.39	1.00	
Satd. Flow (perm)	606	1631		636	1635		508	3465		734	3478	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	79	38	184	58	42	186	127	570	93	375	865	113
RTOR Reduction (vph)	0	156	0	0	157	0	0	14	0	0	11	0
Lane Group Flow (vph)	79	66	0	58	71	0	127	649	0	375	967	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	12.3	12.3		12.3	12.3		59.7	59.7		59.7	59.7	
Effective Green, g (s)	12.3	12.3		12.3	12.3		59.7	59.7		59.7	59.7	
Actuated g/C Ratio	0.15	0.15		0.15	0.15		0.75	0.75		0.75	0.75	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	93	251		98	251		379	2586		548	2595	
v/s Ratio Prot		0.04			0.04			0.19			0.28	
v/s Ratio Perm	c0.13			0.09			0.25			c0.51		
v/c Ratio	0.85	0.26		0.59	0.28		0.34	0.25		0.68	0.37	
Uniform Delay, d1	32.9	29.9		31.5	29.9		3.4	3.2		5.3	3.6	
Progression Factor	0.77	1.38		1.00	1.00		1.00	1.00		0.92	0.59	
Incremental Delay, d2	6.7	0.1		9.2	0.6		2.4	0.2		6.2	0.4	
Delay (s)	32.2	41.1		40.7	30.6		5.8	3.4		11.0	2.5	
Level of Service	C	D		D	C		A	A		B	A	
Approach Delay (s)		38.8			32.6			3.8			4.8	
Approach LOS		D			C			A			A	

Intersection Summary			
HCM Average Control Delay	11.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	66.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



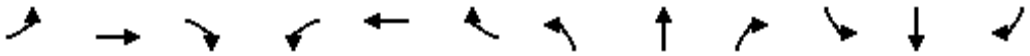
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	24	3	209	45	11	101	192	911	87	150	756	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.85		1.00	0.86		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1587		1770	1611		1770	3493		1770	3504	
Flt Permitted	0.65	1.00		0.42	1.00		0.31	1.00		0.24	1.00	
Satd. Flow (perm)	1211	1587		784	1611		578	3493		452	3504	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	3	227	49	12	110	209	990	95	163	822	58
RTOR Reduction (vph)	0	184	0	0	95	0	0	8	0	0	5	0
Lane Group Flow (vph)	26	46	0	49	27	0	209	1078	0	163	875	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	9.5	9.5		9.5	9.5		52.5	52.5		52.5	52.5	
Effective Green, g (s)	9.5	9.5		9.5	9.5		52.5	52.5		52.5	52.5	
Actuated g/C Ratio	0.14	0.14		0.14	0.14		0.75	0.75		0.75	0.75	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	164	215		106	219		434	2620		339	2628	
v/s Ratio Prot		0.03			0.02			0.31			0.25	
v/s Ratio Perm	0.02			c0.06			c0.36			0.36		
v/c Ratio	0.16	0.21		0.46	0.12		0.48	0.41		0.48	0.33	
Uniform Delay, d1	26.7	26.9		27.9	26.6		3.4	3.2		3.4	2.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.83	1.08	
Incremental Delay, d2	0.5	0.5		3.2	0.3		3.8	0.5		3.5	0.2	
Delay (s)	27.2	27.4		31.1	26.8		7.2	3.6		6.4	3.4	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		27.4			28.1			4.2			3.9	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	7.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	66.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



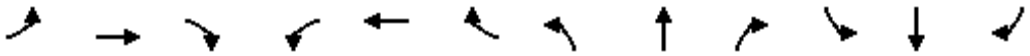
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	88	30	178	97	48	198	147	619	73	398	1114	178
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.87		1.00	0.88		1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1624		1770	1638		1770	3483		1770	3466	
Flt Permitted	0.30	1.00		0.39	1.00		0.15	1.00		0.35	1.00	
Satd. Flow (perm)	552	1624		729	1638		283	3483		654	3466	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	96	33	193	105	52	215	160	673	79	433	1211	193
RTOR Reduction (vph)	0	91	0	0	175	0	0	10	0	0	15	0
Lane Group Flow (vph)	96	135	0	105	92	0	160	742	0	433	1389	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	14.7	14.7		14.7	14.7		57.3	57.3		57.3	57.3	
Effective Green, g (s)	14.7	14.7		14.7	14.7		57.3	57.3		57.3	57.3	
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.72	0.72		0.72	0.72	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	101	298		134	301		203	2495		468	2483	
v/s Ratio Prot		0.08			0.06			0.21			0.40	
v/s Ratio Perm	c0.17			0.14			0.57			c0.66		
v/c Ratio	0.95	0.45		0.78	0.30		0.79	0.30		0.93	0.56	
Uniform Delay, d1	32.3	29.1		31.1	28.2		7.4	4.1		9.5	5.4	
Progression Factor	0.47	0.47		1.00	1.00		1.00	1.00		0.75	0.46	
Incremental Delay, d2	16.3	0.1		25.2	0.6		25.9	0.3		20.5	0.6	
Delay (s)	31.5	13.7		56.3	28.8		33.3	4.4		27.6	3.1	
Level of Service	C	B		E	C		C	A		C	A	
Approach Delay (s)		19.0			36.6			9.5			8.9	
Approach LOS		B			D			A			A	

Intersection Summary			
HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	77.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	5	239	39	13	103	199	776	70	169	766	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.85		1.00	0.87		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1589		1770	1614		1770	3495		1770	3490	
Flt Permitted	0.55	1.00		0.37	1.00		0.30	1.00		0.30	1.00	
Satd. Flow (perm)	1034	1589		684	1614		555	3495		555	3490	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	36	5	260	42	14	112	216	843	76	184	833	85
RTOR Reduction (vph)	0	177	0	0	98	0	0	4	0	0	5	0
Lane Group Flow (vph)	36	88	0	42	28	0	216	915	0	184	913	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	10.9	10.9		10.9	10.9		71.1	71.1		71.1	71.1	
Effective Green, g (s)	10.9	10.9		10.9	10.9		71.1	71.1		71.1	71.1	
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.79	0.79		0.79	0.79	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	125	192		83	195		438	2761		438	2757	
v/s Ratio Prot		0.06			0.02			0.26			0.26	
v/s Ratio Perm	0.03			c0.06			c0.39			0.33		
v/c Ratio	0.29	0.46		0.51	0.14		0.49	0.33		0.42	0.33	
Uniform Delay, d1	36.0	36.8		37.0	35.4		3.3	2.7		3.0	2.7	
Progression Factor	0.81	0.86		1.00	1.00		1.05	1.14		1.69	1.74	
Incremental Delay, d2	1.1	1.5		4.8	0.3		3.5	0.3		2.5	0.3	
Delay (s)	30.2	32.9		41.8	35.7		6.9	3.4		7.6	5.0	
Level of Service	C	C		D	D		A	A		A	A	
Approach Delay (s)		32.6			37.2			4.0			5.4	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM Average Control Delay	9.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	66.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	97	39	229	64	77	203	202	541	75	398	1094	232
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.87		1.00	0.89		1.00	0.98		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1624		1770	1660		1770	3474		1770	3446	
Flt Permitted	0.25	1.00		0.28	1.00		0.14	1.00		0.38	1.00	
Satd. Flow (perm)	466	1624		515	1660		258	3474		703	3446	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	105	42	249	70	84	221	220	588	82	433	1189	252
RTOR Reduction (vph)	0	93	0	0	86	0	0	10	0	0	16	0
Lane Group Flow (vph)	105	198	0	70	219	0	220	660	0	433	1425	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	24.0	24.0		24.0	24.0		78.0	78.0		78.0	78.0	
Effective Green, g (s)	24.0	24.0		24.0	24.0		78.0	78.0		78.0	78.0	
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.71	0.71		0.71	0.71	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	102	354		112	362		183	2463		498	2444	
v/s Ratio Prot		0.12			0.13			0.19			0.41	
v/s Ratio Perm	c0.23			0.14			c0.85			0.62		
v/c Ratio	1.03	0.56		0.62	0.60		1.20	0.27		0.87	0.58	
Uniform Delay, d1	43.0	38.3		38.9	38.7		16.0	5.7		12.1	7.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.69	0.44	
Incremental Delay, d2	97.3	1.9		10.4	2.8		131.5	0.3		15.4	0.8	
Delay (s)	140.3	40.2		49.3	41.6		147.5	6.0		23.8	4.3	
Level of Service	F	D		D	D		F	A		C	A	
Approach Delay (s)		66.7			43.0			41.0			8.8	
Approach LOS		E			D			D			A	

Intersection Summary			
HCM Average Control Delay	27.0	HCM Level of Service	C
HCM Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	84.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Appendix E

MULTIMODAL LEVEL OF SERVICE (MMLOS) DATA

Multimodal Level of Service for Urban Streets

Diagram of Uban Street

Street: RAILROAD AVE

Date:

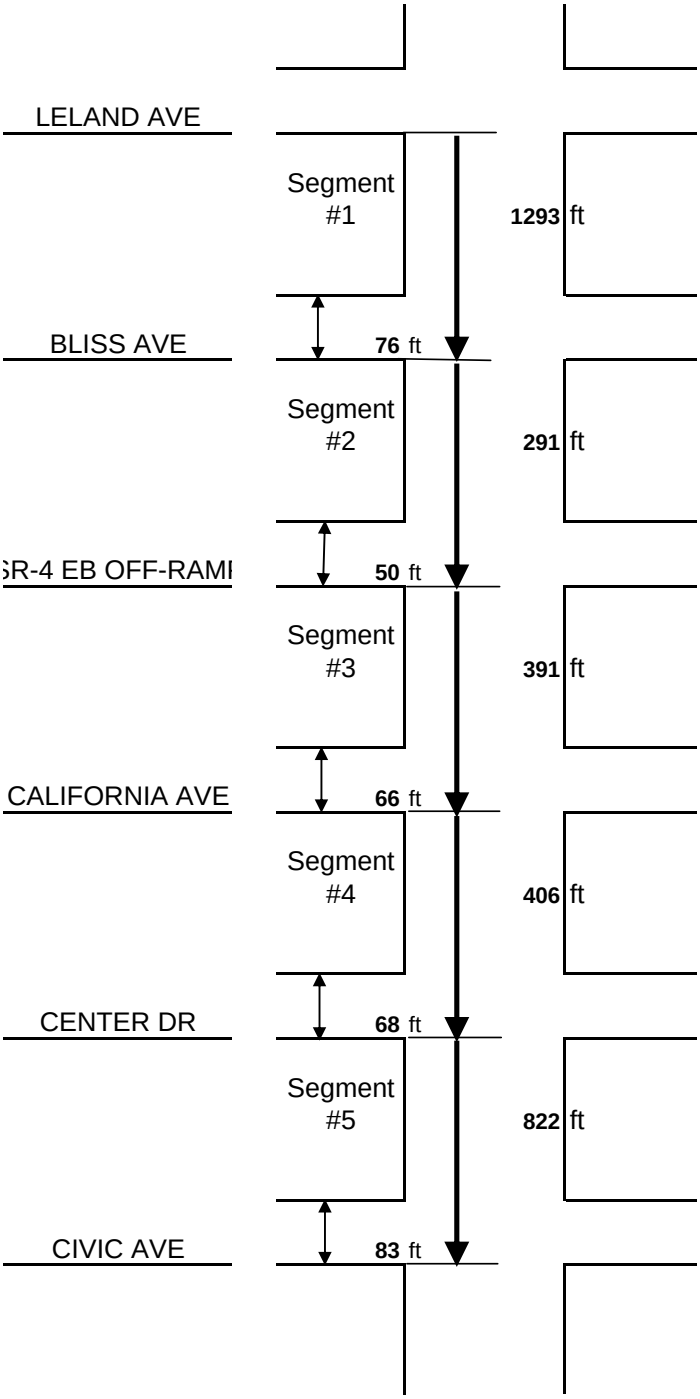
Limits: FROM LELAND RD TO CIVIC AVE

Observer:

Analysis Direction:	NB

(NB, SB, EB, WB)
(NW, SE, NE, SW)

Data Entry Fields in Red



Intersect. Control	X-Street Lanes	X-Street Speed	X-Street 2-W vph	Right Turn Isl.
SIGNAL	3	35	384	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	2	35	1820	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	3	30	426	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	0	0	0	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	0	0	0	0

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: RAILROAD AVE Limits: FROM LELAND R

Cross-Section #1 Observer: 0

From: LELAND AVE To: BLISS AVE

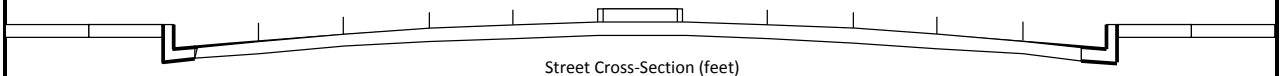
1

Ft/Trees	% Occ.
30	0%

NB

Pavement Cond:	5
Jay-Walking Legal:	no

SB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	12	14	0	0	12	12	3	12	12	0	0	14	0	5

Ped Vol: 0

Cross-Section #2

From: BLISS AVE To: SR-4 EB OFF-RAMP

2

Ft/Trees	% Occ.
0	0%

NB

Pavement Cond:	5
Jay-Walking Legal:	no

SB

Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	8	0	12	12	12	10	12	12	12	0	8	0	5

0

Cross-Section #3

From: SR-4 EB OFF-RAMP To: CALIFORNIA AVE

3

Ft/Trees	% Occ.
0	0

NB

Pavement Cond:	5
Jay-Walking Legal:	no

SB

Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
10	0	8	0	12	12	24	4	12	12	12	0	8	0	5

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: RAILROAD AVE Limits: FROM LELAND R

Cross-Section #4 Observer: 0

From: CALIFORNIA AVE To: CENTER DR

4

Ft/Trees	% Occ.
0	0

NB

Pavement Cond: 5
Jay-Walking Legal: no

SB

Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
10	0	8	0	0	12	12	6	12	12	0	0	8	0	5

Ped Vol: 0

Cross-Section #5

From: CENTER DR To: CIVIC AVE

5

Ft/Trees	% Occ.
30	0

NB

Pavement Cond: 5
Jay-Walking Legal: no

SB

Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	5	7	0	0	12	12	6	12	12	0	0	7	5	5

Ped Vol: 0

Urban Street Multimodal Level of Service
Data Collection Sheet - Vehicle Traffic

Direction: **NB**

Street: RAILROAD AVE Date: 0-Jan-00

Limits: FROM LELAND RD TO CIVIC AVE Observer: 0

Field Survey

	Segment And Downstream Signal		Speed Limit	Median Type	Left Turn Pocket	Drivewys Rightside	Unsig. Intersects
	From	To	(mph)	(0-3)	(y/n)	(#)	(#)
1	LELAND AVE	BLISS AVE	35	3	y	11	
2	BLISS AVE	-4 EB OFF-RA	35	3	n	1	
3	-4 EB OFF-RA	ALIFORNIA AV	35	3	y	0	
4	ALIFORNIA AV	CENTER DR	35	3	y	0	
5	CENTER DR	CIVIC AVE	35	3	y	4	

Traffic Counts K: 100 D: 100

	Segment And Downstream Signal		Vol	Heavy Vehicle	RTOR+ PermLeft	Left/Right Turns	Thru Adj. Sat.	PHF
	From	To	(1-wy)	(%)	veh	%	(vphgl)	
1	LELAND AVE	BLISS AVE	834	2%	539	0%	1900	0.88
2	BLISS AVE	-4 EB OFF-RA	998	2%	232	0%	1900	0.93
3	-4 EB OFF-RA	ALIFORNIA AV	1480	2%	390	0%	1900	0.93
4	ALIFORNIA AV	CENTER DR	1170	2%	0	0%	1900	0.92
5	CENTER DR	CIVIC AVE	793	2%	4	0%	1900	0.95

Arterial Traffic Performance & Signal Timing

	Segment And Downstream Signal		Field Survey		Signal Timing Data			
			Mean Speed	Average Stops	Cycle Length	Grn/Cycle for Thru	Ped Walk	Xing Ped Walk
	From	To	(mph)	(#/veh)	(secs)	(%)	(sec/cyc)	(sec/cyc)
1	LELAND AVE	BLISS AVE	31.5	3.6	80.0	40%	13.0	30.0
2	BLISS AVE	-4 EB OFF-RA	31.5	1.6	80.0	30%	14.0	26.0
3	-4 EB OFF-RA	ALIFORNIA AV	31.5	0.4	80.0	60%	14.0	38.0
4	ALIFORNIA AV	CENTER DR	24.5	0.2	80.0	100%	0.0	22.0
5	CENTER DR	CIVIC AVE	14.0	0.8	80.0	80%	0.0	23.0

Notes: Median = 0 if None, 1 if one-way st., 2 if Painted or TWLTL, 3 if Raised
Heavy Vehicles = Buses plus trucks plus recreational vehicles
Thru Adusted Saturation Flow rates computed per Signalized Intersections Chapter, HC
Signal data is at the downstream signal

Urban Street Multimodal Level of Service
Data Collection Sheet - Transit

Direction: **NB**

Street: RAILROAD AVE Date: 0-Jan-00

Limits: FROM LELAND RD TO CIVIC AVE Observer: 0

Field Survey

Segment			Bus Stop	Shelters	Benches	CBD
	From	To	(#)	(% stops)	(% stops)	(yes/no)
1	LELAND AVE	BLISS AVE	1	0	0	no
2	BLISS AVE	-4 EB OFF-RA	1	0	1	no
3	-4 EB OFF-RA	ALIFORNIA AV	0	0	0	no
4	ALIFORNIA AV	CENTER DR	0	0	0	no
5	CENTER DR	CIVIC AVE	0	0	0	no

Transit Performance Data

Segment			Route	Frequency	Load Factor	On-Time Perform.	Schedule Speed
	From	To	#'s	(bus/hr)	(pas/seat)	(%)	(mph)
1	LELAND AVE	BLISS AVE	380-W	2	0.55	0.962	14
2	BLISS AVE	-4 EB OFF-RA	380-W	2	0.55	0.962	14
3	-4 EB OFF-RA	ALIFORNIA AV	380-W	2	0.55	0.962	14
4	ALIFORNIA AV	CENTER DR	380-W	2	0.55	0.962	14
5	CENTER DR	CIVIC AVE	380-W	2	0.55	0.962	14

Bus is On-Time if arrives within: 5 minutes of scheduled time.
Average Passenger Trip Length: 6.4 miles

A. Compute Auto LOS and Performance

Street: **RAILROAD AVE**

Direction=	Down	NB

1. Compute Eastbound Hourly Demand (v)

Segment & Downstream Signal	AADT (vpd)	Peak Factor K (#)	Dir. Factor D (#)	Pk.Hr.Fac. PHF (#)	Thru Traffic (%)	Demand v (vph)	from:
1	834	1.000	1.00	0.88	100%	834	traffic
2	998	1.000	1.00	0.93	100%	998	traffic
3	1480	1.000	1.00	0.93	100%	1480	traffic
4	1170	1.000	1.00	0.92	100%	1170	traffic
5	793	1.000	1.00	0.95	100%	793	traffic

2. Compute Eastbound Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1900	2	0.40	1520	0.55	OK	xsec 1-3, traffic
2	1900	3	0.30	1710	0.58	OK	xsec 1-3, traffic
3	1900	4	0.60	4560	0.32	OK	xsec 1-3, traffic
4	1900	2	1.00	3800	0.31	OK	xsec 4-5, traffic
5	1900	2	0.80	3040	0.26	OK	xsec 4-5, traffic

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	35	1293	31.5	traffic, layout
2	35	291	31.5	traffic, layout
3	35	391	31.5	traffic, layout
4	35	406	24.5	traffic, layout
5	35	822	14.0	traffic, layout
Total/Ave.	35.0	3203	23.2	

4. Compute Stops & % Left Lane

Segment & Downstream Signal	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	14.70	y	3	traffic
2	29.03	n	3	traffic
3	5.40	y	3	traffic
4	2.08	y	3	traffic
5	4.82	y	3	traffic
Total/Ave	10.73	0.00	3.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weight. Ave.	Auto LOS
1	0.8%	3.6%	7.8%	14.5%	25.5%	47.9%	5.04	F
2	0.0%	0.1%	0.2%	0.6%	1.9%	97.2%	5.96	F
3	7.4%	24.8%	27.0%	20.0%	12.7%	8.0%	3.30	C
4	15.6%	36.8%	24.7%	12.8%	6.5%	3.6%	2.69	B
5	8.5%	27.1%	27.2%	18.8%	11.4%	7.0%	3.19	C
Average	2.0%	9.0%	16.4%	22.4%	25.1%	25.2%	4.35	E

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Pedestrian LOS

Street: **RAILROAD AVE**

1. Compute Pedestrian Density LOS

Seg.	Sidewalk Width (ft)	Ped Flow (pph)	Ped. Density LOS #	Ped. Density LOS	from
1	5	0	0.00	A	xsec1-3
2	5	0	0.00	A	xsec1-3
3	10	0	0.00	A	xsec1-3
4	10	0	0.00	A	xsec4-5
5	5	0	0.00	A	xsec4-5

Density LOS Lookup	
Ped/hr/ft	LOS
0	A
300	B
420	C
600	D
900	E
1380	F

2. Compute Pedestrian Segment LOS

Seg.	Outside Lane (ft)	Bike Ln + Park/Shldr (ft)	On-Street Parking Occ (%)	Barrier (ft/Tree)	Buffer Width (ft)	Dir. Traffic Volume (vph)	Traf. Lanes One-Dir (lanes)	Midblock Veh. Speed (mph)	Ped. Seg. LOS #	from
1	0	14	0%	30	12	834	2	33.3	2.16	xsec1-3
2	12	8	0%	0	0	998	3	33.3	2.74	xsec1-3
3	12	8	0%	0	0	1,480	4	33.3	2.64	xsec1-3
4	0	8	0%	0	0	1,170	2	29.8	3.45	xsec4-5
5	0	7	0%	30	5	793	2	24.5	2.48	xsec4-5

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with intersection delay.

3. Compute Pedestrian Intersection LOS

Downstream Signal	RTOR+ Perm LT (vph)	X-Street Volume (vph)	X-Street PHF (#)	X-Street Speed (mph)	X-Street Lanes (#)	Ave Ped. Wait At Signal (sec)	Right Turn Channel Islands (#)	Ped. Intersect LOS #	from
1	539	384	0.88	35	3	28.1	0	3.40	layout, traffic
2	232	1820	0.93	35	2	27.2	0	4.59	layout, traffic
3	390	426	0.93	30	3	27.2	0	3.08	layout, traffic
4	0	0	0.92	0	0	40.0	0	1.93	layout, traffic
5	4	0	0.95	0	0	40.0	0	1.93	layout, traffic

Pedestrian Delay computed per Chapter 18 method (eqn 18-5, HCM 2000).

4. Compute Roadway Crossing Difficulty Factor (RCDF)

Seg.	Signal Spacing (ft)	Cross St. Ped Wait (secs/cycle)	Divert Delay (sec)	Arterial X Distance (ft)	Midblock Veh Speed (mph)	Vehicle Vol 2-Dir (vph)	Wait To X (max=900) (sec)	Is J-Walking Allowed? (Yes/No)	from
1	1293	15.6	254	79	33.3	834	900	no	layout, traffic
2	291	18.2	65	98	33.3	998	900	no	layout, traffic
3	391	11.0	80	104	33.3	1,480	900	no	layout, traffic
4	406	21.0	88	70	29.8	1,170	900	no	layout, traffic
5	822	20.3	167	68	24.5	793	542	no	layout, traffic

5. Compute Pedestrian Facility LOS

Segment & Downstream Signal	Min. Wait,Divert (sec)	Crossing LOS (#)	No Cross LOS (#)	RCDF (#)	Ped. NDLOS (#)	Ped. Density LOS #	Ped. Fac. LOS (#)	Ped. Facility LOS
1	254	6.00	3.04	1.00	3.04	0.00	3.04	D
2	65	6.00	3.49	1.00	3.49	0.00	3.49	D
3	80	6.00	3.12	1.00	3.12	0.00	3.12	D
4	88	6.00	3.13	1.00	3.13	0.00	3.13	D
5	167	6.00	2.82	1.00	2.82	0.00	2.82	D
Average							3.05	D

C. Compute Transit LOS

Street: **RAILROAD AVE**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	2	96%	0%	0%	0.55	no	transit
2	2	96%	0%	100%	0.55	no	transit
3	2	96%	0%	0%	0.55	no	transit
4	2	96%	0%	0%	0.55	no	transit
5	2	96%	0%	0%	0.55	no	transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus (mph)	from
1	1293	31.5	1	14.0	transit
2	291	31.5	1	14.0	transit
3	391	31.5	0	14.0	transit
4	406	24.5	0	14.0	transit
5	822	14.0	0	14.0	transit
Total/Ave	3203	23.2		14.0	

3. Compute Transit Perceived Travel Time and Headway Factors

Segment	a1 factor	IVTTR min/mi	EWTTR min/mi	ATR min/mi	PTTR	Fptt	Fh
1	1.00	4.29	0.01	0.00	4.30	1.14	1.97
2	1.00	4.29	0.01	0.03	4.27	1.14	1.97
3	1.00	4.29	0.01	0.00	4.30	1.14	1.97
4	1.00	4.29	0.01	0.00	4.30	1.14	1.97
5	1.00	4.29	0.01	0.00	4.30	1.14	1.97

IVTTR = In-Vehicle Travel Time Rate
EWTTR = Equivalent Wait Travel Time Rate
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor

4. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	2.25	3.04	3.08	C
2	2.26	3.49	3.14	C
3	2.25	3.12	3.09	C
4	2.25	3.13	3.09	C
5	2.25	2.82	3.05	C
Average			3.08	C

D. Compute Bicycle LOS

Street: **RAILROAD AVE**

1. Geometric Input Data

Segment & Downstream Signal	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Sig. Int Cross-Dist (ft)	Unsig.Conf Per Mile (conf/mi)	from
1	0	14	2	D	76	44.9	xsec1-3, layout
2	12	8	3	D	50	18.1	xsec1-3, layout
3	12	8	4	D	66	0.0	xsec1-3, layout
4	0	8	2	D	68	0.0	xsec4-5, layout
5	0	7	2	D	83	25.7	xsec4-5, layout

2. Performance and Other Input Data

Segment & Downstream Signal	Traffic Volume (vph)	Heavy Vehicle (%)	Midblock Traffic Spd (mph)	On-Street Parking (%)	Pavement Rating (#)	from
1	834	2%	33.3	0%	5.0	traffic, xsec1-3
2	998	2%	33.3	0%	5.0	traffic, xsec1-3
3	1480	2%	33.3	0%	5.0	traffic, xsec1-3
4	1170	2%	29.8	0%	5.0	traffic, xsec4-5
5	793	2%	24.5	0%	5.0	traffic, xsec4-5

Pavement Rating: 1=Poor, 5=Excellent

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with inte

3. Compute Bicycle LOS

Segment & Downstream Signal	Prelim. Eff. Width (Wv)	Effective Width (We)	Speed Factor (#)	Segment LOS (#)	Intersect LOS (#)	Bicycle Score (#)	Bicycle LOS
1	14.0	28.0	3.70	0.64	3.11	4.77	F
2	20.0	28.0	3.70	0.50	1.23	3.60	E
3	20.0	28.0	3.70	0.55	1.54	2.99	D
4	8.0	16.0	3.36	3.33	4.56	4.43	F
5	7.0	14.0	2.49	3.17	4.62	5.38	F
Average						4.56	F

E. LOS Summary

Title: RAILROAD AVE

Direction =	Down	NB

Date: Analyst:

Segment & Downstream Signal	Auto Stops LOS #1	Auto Speed LOS #2	Auto HCM LOS #3	Auto NCHRP 379 LOS #4	Transit LOS	Bicycle LOS	Pedestrian LOS
1	F	A	A	A	C	F	D
2	F	A	A	A	C	E	D
3	C	A	A	A	C	D	D
4	B	B	B	B	C	F	D
5	C	C	D	D	C	F	D
Facility	E	B	C	C	C	F	D

Auto Performance Measures Summary NB

Seg+Sig	Stops	FFS	Speed	%FFS
1	14.70	35.0	31.5	90.0%
2	29.03	35.0	31.5	90.0%
3	5.40	35.0	31.5	90.0%
4	2.08	35.0	24.5	70.0%
5	4.82	35.0	14.0	40.0%
Facility	10.73	35.0	23.2	66.3%

Spreadsheet created by: R.Dowling of Dowling Associates, Inc.
Under contract to:
Transportation Research Board
NCHRP 3-70 Multimodal Level of Service For Urban Streets

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Created: 8-Jun-07 Updated: 25-Sep-08

Multimodal Level of Service for Urban Streets

Diagram of Uban Street

Street: RAILROAD AVE

Date:

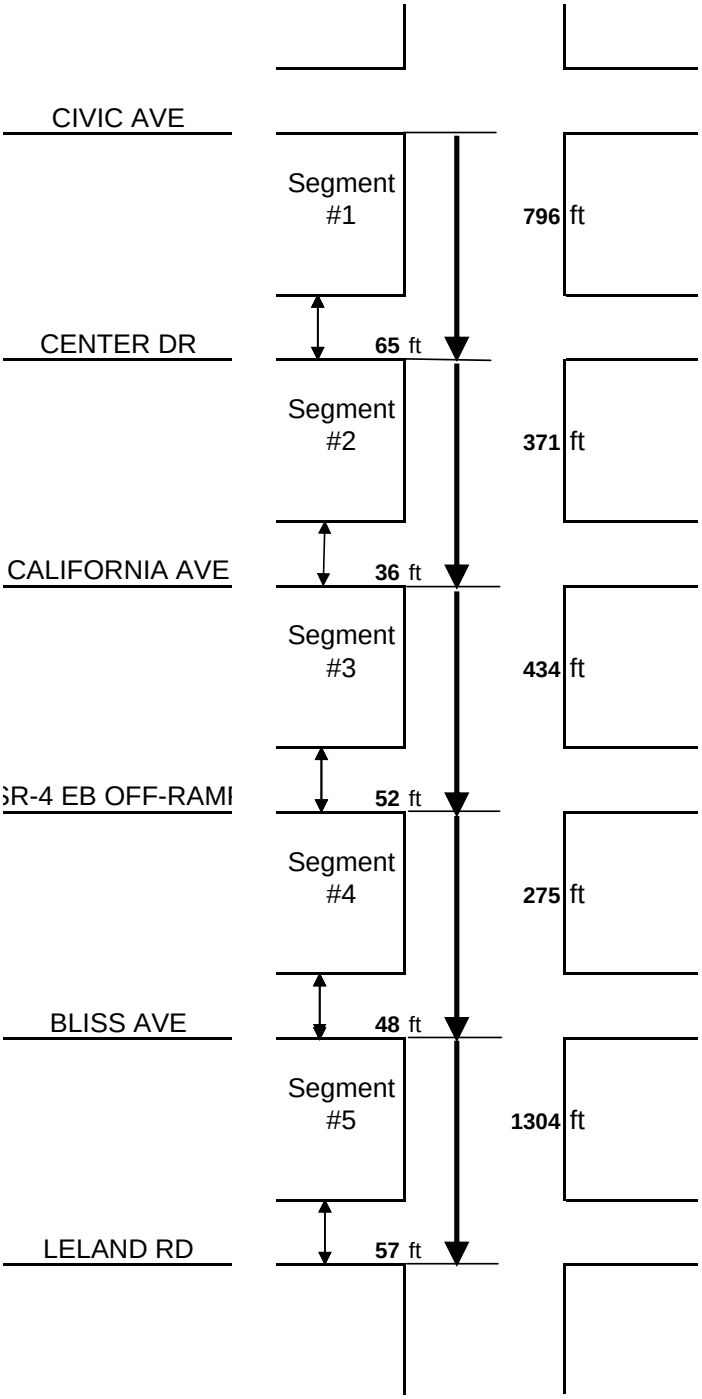
Limits: FROM CIVIC AVE TO LELAND RD

Observer:

Analysis Direction:	SB

(NB, SB, EB, WB)
(NW, SE, NE, SW)

Data Entry Fields in Red



Intersect. Control	X-Street Lanes	X-Street Speed	X-Street 2-W vph	Right Turn Isl.
SIGNAL	4	30	307	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	3	30	426	1

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	3	35	1820	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	3	35	384	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	5	35	1978	0

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: RAILROAD AVE

Limits: FROM CIVIC AVE

Observer: 0

Cross-Section #1
From: CIVIC AVE To: CENTER DR

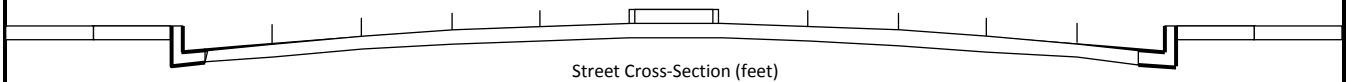
1

Ft/Trees	% Occ.
30	0%

SB

Pavement Cond:	5
Jay-Walking Legal:	YES

NB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	5	7	0	0	12	12	6	12	12	0	0	7	5	5

Ped Vol: 0

Cross-Section #2
From: CENTER DR To: CALIFORNIA AVE

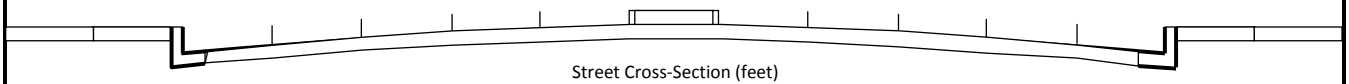
2

Ft/Trees	% Occ.
0	0%

SB

Pavement Cond:	5
Jay-Walking Legal:	YES

NB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	8	0	0	12	12	6	12	12	0	0	8	0	10

0

Cross-Section #3
From: CALIFORNIA AVE To: SR-4 EB OFF-RAMP

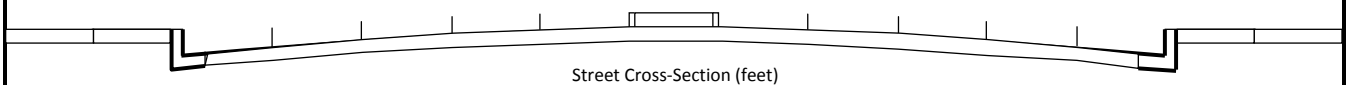
3

Ft/Trees	% Occ.
0	0

SB

Pavement Cond:	5
Jay-Walking Legal:	YES

NB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	8	0	12	12	12	4	24	12	12	0	8	0	10

Multimodal Level of Service for Urban Streets

Street Cross-Section Data | Street: RAILROAD AVE | Limits: FROM CIVIC AVE

Cross-Section #4 | Observer: 0

From: SR-4 EB OFF-RAMP To: BLISS AVE

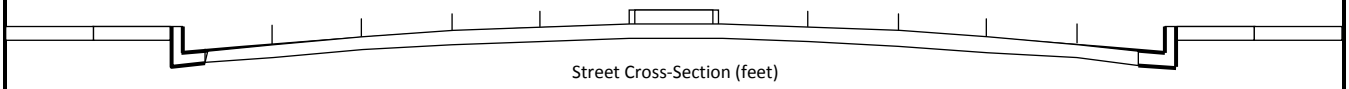
4

Ft/Trees	% Occ.
0	0

SB

Pavement Cond:	5
Jay-Walking Legal:	YES

NB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	8	0	12	12	12	10	12	12	12	0	8	0	5

Ped Vol: 0

Cross-Section #5

From: BLISS AVE To: LELAND RD

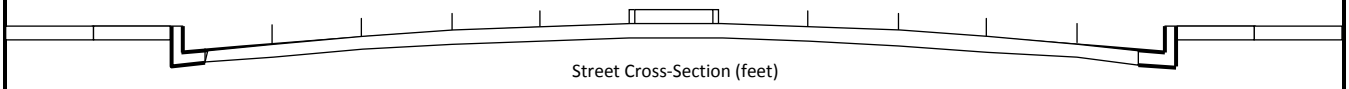
5

Ft/Trees	% Occ.
0	0

SB

Pavement Cond:	5
Jay-Walking Legal:	YES

NB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	14	0	0	12	12	3	12	12	0	0	14	12	5

Ped Vol: 0

Urban Street Multimodal Level of Service
Data Collection Sheet - Vehicle Traffic

Direction: **SB**

Street: RAILROAD AVE Date: 0-Jan-00

Limits: FROM CIVIC AVE TO LELAND RD Observer: 0

Field Survey

	Segment And Downstream Signal		Speed Limit	Median Type	Left Turn Pocket	Drivewys Rightside	Unsig. Intersects
	From	To	(mph)	(0-3)	(y/n)	(#)	(#)
1	CIVIC AVE	CENTER DR	35	3	n	2	
2	CENTER DR	ALIFORNIA AV	35	3	y	0	
3	ALIFORNIA AV	-4 EB OFF-RA	35	3	y	0	
4	-4 EB OFF-RA	BLISS AVE	35	3	y	0	
5	BLISS AVE	LELAND RD	35	3	y	6	

Traffic Counts K: 100 D: 100

	Segment And Downstream Signal		Vol	Heavy Vehicle	RTOR+ PermLeft	Left/Right Turns	Thru Adj. Sat.	PHF
	From	To	(1-wy)	(%)	veh	%	(vphgl)	
1	CIVIC AVE	CENTER DR	733	2%	312	0%	1900	0.91
2	CENTER DR	ALIFORNIA AV	1035	2%	667	0%	1900	0.83
3	ALIFORNIA AV	-4 EB OFF-RA	599	2%	0	0%	1900	0.88
4	-4 EB OFF-RA	BLISS AVE	1705	2%	111	0%	1900	0.92
5	BLISS AVE	LELAND RD	1130	2%	340	0%	1900	0.92

Arterial Traffic Performance & Signal Timing

	Segment And Downstream Signal		Field Survey		Signal Timing Data			
			Mean Speed	Average Stops	Cycle Length	Grn/Cycle for Thru	Ped Walk	Xing Ped Walk
	From	To	(mph)	(#/veh)	(secs)	(%)	(sec/cyc)	(sec/cyc)
1	CIVIC AVE	CENTER DR	31.5	0.02	80.0	100%	18.0	23.0
2	CENTER DR	ALIFORNIA AV	31.5	0.4	80.0	50%	20.0	36.0
3	ALIFORNIA AV	-4 EB OFF-RA	31.5	0.5	80.0	40%	14.0	28.0
4	-4 EB OFF-RA	BLISS AVE	24.5	0.3	80.0	70%	16.0	28.0
5	BLISS AVE	LELAND RD	14.0	0.7	100.0	50%	20.0	26.0

Notes: Median = 0 if None, 1 if one-way st., 2 if Painted or TWLTL, 3 if Raised
Heavy Vehicles = Buses plus trucks plus recreational vehicles
Thru Adusted Saturation Flow rates computed per Signalized Intersections Chapter, HC
Signal data is at the downstream signal

Urban Street Multimodal Level of Service
Data Collection Sheet - Transit

Direction: **SB**

Street: RAILROAD AVE Date: 0-Jan-00

Limits: FROM CIVIC AVE TO LELAND RD Observer: 0

Field Survey

Segment			Bus Stop	Shelters	Benches	CBD
	From	To	(#)	(% stops)	(% stops)	(yes/no)
1	CIVIC AVE	CENTER DR	1	0	0	no
2	CENTER DR	ALIFORNIA AV	0	0	0	no
3	ALIFORNIA AV	-4 EB OFF-RA	0	0	0	no
4	-4 EB OFF-RA	BLISS AVE	0	0	0	no
5	BLISS AVE	LELAND RD	1	0	1	no

Transit Performance Data

Segment			Route	Frequency	Load Factor	On-Time Perform.	Schedule Speed
	From	To	#'s	(bus/hr)	(pas/seat)	(%)	(mph)
1	CIVIC AVE	CENTER DR	380-E	2	64%	0.962	13
2	CENTER DR	ALIFORNIA AV	380-E	2	0.64	0.962	13
3	ALIFORNIA AV	-4 EB OFF-RA	380-E	2	0.64	0.962	13
4	-4 EB OFF-RA	BLISS AVE	380-E	2	0.64	0.962	13
5	BLISS AVE	LELAND RD	380-E	2	0.64	0.962	13

Bus is On-Time if arrives within: 5 minutes of scheduled time.
Average Passenger Trip Length: 6.4 miles

A. Compute Auto LOS and Performance

Street: **RAILROAD AVE**

Direction=	**Down**	**SB**

1. Compute Eastbound Hourly Demand (v)

Segment & Downstream Signal	AADT (vpd)	Peak Factor K (#)	Dir. Factor D (#)	Pk.Hr.Fac. PHF (#)	Thru Traffic (%)	Demand v (vph)	from:
1	733	1.000	1.00	0.91	100%	733	traffic
2	1035	1.000	1.00	0.83	100%	1035	traffic
3	599	1.000	1.00	0.88	100%	599	traffic
4	1705	1.000	1.00	0.92	100%	1705	traffic
5	1130	1.000	1.00	0.92	100%	1130	traffic

2. Compute Eastbound Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1900	2	1.00	3800	0.19	OK	xsec 1-3, traffic
2	1900	2	0.50	1900	0.54	OK	xsec 1-3, traffic
3	1900	3	0.40	2280	0.26	OK	xsec 1-3, traffic
4	1900	3	0.70	3990	0.43	OK	xsec 4-5, traffic
5	1900	2	0.50	1900	0.59	OK	xsec 4-5, traffic

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	35	796	31.5	traffic, layout
2	35	371	31.5	traffic, layout
3	35	434	31.5	traffic, layout
4	35	275	24.5	traffic, layout
5	35	1304	14.0	traffic, layout
Total/Ave.	35.0	3180	20.5	

4. Compute Stops & % Left Lane

Segment & Downstream Signal	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	0.13	n	3	traffic
2	5.55	y	3	traffic
3	5.96	y	3	traffic
4	6.34	y	3	traffic
5	2.83	y	3	traffic
Total/Ave	3.20	0.00	3.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weight. Ave.	Auto LOS
1	23.2%	41.1%	20.3%	8.9%	4.2%	2.3%	2.37	B
2	7.1%	24.3%	26.9%	20.3%	13.1%	8.3%	3.33	C
3	6.5%	22.7%	26.5%	21.0%	14.1%	9.1%	3.41	C
4	5.9%	21.4%	26.1%	21.7%	15.0%	10.0%	3.48	C
5	13.3%	34.4%	25.9%	14.4%	7.7%	4.4%	2.82	C
Average	12.2%	33.1%	26.3%	15.3%	8.3%	4.8%	2.89	C

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Pedestrian LOS

Street: **RAILROAD AVE**

1. Compute Pedestrian Density LOS

Seg.	Sidewalk Width (ft)	Ped Flow (pph)	Ped. Density LOS #	Ped. Density LOS	from
1	5	0	0.00	A	xsec1-3
2	5	0	0.00	A	xsec1-3
3	5	0	0.00	A	xsec1-3
4	5	0	0.00	A	xsec4-5
5	5	0	0.00	A	xsec4-5

Density LOS Lookup	
Ped/hr/ft	LOS
0	A
300	B
420	C
600	D
900	E
1380	F

2. Compute Pedestrian Segment LOS

Seg.	Outside Lane (ft)	Bike Ln + Park/Shldr (ft)	On-Street Parking Occ (%)	Barrier (ft/Tree)	Buffer Width (ft)	Dir. Traffic Volume (vph)	Traf. Lanes One-Dir (lanes)	Midblock Veh. Speed (mph)	Ped. Seg. LOS #	from
1	0	7	0%	30	5	733	2	33.3	2.65	xsec1-3
2	0	8	0%	0	0	1,035	2	33.3	3.78	xsec1-3
3	12	8	0%	0	0	599	3	33.3	2.43	xsec1-3
4	12	8	0%	0	0	1,705	3	29.8	3.27	xsec4-5
5	0	14	0%	0	0	1,130	2	24.5	3.34	xsec4-5

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with intersection delay.

3. Compute Pedestrian Intersection LOS

Downstream Signal	RTOR+ Perm LT (vph)	X-Street Volume (vph)	X-Street PHF (#)	X-Street Speed (mph)	X-Street Lanes (#)	Ave Ped. Wait At Signal (sec)	Right Turn Channel Islands (#)	Ped. Intersect LOS #	from
1	312	307	0.91	30	4	24.0	0	2.86	layout, traffic
2	667	426	0.83	30	3	22.5	1	3.32	layout, traffic
3	0	1820	0.88	35	3	27.2	0	4.39	layout, traffic
4	111	384	0.92	35	3	25.6	0	2.68	layout, traffic
5	340	1978	0.92	35	5	32.0	0	5.05	layout, traffic

Pedestrian Delay computed per Chapter 18 method (eqn 18-5, HCM 2000).

4. Compute Roadway Crossing Difficulty Factor (RCDF)

Seg.	Signal Spacing (ft)	Cross St. Ped Wait (secs/cycle)	Divert Delay (sec)	Arterial X Distance (ft)	Midblock Veh Speed (mph)	Vehicle Vol 2-Dir (vph)	Wait To X (max=900) (sec)	Is J-Walking Allowed? (Yes/No)	from
1	796	20.3	162	68	33.3	733	389	YES	layout, traffic
2	371	12.1	77	70	33.3	1,035	900	YES	layout, traffic
3	434	16.9	91	104	33.3	599	900	YES	layout, traffic
4	275	16.9	61	98	29.8	1,705	900	YES	layout, traffic
5	1304	27.4	262	79	24.5	1,130	900	YES	layout, traffic

5. Compute Pedestrian Facility LOS

Segment & Downstream Signal	Min. Wait,Divert (sec)	Crossing LOS (#)	No Cross LOS (#)	RCDF (#)	Ped. NDLOS (#)	Ped. Density LOS #	Ped. Fac. LOS (#)	Ped. Facility LOS
1	162	6.00	3.08	1.20	3.69	0.00	3.69	E
2	77	6.00	3.54	1.20	4.25	0.00	4.25	E
3	91	6.00	3.34	1.20	4.01	0.00	4.01	E
4	61	6.00	3.24	1.20	3.88	0.00	3.88	E
5	262	6.00	3.78	1.20	4.53	0.00	4.53	F
Average							4.16	E

C. Compute Transit LOS

Street: **RAILROAD AVE**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	2	96%	0%	0%	0.64	no	transit
2	2	96%	0%	0%	0.64	no	transit
3	2	96%	0%	0%	0.64	no	transit
4	2	96%	0%	0%	0.64	no	transit
5	2	96%	0%	100%	0.64	no	transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus (mph)	from
1	796	31.5	1	13.0	transit
2	371	31.5	0	13.0	transit
3	434	31.5	0	13.0	transit
4	275	24.5	0	13.0	transit
5	1304	14.0	1	13.0	transit
Total/Ave	3180	20.5		13.0	

3. Compute Transit Perceived Travel Time and Headway Factors

Segment	a1 factor	IVTTR min/mi	EWTTR min/mi	ATR min/mi	PTTR	Fptt	Fh
1	1.00	4.62	0.01	0.00	4.63	1.11	1.97
2	1.00	4.62	0.01	0.00	4.63	1.11	1.97
3	1.00	4.62	0.01	0.00	4.63	1.11	1.97
4	1.00	4.62	0.01	0.00	4.63	1.11	1.97
5	1.00	4.62	0.01	0.03	4.60	1.11	1.97

IVTTR = In-Vehicle Travel Time Rate
EWTTR = Equivalent Wait Travel Time Rate
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor

4. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	2.19	3.69	3.27	C
2	2.19	4.25	3.36	C
3	2.19	4.01	3.32	C
4	2.19	3.88	3.30	C
5	2.19	4.53	3.39	C
Average			3.34	C

D. Compute Bicycle LOS

Street: **RAILROAD AVE**

1. Geometric Input Data

Segment & Downstream Signal	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Sig. Int Cross-Dist (ft)	Unsig.Conf Per Mile (conf/mi)	from
1	0	7	2	D	65	13.3	xsec1-3, layout
2	0	8	2	D	36	0.0	xsec1-3, layout
3	12	8	3	D	52	0.0	xsec1-3, layout
4	12	8	3	D	48	0.0	xsec4-5, layout
5	0	14	2	D	57	24.3	xsec4-5, layout

2. Performance and Other Input Data

Segment & Downstream Signal	Traffic Volume (vph)	Heavy Vehicle (%)	Midblock Traffic Spd (mph)	On-Street Parking (%)	Pavement Rating (#)	from
1	733	2%	33.3	0%	5.0	traffic, xsec1-3
2	1035	2%	33.3	0%	5.0	traffic, xsec1-3
3	599	2%	33.3	0%	5.0	traffic, xsec1-3
4	1705	2%	29.8	0%	5.0	traffic, xsec4-5
5	1130	2%	24.5	0%	5.0	traffic, xsec4-5

Pavement Rating: 1=Poor, 5=Excellent

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with inte

3. Compute Bicycle LOS

Segment & Downstream Signal	Prelim. Eff. Width (Wv)	Effective Width (We)	Speed Factor (#)	Segment LOS (#)	Intersect LOS (#)	Bicycle Score (#)	Bicycle LOS
1	7.0	14.0	3.70	3.50	4.32	4.70	F
2	8.0	16.0	3.70	3.42	4.05	4.03	E
3	20.0	28.0	3.70	0.27	1.03	2.92	D
4	20.0	28.0	3.36	0.68	1.65	3.02	D
5	14.0	28.0	2.49	0.42	3.07	4.00	E
Average						3.95	E

E. LOS Summary

Title: RAILROAD AVE

Direction =	Down	SB

Date: Analyst:

Segment & Downstream Signal	Auto Stops LOS #1	Auto Speed LOS #2	Auto HCM LOS #3	Auto NCHRP 379 LOS #4	Transit LOS	Bicycle LOS	Pedestrian LOS
1	B	A	A	A	C	F	E
2	C	A	A	A	C	E	E
3	C	A	A	A	C	D	E
4	C	B	B	B	C	D	E
5	C	C	D	D	C	E	F
Facility	C	B	C	C	C	E	E

Auto Performance Measures Summary SB

Seg+Sig	Stops	FFS	Speed	%FFS
1	0.13	35.0	31.5	90.0%
2	5.55	35.0	31.5	90.0%
3	5.96	35.0	31.5	90.0%
4	6.34	35.0	24.5	70.0%
5	2.83	35.0	14.0	40.0%
Facility	3.20	35.0	20.5	58.5%

Spreadsheet created by: R.Dowling of Dowling Associates, Inc.
Under contract to:
Transportation Research Board
NCHRP 3-70 Multimodal Level of Service For Urban Streets

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Created: 8-Jun-07 Updated: 25-Sep-08

Multimodal Level of Service for Urban Streets

Diagram of Uban Street

Street: E LELAND RD

Date:

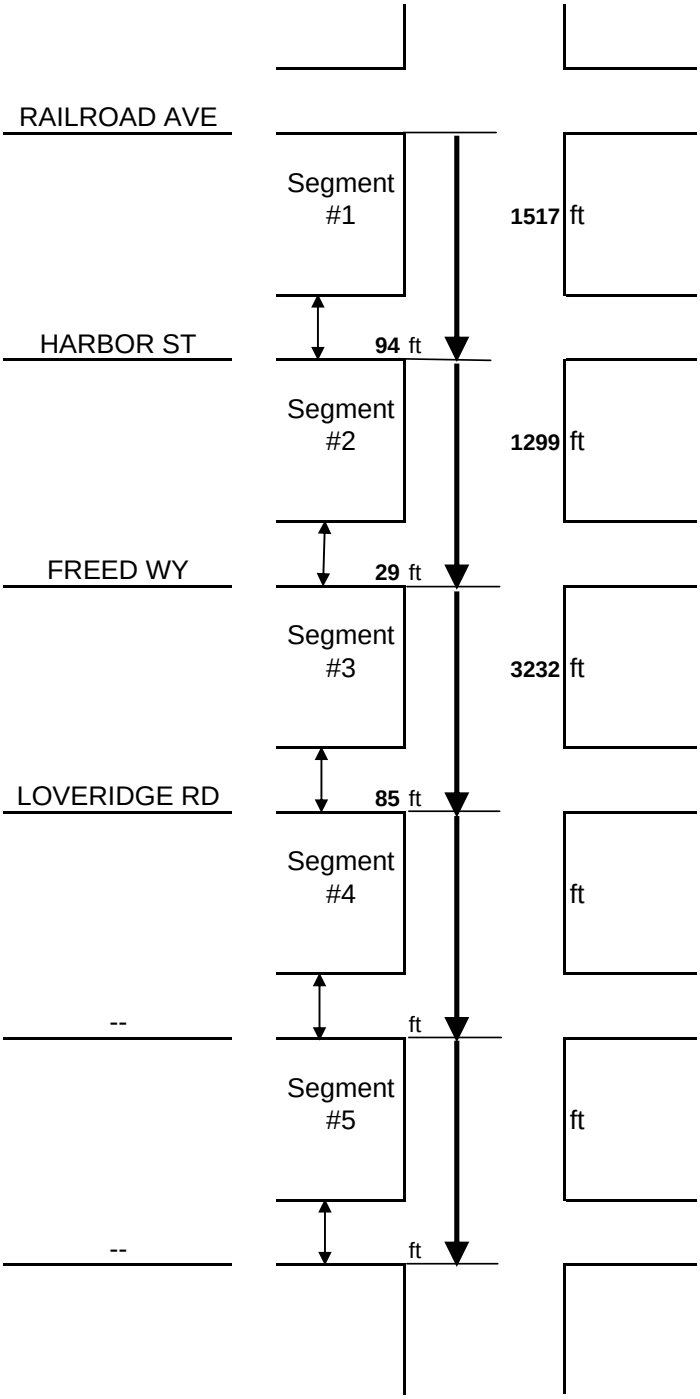
Limits: FROM RAILROAD AVE TO LOVERIDGE RD

Observer:

Analysis Direction:	EB

(NB, SB, EB, WB)
(NW, SE, NE, SW)

Data Entry Fields in Red



Intersect. Control	X-Street Lanes	X-Street Speed	X-Street 2-W vph	Right Turn Isl.
SIGNAL	5	35	1900	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	2	35	81	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	5	35	1967	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: E LELAND RD

Limits: FROM RAILROAD AVI

Observer: 0

Cross-Section #1
From: RAILROAD AVE To: HARBOR ST

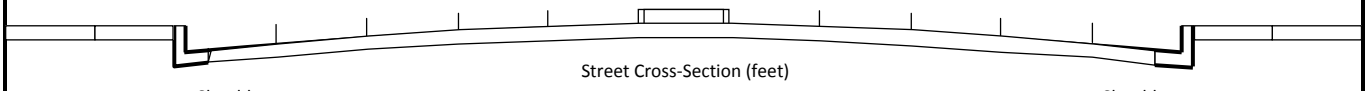
1

Ft/Trees	% Occ.
0	0%

EB

Pavement Cond:	5
Jay-Walking Legal:	no

WB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
10	0	0	8	0	12	12	15	12	12	0	8	0	0	5

Ped Vol: 0

Cross-Section #2
From: HARBOR ST To: FREED WY

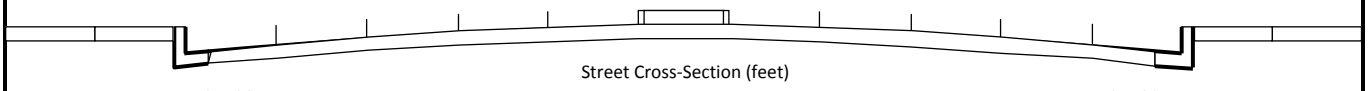
2

Ft/Trees	% Occ.
0	0%

EB

Pavement Cond:	5
Jay-Walking Legal:	no

WB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	0	8	0	12	12	15	12	12	0	8	0	0	5

0

Cross-Section #3
From: FREED WY To: LOVERIDGE RD

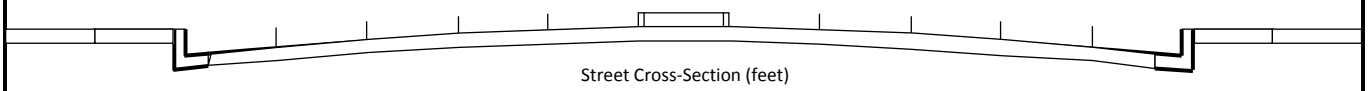
3

Ft/Trees	% Occ.
0	0

EB

Pavement Cond:	5
Jay-Walking Legal:	no

WB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	0	8	0	12	12	15	12	12	0	8	0	0	5

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: E LELAND RD

Limits: FROM RAILROAD AVI

Cross-Section #4

Observer: 0

From: LOVERIDGE RD To: --

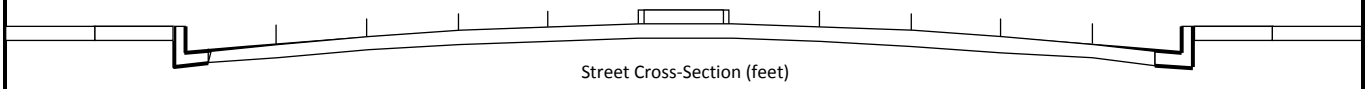
4

Ft/Trees	% Occ.

EB

Pavement Cond:	
Jay-Walking Legal:	

WB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Cross-Section #5

From: -- To: --

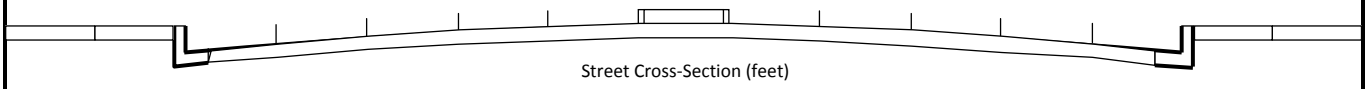
5

Ft/Trees	% Occ.

EB

Pavement Cond:	
Jay-Walking Legal:	

WB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Urban Street Multimodal Level of Service
Data Collection Sheet - Vehicle Traffic

Direction: **EB**

Street: E LELAND RD Date: 0-Jan-00

Limits: M RAILROAD AVE TO LOVERIDG Observer: 0

Field Survey

	Segment And Downstream Signal		Speed Limit	Median Type	Left Turn Pocket	Drivewys Rightside	Unsig. Intersects
	From	To	(mph)	(0-3)	(y/n)	(#)	(#)
1	RAILROAD AVI	HARBOR ST	35	3	yes	9	
2	HARBOR ST	FREED WY	35	3	yes	2	
3	FREED WY	OVERIDGE RI	35	3	yes	7	
4	OVERIDGE RI	--					
5	--	--					

Traffic Counts K: 100 D: 100

	Segment And Downstream Signal		Vol	Heavy Vehicle	RTOR+ PermLeft	Left/Right Turns	Thru Adj. Sat.	PHF
	From	To	(1-wy)	(%)	veh	%	(vphgl)	
1	RAILROAD AVI	HARBOR ST	1278	2%	384	0%	1900	0.92
2	HARBOR ST	FREED WY	1616	2%	31	0%	1900	0.92
3	FREED WY	OVERIDGE RI	1441	2%	396	0%	1900	0.92
4	OVERIDGE RI	--						
5	--	--						

Arterial Traffic Performance & Signal Timing

	Segment And Downstream Signal		Field Survey		Signal Timing Data			
			Mean Speed	Average Stops	Cycle Length	Grn/Cycle for Thru	Ped Walk	Xing Ped Walk
	From	To	(mph)	(#/veh)	(secs)	(%)	(sec/cyc)	(sec/cyc)
1	RAILROAD AVI	HARBOR ST	31.5	0.4	100.0	40%	27.0	25.0
2	HARBOR ST	FREED WY	31.5	0.01	100.0	100%	0.0	0.0
3	FREED WY	OVERIDGE RI	31.5	0.6	100.0	30%	26.0	29.0
4	OVERIDGE RI	--	0.0					
5	--	--	0.0					

Notes: Median = 0 if None, 1 if one-way st., 2 if Painted or TWLTL, 3 if Raised
Heavy Vehicles = Buses plus trucks plus recreational vehicles
Thru Adusted Saturation Flow rates computed per Signalized Intersections Chapter, HC
Signal data is at the downstream signal

Urban Street Multimodal Level of Service
Data Collection Sheet - Transit

Direction: **EB**

Street: E LELAND RD

Date: 0-Jan-00

Limits: FROM RAILROAD AVE TO LOVERIDGE RD

Observer: 0

Field Survey

Segment			Bus Stop	Shelters	Benches	CBD
	From	To	(#)	(% stops)	(% stops)	(yes/no)
1	RAILROAD AVI	HARBOR ST	1	1	1	no
2	HARBOR ST	FREED WY	2	0	0.5	no
3	FREED WY	OVERIDGE RI	2	0	0.5	no
4	OVERIDGE RI	--				
5	--	--				

Transit Performance Data

Segment			Route	Frequency	Load Factor	On-Time Perform.	Schedule Speed
	From	To	#'s	(bus/hr)	(pas/seat)	(%)	(mph)
1	RAILROAD AVI	HARBOR ST	380-E	2	0.64	0.962	13
			390-E	2	0.45	0.962	20
2	HARBOR ST	FREED WY	387-E	1	0.57	0.962	13
			391-E	2	0.55	0.962	23
			390-E	2	0.45	0.962	20
3	FREED WY	OVERIDGE RI	387-E	1	0.57	0.962	13
			391-E	3	0.55	0.962	23
			390-E	2	0.45	0.962	20
4	OVERIDGE RI	--					
5	--	--					

Bus is On-Time if arrives within: 5 minutes of scheduled time.
Average Passenger Trip Length: 6.4 miles

Street: **E LELAND RD**

Direction=	Down	EB

1. Compute Eastbound Hourly Demand (v)

Segment & Downstream Signal	AADT (vpd)	Peak Factor K (#)	Dir. Factor D (#)	Pk.Hr.Fac. PHF (#)	Thru Traffic (%)	Demand v (vph)	from:
1	1278	1.000	1.00	0.92	100%	1278	traffic
2	1616	1.000	1.00	0.92	100%	1616	traffic
3	1441	1.000	1.00	0.92	100%	1441	traffic
4	0	1.000	1.00	0	100%	0	traffic
5	0	1.000	1.00	0	100%	0	traffic

2. Compute Eastbound Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1900	2	0.40	1520	0.84	OK	xsec 1-3, traffic
2	1900	2	1.00	3800	0.43	OK	xsec 1-3, traffic
3	1900	2	0.30	1140	1.26	Over Cap.	xsec 1-3, traffic
4	0	0	0.00	1	0.00	OK	xsec 4-5, traffic
5	0	0	0.00	1	0.00	OK	xsec 4-5, traffic

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	35	1517	31.5	traffic, layout
2	35	1299	31.5	traffic, layout
3	35	3232	31.5	traffic, layout
4	0	0	0	traffic, layout
5	0	0	0	traffic, layout
Total/Ave.	35.0	6048	31.5	

4. Compute Stops & % Left Lane

Segment & Downstream Signal	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	1.36	yes	3	traffic
2	0.04	yes	3	traffic
3	0.96	yes	3	traffic
4	#DIV/0!	0	0	traffic
5	#DIV/0!	0	0	traffic
Total/Ave	0.86	1.00	3.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weight. Ave.	Auto LOS
1	23.8%	41.3%	20.0%	8.7%	4.1%	2.2%	2.34	B
2	30.4%	41.8%	16.6%	6.6%	3.0%	1.6%	2.15	B
3	25.7%	41.6%	19.0%	8.0%	3.7%	2.0%	2.28	F (v/c>1)
4	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average	26.2%	41.7%	18.7%	7.9%	3.6%	1.9%	2.27	F (v/c>1)

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Pedestrian LOS

Street: **E LELAND RD**

1. Compute Pedestrian Density LOS

Seg.	Sidewalk Width (ft)	Ped Flow (pph)	Ped. Density LOS #	Ped. Density LOS	
1	10	0	0.00	A	from xsec1-3
2	5	0	0.00	A	from xsec1-3
3	5	0	0.00	A	from xsec1-3
4	0	0	N/A	N/A	from xsec4-5
5	0	0	N/A	N/A	from xsec4-5

Density LOS Lookup	
Ped/hr/ft	LOS
0	A
300	B
420	C
600	D
900	E
1380	F

2. Compute Pedestrian Segment LOS

Seg.	Outside Lane (ft)	Bike Ln + Park/Shldr (ft)	On-Street Parking Occ (%)	Barrier (ft/Tree)	Buffer Width (ft)	Dir. Traffic Volume (vph)	Traf. Lanes One-Dir (lanes)	Midblock Veh. Speed (mph)	Ped. Seg. LOS #	
1	0	8	0%	0	0	1,278	2	33.3	3.68	from xsec1-3
2	0	8	0%	0	0	1,616	2	33.3	4.39	from xsec1-3
3	0	8	0%	0	0	1,441	2	33.3	4.16	from xsec1-3
4	0	0	0%	0	0	0	0	0.0	#NUM!	from xsec4-5
5	0	0	0%	0	0	0	0	0.0	#NUM!	from xsec4-5

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with intersection delay.

3. Compute Pedestrian Intersection LOS

Downstream Signal	RTOR+ Perm LT (vph)	X-Street Volume (vph)	X-Street PHF (#)	X-Street Speed (mph)	X-Street Lanes (#)	Ave Ped. Wait At Signal (sec)	Right Turn Channel Islands (#)	Ped. Intersect LOS #	
1	384	1900	0.92	35	5	26.6	0	5.01	from layout, traffic
2	31	81	0.92	35	2	50.0	0	2.18	from layout, traffic
3	396	1967	0.92	35	5	27.4	0	5.11	from layout, traffic
4	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	from layout, traffic
5	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	from layout, traffic

Pedestrian Delay computed per Chapter 18 method (eqn 18-5, HCM 2000).

4. Compute Roadway Crossing Difficulty Factor (RCDF)

Seg.	Signal Spacing (ft)	Cross St. Ped Wait (secs/cycle)	Divert Delay (sec)	Arterial X Distance (ft)	Midblock Veh Speed (mph)	Vehicle Vol 2-Dir (vph)	Wait To X (max=900) (sec)	Is J-Walking Allowed? (Yes/No)	
1	1517	28.1	303	79	33.3	1,278	900	no	from layout, traffic
2	1299	50.0	272	79	33.3	1,616	900	no	from layout, traffic
3	3232	25.2	628	79	33.3	1,441	900	no	from layout, traffic
4	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	from layout, traffic
5	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	from layout, traffic

5. Compute Pedestrian Facility LOS

Segment & Downstream Signal	Min. Wait,Divert (sec)	Crossing LOS (#)	No Cross LOS (#)	RCDF (#)	Ped. NDLOS (#)	Ped. Density LOS #	Ped. Fac. LOS (#)	Ped. Facility LOS
1	303	6.00	3.88	1.00	3.88	0.00	3.88	E
2	272	6.00	3.48	1.00	3.48	0.00	3.48	D
3	628	6.00	4.06	1.00	4.06	0.00	4.06	E
4	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
5	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
Average							3.89	E

C. Compute Transit LOS

Street: **E LELAND RD**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	4	96%	100%	100%	0.55	no	transit
2	5	96%	0%	50%	0.51	no	transit
3	6	96%	0%	50%	0.52	no	transit
4	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
5	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus (mph)	from
1	1517	31.5	1	16.5	transit
2	1299	31.5	2	19.8	transit
3	3232	31.5	2	20.3	transit
4	0	0	0	#DIV/0!	transit
5	0	0	0	#DIV/0!	transit
Total/Ave	6048	#DIV/0!		#DIV/0!	

3. Compute Transit Perceived Travel Time and Headway Factors

Segment	a1 factor	IVTTR min/mi	EWTTR min/mi	ATR min/mi	PTTR	Fptt	Fh
1	1.00	3.64	0.01	0.23	3.41	1.25	2.83
2	1.00	3.03	0.01	0.02	3.03	1.30	3.04
3	1.00	2.95	0.01	0.02	2.95	1.32	3.19
4	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
5	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00

IVTTR = In-Vehicle Travel Time Rate
EWTTR = Equivalent Wait Travel Time Rate
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor

4. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	3.53	3.88	1.29	A
2	3.97	3.48	0.57	A
3	4.20	4.06	0.30	A
4	#DIV/0!	#NUM!	#DIV/0!	F
5	#DIV/0!	#NUM!	#DIV/0!	F
Average			0.61	A

D. Compute Bicycle LOS

Street: **E LELAND RD**

1. Geometric Input Data

Segment & Downstream Signal	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Sig. Int Cross-Dist (ft)	Unsig.Conf Per Mile (conf/mi)	from
1	0	8	2	D	94	31.3	xsec1-3, layout
2	0	8	2	D	29	8.1	xsec1-3, layout
3	0	8	2	D	85	11.4	xsec1-3, layout
4	0	0	0	UD	0	#DIV/0!	xsec4-5, layout
5	0	0	0	UD	0	#DIV/0!	xsec4-5, layout

2. Performance and Other Input Data

Segment & Downstream Signal	Traffic Volume (vph)	Heavy Vehicle (%)	Midblock Traffic Spd (mph)	On-Street Parking (%)	Pavement Rating (#)	from
1	1278	2%	33.3	0%	5.0	traffic, xsec1-3
2	1616	2%	33.3	0%	5.0	traffic, xsec1-3
3	1441	2%	33.3	0%	5.0	traffic, xsec1-3
4	0	0%	0.0	0%	0.0	traffic, xsec4-5
5	0	0%	0.0	0%	0.0	traffic, xsec4-5

Pavement Rating: 1=Poor, 5=Excellent

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with inte

3. Compute Bicycle LOS

Segment & Downstream Signal	Prelim. Eff. Width (Wv)	Effective Width (We)	Speed Factor (#)	Segment LOS (#)	Intersect LOS (#)	Bicycle Score (#)	Bicycle LOS
1	8.0	16.0	3.70	3.48	5.06	6.23	F
2	8.0	16.0	3.70	3.60	4.38	4.59	F
3	8.0	16.0	3.70	3.54	5.07	5.58	F
4	0.0	0.0	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	0.0	0.0	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average						5.53	F

E. LOS Summary

Title: E LELAND RD

Direction =	Down	EB

Date: Analyst:

Segment & Downstream Signal	Auto Stops LOS #1	Auto Speed LOS #2	Auto HCM LOS #3	Auto NCHRP 379 LOS #4	Transit LOS	Bicycle LOS	Pedestrian LOS
1	B	A	A	A	A	F	E
2	B	A	A	A	A	F	D
3	F (v/c>1)	F (v/c>1)	A	A	A	F	E
4	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
5	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
Facility	F (v/c>1)	#DIV/0!	A	A	A	F	E

Auto Performance Measures Summary EB

Seg+Sig	Stops	FFS	Speed	%FFS
1	1.36	35.0	31.5	90.0%
2	0.04	35.0	31.5	90.0%
3	0.96	35.0	31.5	90.0%
4	#DIV/0!	0.0	0	#DIV/0!
5	#DIV/0!	0.0	0	#DIV/0!
Facility	0.86	35.0	31.5	90.0%

Spreadsheet created by: R.Dowling of Dowling Associates, Inc.
Under contract to:
Transportation Research Board
NCHRP 3-70 Multimodal Level of Service For Urban Streets

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Created: 8-Jun-07 Updated: 25-Sep-08

Multimodal Level of Service for Urban Streets

Diagram of Uban Street

Street: E LELAND RD

Date:

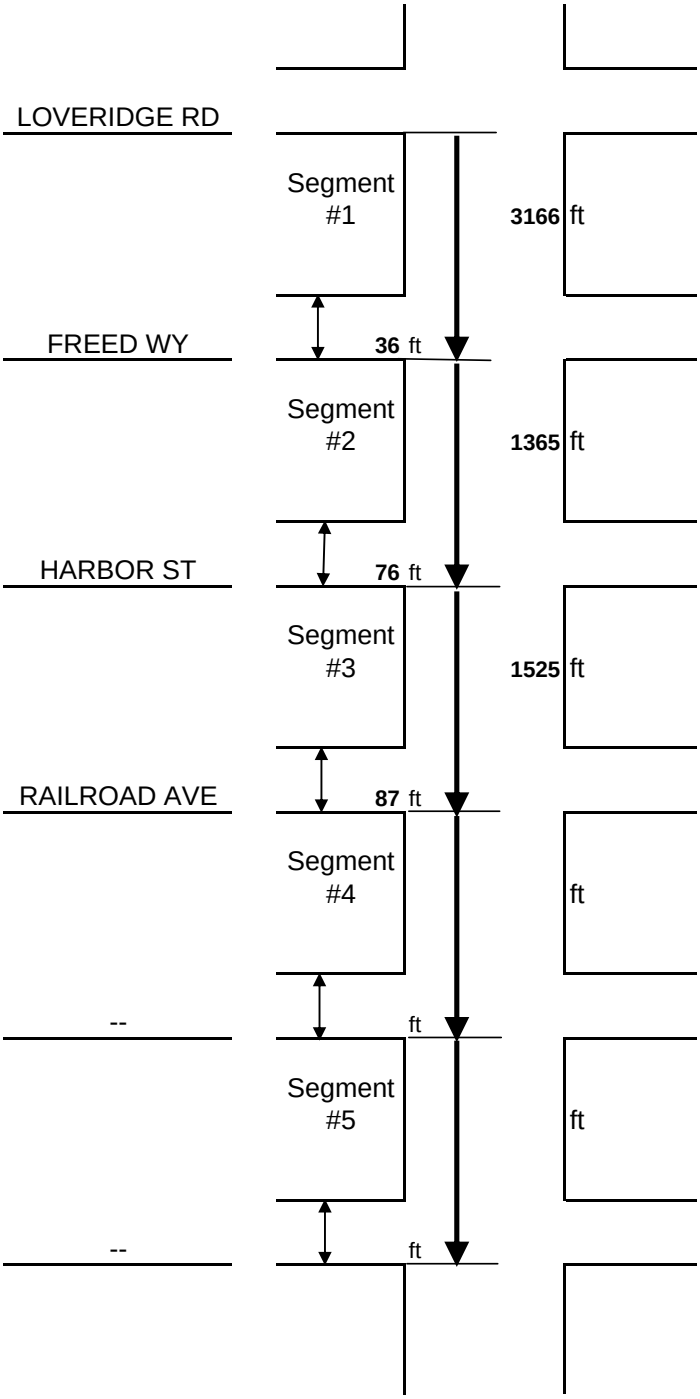
Limits: FROM LOVERIDGE RD TO RAILROAD AVE

Observer:

Analysis Direction:	WB

(NB, SB, EB, WB)
(NW, SE, NE, SW)

Data Entry Fields in Red



Intersect. Control	X-Street Lanes	X-Street Speed	X-Street 2-W vph	Right Turn Isl.
SIGNAL	3	35	81	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	5	35	1900	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	6	35	2279	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: E LELAND RD

Limits: FROM LOVERIDGE R

Cross-Section #1

Observer: 0

From: LOVERIDGE RD To: FREED WY

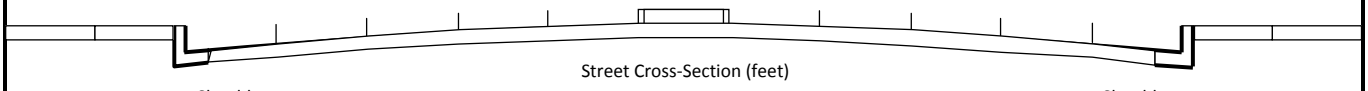
1

Ft/Trees	% Occ.
0	0%

WB

Pavement Cond:	5
Jay-Walking Legal:	no

EB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	0	8	0	12	12	15	12	12	0	8	0	0	5

Ped Vol: 0

Cross-Section #2

From: FREED WY To: HARBOR ST

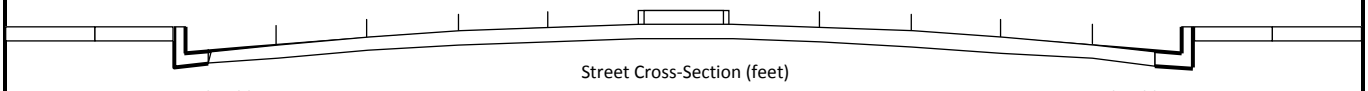
2

Ft/Trees	% Occ.
0	0%

WB

Pavement Cond:	5
Jay-Walking Legal:	no

EB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	0	8	0	12	12	15	12	12	0	8	0	0	5

0

Cross-Section #3

From: HARBOR ST To: RAILROAD AVE

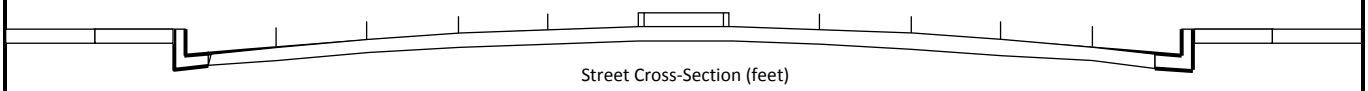
3

Ft/Trees	% Occ.
0	0

WB

Pavement Cond:	5
Jay-Walking Legal:	no

EB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	0	8	0	12	12	15	12	12	0	8	0	0	10

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: E LELAND RD

Limits: FROM LOVERIDGE R

Cross-Section #4

Observer: 0

From: RAILROAD AVE To: --

4

Ft/Trees	% Occ.

WB

Pavement Cond:	
Jay-Walking Legal:	

EB

Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Cross-Section #5

From: -- To: --

5

Ft/Trees	% Occ.

WB

Pavement Cond:	
Jay-Walking Legal:	

EB

Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Urban Street Multimodal Level of Service
Data Collection Sheet - Vehicle Traffic

Direction: **WB**

Street: E LELAND RD Date: 0-Jan-00

Limits: M LOVERIDGE RD TO RAILROAD Observer: 0

Field Survey

	Segment And Downstream Signal		Speed Limit	Median Type	Left Turn Pocket	Drivewys Rightside	Unsig. Intersects
	From	To	(mph)	(0-3)	(y/n)	(#)	(#)
1	OVERIDGE RI	FREED WY	35	3	y	4	
2	FREED WY	HARBOR ST	35	3	y	2	
3	HARBOR ST	RAILROAD AVI	35	3	y	7	
4	RAILROAD AVI	--					
5	--	--					

Traffic Counts K: 100 D: 100

	Segment And Downstream Signal		Vol	Heavy Vehicle	RTOR+ PermLeft	Left/Right Turns	Thru Adj. Sat.	PHF
	From	To	(1-wy)	(%)	veh	%	(vphgl)	
1	OVERIDGE RI	FREED WY	592	2%	39	0%	1900	0.92
2	FREED WY	HARBOR ST	640	2%	223	0%	1900	0.92
3	HARBOR ST	RAILROAD AVI	696	2%	421	0%	1900	0.92
4	RAILROAD AVI	--						
5	--	--						

Arterial Traffic Performance & Signal Timing

	Segment And Downstream Signal		Field Survey		Signal Timing Data			
			Mean Speed	Average Stops	Cycle Length	Grn/Cycle for Thru	Ped Walk	Xing Ped Walk
	From	To	(mph)	(#/veh)	(secs)	(%)	(sec/cyc)	(sec/cyc)
1	OVERIDGE RI	FREED WY	31.5	0.01	100.0	20%	0.0	0.0
2	FREED WY	HARBOR ST	31.5	0.8	100.0	100%	26.0	26.0
3	HARBOR ST	RAILROAD AVI	31.5	3.1	100.0	40%	28.0	20.0
4	RAILROAD AVI	--						
5	--	--						

Notes: Median = 0 if None, 1 if one-way st., 2 if Painted or TWLTL, 3 if Raised
Heavy Vehicles = Buses plus trucks plus recreational vehicles
Thru Adusted Saturation Flow rates computed per Signalized Intersections Chapter, HC
Signal data is at the downstream signal

Urban Street Multimodal Level of Service
Data Collection Sheet - Transit

Direction: **WB**

Street: E LELAND RD Date: 0-Jan-00

Limits: FROM LOVERIDGE RD TO RAILROAD AVE Observer: 0

Field Survey

Segment			Bus Stop	Shelters	Benches	CBD
	From	To	(#)	(% stops)	(% stops)	(yes/no)
1	OVERIDGE RI	FREED WY	3	0	0	no
2	FREED WY	HARBOR ST	0	0	0	no
3	HARBOR ST	RAILROAD AVI	2	0.5	0.5	no
4	RAILROAD AVI	--				
5	--	--				

Transit Performance Data

Segment			Route	Frequency	Load Factor	On-Time Perform.	Schedule Speed
	From	To	#'s	(bus/hr)	(pas/seat)	(%)	(mph)
1	OVERIDGE RI	FREED WY					
			387-W	1	0.43	0.962	21
			391-W	2	0.34	0.962	20
			390-W	2	0.35	0.962	19
2	FREED WY	HARBOR ST					
3	HARBOR ST	RAILROAD AVI					
			380-W	2	0.55	0.962	14
			390-W	2	0.35	0.962	19
4	RAILROAD AVI	--					
5	--	--					

Bus is On-Time if arrives within: 5 minutes of scheduled time.
Average Passenger Trip Length: 6.4 miles

Street: **E LELAND RD**

Direction=	**Down**	**WB**

1. Compute Eastbound Hourly Demand (v)

Segment & Downstream Signal	AADT (vpd)	Peak Factor K (#)	Dir. Factor D (#)	Pk.Hr.Fac. PHF (#)	Thru Traffic (%)	Demand v (vph)	from:
1	592	1.000	1.00	0.92	100%	592	traffic
2	640	1.000	1.00	0.92	100%	640	traffic
3	696	1.000	1.00	0.92	100%	696	traffic
4	0	1.000	1.00	0	100%	0	traffic
5	0	1.000	1.00	0	100%	0	traffic

2. Compute Eastbound Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1900	2	0.20	760	0.78	OK	xsec 1-3, traffic
2	1900	2	1.00	3800	0.17	OK	xsec 1-3, traffic
3	1900	2	0.40	1520	0.46	OK	xsec 1-3, traffic
4	0	0	0.00	1	0.00	OK	xsec 4-5, traffic
5	0	0	0.00	1	0.00	OK	xsec 4-5, traffic

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	35	3166	31.5	traffic, layout
2	35	1365	31.5	traffic, layout
3	35	1525	31.5	traffic, layout
4	0	0	0	traffic, layout
5	0	0	0	traffic, layout
Total/Ave.	35.0	6056	31.5	

4. Compute Stops & % Left Lane

Segment & Downstream Signal	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	0.02	y	3	traffic
2	2.90	y	3	traffic
3	10.73	y	3	traffic
4	#DIV/0!	0	0	traffic
5	#DIV/0!	0	0	traffic
Total/Ave	3.37	1.00	3.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weight. Ave.	Auto LOS
1	23.8%	41.2%	20.0%	8.7%	4.1%	2.2%	2.35	B
2	13.1%	34.2%	26.0%	14.6%	7.8%	4.4%	2.83	C
3	2.0%	9.0%	16.4%	22.4%	25.1%	25.2%	4.35	E
4	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average	15.8%	37.0%	24.5%	12.6%	6.4%	3.6%	2.67	B

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Pedestrian LOS

Street: **E LELAND RD**

1. Compute Pedestrian Density LOS

Seg.	Sidewalk Width (ft)	Ped Flow (pph)	Ped. Density LOS #	Ped. Density LOS	from
1	5	0	0.00	A	xsec1-3
2	5	0	0.00	A	xsec1-3
3	5	0	0.00	A	xsec1-3
4	0	0	N/A	N/A	xsec4-5
5	0	0	N/A	N/A	xsec4-5

Density LOS Lookup	
Ped/hr/ft	LOS
0	A
300	B
420	C
600	D
900	E
1380	F

2. Compute Pedestrian Segment LOS

Seg.	Outside Lane (ft)	Bike Ln + Park/Shldr (ft)	On-Street Parking Occ (%)	Barrier (ft/Tree)	Buffer Width (ft)	Dir. Traffic Volume (vph)	Traf. Lanes One-Dir (lanes)	Midblock Veh. Speed (mph)	Ped. Seg. LOS #	from
1	0	8	0%	0	0	592	2	33.3	3.06	xsec1-3
2	0	8	0%	0	0	640	2	33.3	3.12	xsec1-3
3	0	8	0%	0	0	696	2	33.3	3.20	xsec1-3
4	0	0	0%	0	0	0	0	0.0	#NUM!	xsec4-5
5	0	0	0%	0	0	0	0	0.0	#NUM!	xsec4-5

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with intersection delay.

3. Compute Pedestrian Intersection LOS

Downstream Signal	RTOR+ Perm LT (vph)	X-Street Volume (vph)	X-Street PHF (#)	X-Street Speed (mph)	X-Street Lanes (#)	Ave Ped. Wait At Signal (sec)	Right Turn Channel Islands (#)	Ped. Intersect LOS #	from
1	39	81	0.92	35	3	50.0	0	2.22	layout, traffic
2	223	1900	0.92	35	5	27.4	0	4.76	layout, traffic
3	421	2279	0.92	35	6	25.9	0	5.55	layout, traffic
4	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
5	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic

Pedestrian Delay computed per Chapter 18 method (eqn 18-5, HCM 2000).

4. Compute Roadway Crossing Difficulty Factor (RCDF)

Seg.	Signal Spacing (ft)	Cross St. Ped Wait (secs/cycle)	Divert Delay (sec)	Arterial X Distance (ft)	Midblock Veh Speed (mph)	Vehicle Vol 2-Dir (vph)	Wait To X (max=900) (sec)	Is J-Walking Allowed? (Yes/No)	from
1	3166	50.0	628	79	33.3	592	336	no	layout, traffic
2	1365	27.4	274	79	33.3	640	443	no	layout, traffic
3	1525	32.0	306	79	33.3	696	612	no	layout, traffic
4	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
5	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic

5. Compute Pedestrian Facility LOS

Segment & Downstream Signal	Min. Wait,Divert (sec)	Crossing LOS (#)	No Cross LOS (#)	RCDF (#)	Ped. NDLOS (#)	Ped. Density LOS #	Ped. Fac. LOS (#)	Ped. Facility LOS
1	336	6.00	3.07	1.00	3.07	0.00	3.07	D
2	274	6.00	3.65	1.00	3.65	0.00	3.65	E
3	306	6.00	3.84	1.00	3.84	0.00	3.84	E
4	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
5	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
Average							3.39	D

C. Compute Transit LOS

Street: **E LELAND RD**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	5	96%	0%	0%	0.36	no	transit
2	0	#DIV/0!	0%	0%	#DIV/0!	no	transit
3	4	96%	50%	50%	0.45	no	transit
4	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
5	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus (mph)	from
1	3166	31.5	3	19.8	transit
2	1365	31.5	0	#DIV/0!	transit
3	1525	31.5	2	16.5	transit
4	0	0	0	#DIV/0!	transit
5	0	0	0	#DIV/0!	transit
Total/Ave	6056	#DIV/0!		#DIV/0!	

3. Compute Transit Perceived Travel Time and Headway Factors

Segment	a1 factor	IVTTR min/mi	EWTTR min/mi	ATR min/mi	PTTR	Fptt	Fh
1	1.00	3.03	0.01	0.00	3.04	1.30	3.04
2	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
3	1.00	3.64	0.01	0.12	3.53	1.23	2.83
4	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
5	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00

IVTTR = In-Vehicle Travel Time Rate
EWTTR = Equivalent Wait Travel Time Rate
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor

4. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	3.96	3.07	0.52	A
2	#DIV/0!	3.65	#DIV/0!	F
3	3.49	3.84	1.35	A
4	#DIV/0!	#NUM!	#DIV/0!	F
5	#DIV/0!	#NUM!	#DIV/0!	F
Average			2.28	B

D. Compute Bicycle LOS

Street: **E LELAND RD**

1. Geometric Input Data

Segment & Downstream Signal	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Sig. Int Cross-Dist (ft)	Unsig.Conf Per Mile (conf/mi)	from
1	0	8	2	D	36	6.7	xsec1-3, layout
2	0	8	2	D	76	7.7	xsec1-3, layout
3	0	8	2	D	87	24.2	xsec1-3, layout
4	0	0	0	UD	0	#DIV/0!	xsec4-5, layout
5	0	0	0	UD	0	#DIV/0!	xsec4-5, layout

2. Performance and Other Input Data

Segment & Downstream Signal	Traffic Volume (vph)	Heavy Vehicle (%)	Midblock Traffic Spd (mph)	On-Street Parking (%)	Pavement Rating (#)	from
1	592	2%	33.3	0%	5.0	traffic, xsec1-3
2	640	2%	33.3	0%	5.0	traffic, xsec1-3
3	696	2%	33.3	0%	5.0	traffic, xsec1-3
4	0	0%	0.0	0%	0.0	traffic, xsec4-5
5	0	0%	0.0	0%	0.0	traffic, xsec4-5

Pavement Rating: 1=Poor, 5=Excellent

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with inte

3. Compute Bicycle LOS

Segment & Downstream Signal	Prelim. Eff. Width (Wv)	Effective Width (We)	Speed Factor (#)	Segment LOS (#)	Intersect LOS (#)	Bicycle Score (#)	Bicycle LOS
1	8.0	16.0	3.70	3.09	3.53	3.95	E
2	8.0	16.0	3.70	3.13	4.18	4.34	F
3	8.0	16.0	3.70	3.17	4.40	5.10	F
4	0.0	0.0	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	0.0	0.0	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average						4.33	F

E. LOS Summary

Title: E LELAND RD

Direction =	Down	WB

Date: Analyst:

Segment & Downstream Signal	Auto Stops LOS #1	Auto Speed LOS #2	Auto HCM LOS #3	Auto NCHRP 379 LOS #4	Transit LOS	Bicycle LOS	Pedestrian LOS
1	B	A	A	A	A	E	D
2	C	A	A	A	F	F	E
3	E	A	A	A	A	F	E
4	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
5	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
Facility	B	#DIV/0!	A	A	B	F	D

Auto Performance Measures Summary WB

Seg+Sig	Stops	FFS	Speed	%FFS
1	0.02	35.0	31.5	90.0%
2	2.90	35.0	31.5	90.0%
3	10.73	35.0	31.5	90.0%
4	#DIV/0!	0.0	0	#DIV/0!
5	#DIV/0!	0.0	0	#DIV/0!
Facility	3.37	35.0	31.5	90.0%

Spreadsheet created by: R.Dowling of Dowling Associates, Inc.
Under contract to:
Transportation Research Board
NCHRP 3-70 Multimodal Level of Service For Urban Streets

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Created: 8-Jun-07 Updated: 25-Sep-08

Multimodal Level of Service for Urban Streets

Diagram of Uban Street

Street: CALIFORNIA AVE

Date:

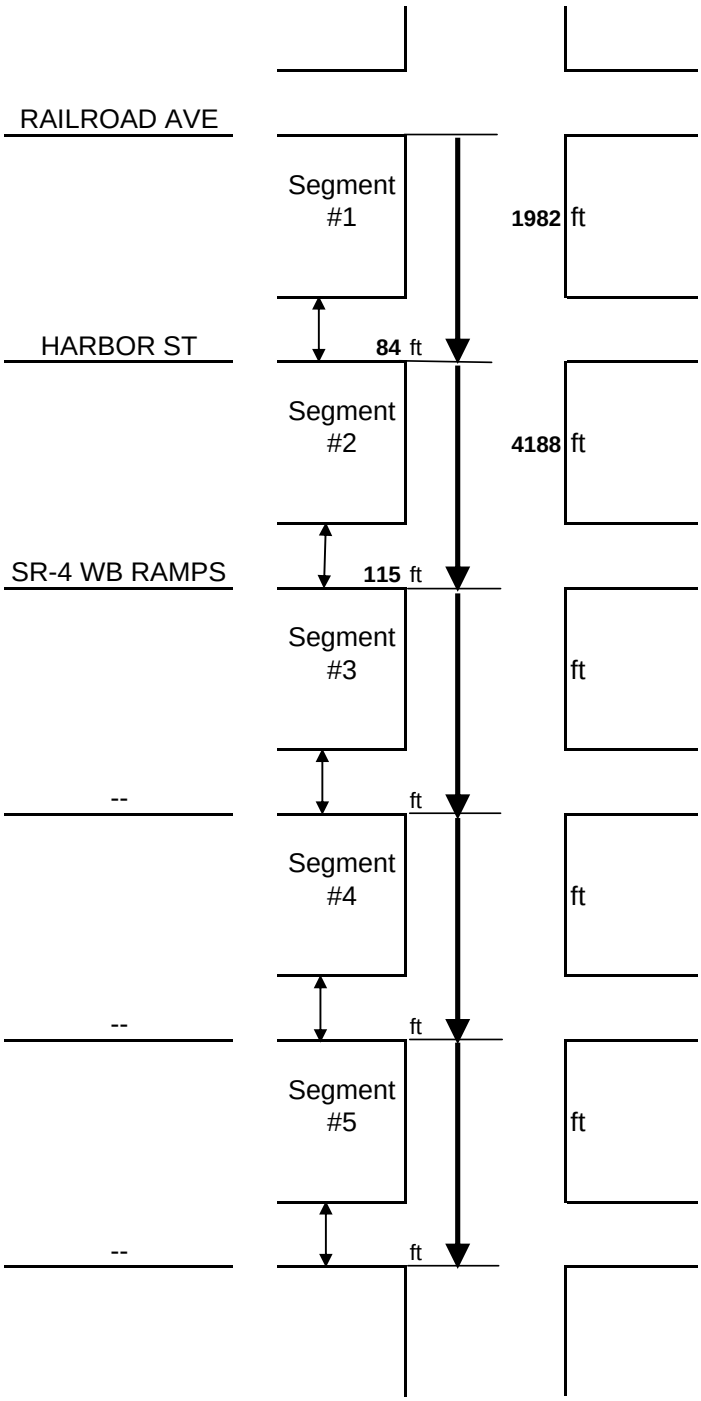
Limits: FROM RAILROAD AVE TO SR-4 WB RAMPS

Observer:

Analysis Direction:	EB

(NB, SB, EB, WB)
(NW, SE, NE, SW)

Data Entry Fields in Red



Intersect. Control	X-Street Lanes	X-Street Speed	X-Street 2-W vph	Right Turn Isl.
SIGNAL	6	35	1564	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	4	35	770	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Multimodal Level of Service for Urban Streets

Street Cross-Section Data Street: CALIFORNIA AVE Limits: FROM RAILROAD AVE

Cross-Section #1 Observer: 0

From: RAILROAD AVE To: HARBOR ST

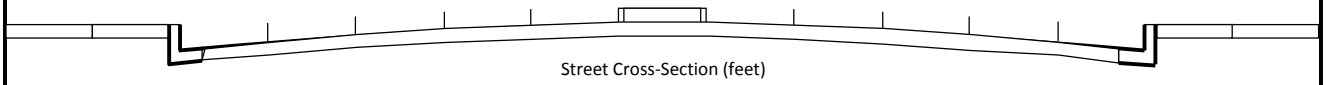
1

Ft/Trees	% Occ.
0	0%

EB

Pavement Cond:	3
Jay-Walking Legal:	no

WB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	6	0	0	0	12	0	12	0	0	0	15	5	5

Ped Vol: 0

Cross-Section #2

From: HARBOR ST To: SR-4 WB RAMPS

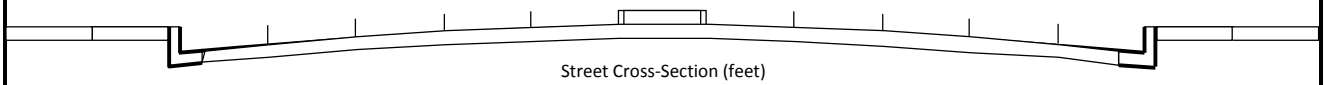
2

Ft/Trees	% Occ.
0	0%

EB

Pavement Cond:	3
Jay-Walking Legal:	no

WB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	6	0	0	12	12	0	12	12	0	0	3	0	5

0

Cross-Section #3

From: SR-4 WB RAMPS To: --

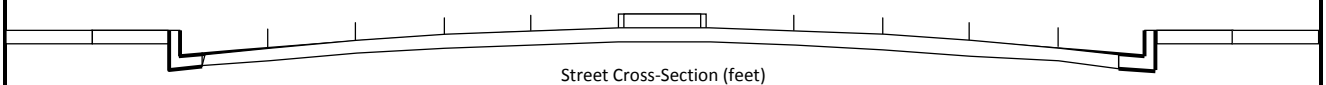
3

Ft/Trees	% Occ.

EB

Pavement Cond:	
Jay-Walking Legal:	

WB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Multimodal Level of Service for Urban Streets

Street Cross-Section Data | Street: CALIFORNIA AVE | Limits: FROM RAILROAD AVE

Cross-Section #4 | Observer: 0

From: -- To: --

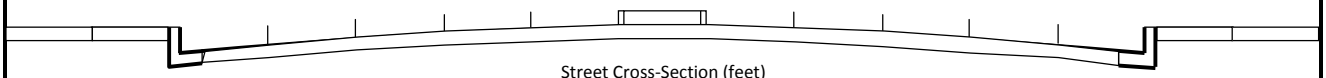
4

Ft/Trees	% Occ.

EB

Pavement Cond:	
Jay-Walking Legal:	

WB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Cross-Section #5

From: -- To: --

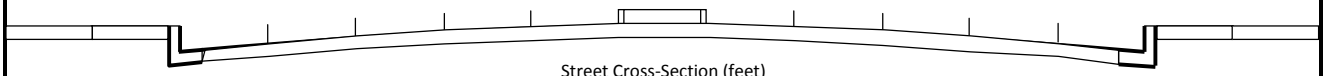
5

Ft/Trees	% Occ.

EB

Pavement Cond:	
Jay-Walking Legal:	

WB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Urban Street Multimodal Level of Service
Data Collection Sheet - Vehicle Traffic

Direction: **EB**

Street: CALIFORNIA AVE Date: 0-Jan-00

Limits: M RAILROAD AVE TO SR-4 WB RA Observer: 0

Field Survey

	Segment And Downstream Signal		Speed Limit	Median Type	Left Turn Pocket	Drivewys Rightside	Unsig. Intersects
	From	To	(mph)	(0-3)	(y/n)	(#)	(#)
1	RAILROAD AVE	HARBOR ST	35	0	y	0	
2	HARBOR ST	R-4 WB RAMP	40	0	y	1	
3	R-4 WB RAMP	--					
4	--	--					
5	--	--					

Traffic Counts K: 100 D: 100

	Segment And Downstream Signal		Vol	Heavy Vehicle	RTOR+ PermLeft	Left/Right Turns	Thru Adj. Sat.	PHF
	From	To	(1-wy)	(%)	veh	%	(vphgl)	
1	RAILROAD AVE	HARBOR ST	369	2%	400	0%	1900	0.92
2	HARBOR ST	R-4 WB RAMP	750	2%	549	0%	1900	0.92
3	R-4 WB RAMP	--						
4	--	--						
5	--	--						

Arterial Traffic Performance & Signal Timing

	Segment And Downstream Signal		Field Survey		Signal Timing Data			
			Mean Speed	Average Stops	Cycle Length	Grn/Cycle for Thru	Ped Walk	Xing Ped Walk
	From	To	(mph)	(#/veh)	(secs)	(%)	(sec/cyc)	(sec/cyc)
1	RAILROAD AVE	HARBOR ST	31.5	0.8	90.0	22%	38.0	17.0
2	HARBOR ST	R-4 WB RAMP	36.0	1.7	90.0	39%	0.0	20.0
3	R-4 WB RAMP	--	0.0					
4	--	--	0.0					
5	--	--	0.0					

Notes: Median = 0 if None, 1 if one-way st., 2 if Painted or TWLTL, 3 if Raised
Heavy Vehicles = Buses plus trucks plus recreational vehicles
Thru Adusted Saturation Flow rates computed per Signalized Intersections Chapter, HC
Signal data is at the downstream signal

Urban Street Multimodal Level of Service
Data Collection Sheet - Transit

Direction: **EB**

Street: CALIFORNIA AVE Date: 0-Jan-00

Limits: FROM RAILROAD AVE TO SR-4 WB RAMPS Observer: 0

Field Survey

Segment			Bus Stop	Shelters	Benches	CBD
	From	To	(#)	(% stops)	(% stops)	(yes/no)
1	RAILROAD AVE	HARBOR ST	0	0	0	no
2	HARBOR ST	R-4 WB RAMP	0	0	0	no
3	R-4 WB RAMP	--				
4	--	--				
5	--	--				

Transit Performance Data

Segment			Route	Frequency	Load Factor	On-Time Perform.	Schedule Speed
	From	To	#'s	(bus/hr)	(pas/seat)	(%)	(mph)
1	RAILROAD AVE	HARBOR ST					
2	HARBOR ST	R-4 WB RAMP					
3	R-4 WB RAMP	--					
4	--	--					
5	--	--					

Bus is On-Time if arrives within: 5 minutes of scheduled time.
Average Passenger Trip Length: 6.4 miles

Street: **CALIFORNIA AVE**

Direction=	**Down**	**EB**

1. Compute Eastbound Hourly Demand (v)

Segment & Downstream Signal	AADT (vpd)	Peak Factor K (#)	Dir. Factor D (#)	Pk.Hr.Fac. PHF (#)	Thru Traffic (%)	Demand v (vph)	from:
1	369	1.000	1.00	0.92	100%	369	traffic
2	750	1.000	1.00	0.92	100%	750	traffic
3	0	1.000	1.00	0	100%	#DIV/0!	traffic
4	0	1.000	1.00	0	100%	#DIV/0!	traffic
5	0	1.000	1.00	0	100%	#DIV/0!	traffic

2. Compute Eastbound Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1900	1	0.22	418	0.88	OK	xsec 1-3, traffic
2	1900	2	0.39	1482	0.51	OK	xsec 1-3, traffic
3	0	0	0.00	1	#DIV/0!	--	xsec 1-3, traffic
4	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic
5	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	35	1982	31.5	traffic, layout
2	40	4188	36.0	traffic, layout
3	0	0	0	traffic, layout
4	0	0	0	traffic, layout
5	0	0	0	traffic, layout
Total/Ave.	38.4	6170	34.4	

4. Compute Stops & % Left Lane

Segment & Downstream Signal	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	2.21	y	0	traffic
2	2.11	y	0	traffic
3	#DIV/0!	0	0	traffic
4	#DIV/0!	0	0	traffic
5	#DIV/0!	0	0	traffic
Total/Ave	2.14	1.00	0.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weight. Ave.	Auto LOS
1	15.2%	36.4%	24.9%	13.0%	6.7%	3.8%	2.71	B
2	15.5%	36.7%	24.7%	12.8%	6.6%	3.7%	2.69	B
3	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average	20.4%	40.0%	21.9%	10.1%	4.9%	2.6%	2.47	B

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Pedestrian LOS

Street: **CALIFORNIA AVE**

1. Compute Pedestrian Density LOS

Seg.	Sidewalk Width (ft)	Ped Flow (pph)	Ped. Density LOS #	Ped. Density LOS	from
1	5	0	0.00	A	xsec1-3
2	5	0	0.00	A	xsec1-3
3	0	0	N/A	N/A	xsec1-3
4	0	0	N/A	N/A	xsec4-5
5	0	0	N/A	N/A	xsec4-5

Density LOS Lookup	
Ped/hr/ft	LOS
0	A
300	B
420	C
600	D
900	E
1380	F

2. Compute Pedestrian Segment LOS

Seg.	Outside Lane (ft)	Bike Ln + Park/Shldr (ft)	On-Street Parking Occ (%)	Barrier (ft/Tree)	Buffer Width (ft)	Dir. Traffic Volume (vph)	Traf. Lanes One-Dir (lanes)	Midblock Veh. Speed (mph)	Ped. Seg. LOS #	from
1	0	6	0%	0	0	369	1	33.3	3.29	xsec1-3
2	0	6	0%	0	0	750	2	38.0	3.49	xsec1-3
3	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec1-3
4	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5
5	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with intersection delay.

3. Compute Pedestrian Intersection LOS

Downstream Signal	RTOR+ Perm LT (vph)	X-Street Volume (vph)	X-Street PHF (#)	X-Street Speed (mph)	X-Street Lanes (#)	Ave Ped. Wait At Signal (sec)	Right Turn Channel Islands (#)	Ped. Intersect LOS #	from
1	400	1564	0.92	35	6	15.0	0	4.61	layout, traffic
2	549	770	0.92	35	4	45.0	0	3.87	layout, traffic
3	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
4	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
5	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic

Pedestrian Delay computed per Chapter 18 method (eqn 18-5, HCM 2000).

4. Compute Roadway Crossing Difficulty Factor (RCDF)

Seg.	Signal Spacing (ft)	Cross St. Ped Wait (secs/cycle)	Divert Delay (sec)	Arterial X Distance (ft)	Midblock Veh Speed (mph)	Vehicle Vol 2-Dir (vph)	Wait To X (max=900) (sec)	Is J-Walking Allowed? (Yes/No)	from
1	1982	29.6	392	45	33.3	369	21	no	layout, traffic
2	4188	27.2	811	57	38.0	750	208	no	layout, traffic
3	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
4	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
5	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic

5. Compute Pedestrian Facility LOS

Segment & Downstream Signal	Min. Wait,Divert (sec)	Crossing LOS (#)	No Cross LOS (#)	RCDF (#)	Ped. NDLOS (#)	Ped. Density LOS #	Ped. Fac. LOS (#)	Ped. Facility LOS
1	21	3.00	3.67	1.00	3.67	0.00	3.67	E
2	208	6.00	3.57	1.00	3.57	0.00	3.57	E
3	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
4	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
5	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
Average							3.60	E

C. Compute Transit LOS

Street: **CALIFORNIA AVE**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	0	#DIV/0!	0%	0%	#DIV/0!	no	transit
2	0	#DIV/0!	0%	0%	#DIV/0!	no	transit
3	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
4	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
5	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus (mph)	from
1	1982	31.5	0	#DIV/0!	transit
2	4188	36.0	0	#DIV/0!	transit
3	0	0	0	#DIV/0!	transit
4	0	0	0	#DIV/0!	transit
5	0	0	0	#DIV/0!	transit
Total/Ave	6170	#DIV/0!		#DIV/0!	

3. Compute Transit Perceived Travel Time and Headway Factors

Segment	a1 factor	IVTTR min/mi	EWTTR min/mi	ATR min/mi	PTTR	Fptt	Fh
1	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
2	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
3	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
4	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
5	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00

IVTTR = In-Vehicle Travel Time Rate
EWTTR = Equivalent Wait Travel Time Rate
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor

4. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	#DIV/0!	3.67	#DIV/0!	F
2	#DIV/0!	3.57	#DIV/0!	F
3	#DIV/0!	#NUM!	#DIV/0!	F
4	#DIV/0!	#NUM!	#DIV/0!	F
5	#DIV/0!	#NUM!	#DIV/0!	F
Average			5.00	F

D. Compute Bicycle LOS

Street: **CALIFORNIA AVE**

1. Geometric Input Data

Segment & Downstream Signal	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Sig. Int Cross-Dist (ft)	Unsig.Conf Per Mile (conf/mi)	from
1	0	6	1	UD	84	0.0	xsec1-3, layout
2	0	6	2	UD	115	1.3	xsec1-3, layout
3	0	0	0	UD	0	#DIV/0!	xsec1-3, layout
4	0	0	0	UD	0	#DIV/0!	xsec4-5, layout
5	0	0	0	UD	0	#DIV/0!	xsec4-5, layout

2. Performance and Other Input Data

Segment & Downstream Signal	Traffic Volume (vph)	Heavy Vehicle (%)	Midblock Traffic Spd (mph)	On-Street Parking (%)	Pavement Rating (#)	from
1	369	2%	33.3	0%	3.0	traffic, xsec1-3
2	750	2%	38.0	0%	3.0	traffic, xsec1-3
3	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec1-3
4	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5
5	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5

Pavement Rating: 1=Poor, 5=Excellent

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with inte

3. Compute Bicycle LOS

Segment & Downstream Signal	Prelim. Eff. Width (Wv)	Effective Width (We)	Speed Factor (#)	Segment LOS (#)	Intersect LOS (#)	Bicycle Score (#)	Bicycle LOS
1	6.0	12.0	3.70	4.26	4.83	4.90	F
2	6.0	12.0	4.05	4.37	5.31	5.82	F
3	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average						5.53	F

E. LOS Summary

Title: CALIFORNIA AVE

Direction =	Down	EB

Date: Analyst:

Segment & Downstream Signal	Auto Stops LOS #1	Auto Speed LOS #2	Auto HCM LOS #3	Auto NCHRP 379 LOS #4	Transit LOS	Bicycle LOS	Pedestrian LOS
1	B	B	A	A	F	F	E
2	B	B	A	A	F	F	E
3	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
4	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
5	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
Facility	B	#DIV/0!	B	A	F	F	E

Auto Performance Measures Summary EB

Seg+Sig	Stops	FFS	Speed	%FFS
1	2.21	35.0	31.5	90.0%
2	2.11	40.0	36.0	90.0%
3	#DIV/0!	0.0	0	#DIV/0!
4	#DIV/0!	0.0	0	#DIV/0!
5	#DIV/0!	0.0	0	#DIV/0!
Facility	2.14	38.4	34.4	89.7%

Spreadsheet created by: R.Dowling of Dowling Associates, Inc.
Under contract to:
Transportation Research Board
NCHRP 3-70 Multimodal Level of Service For Urban Streets

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Spreadsheet does not have data entry error checking.
Created: 8-Jun-07 Updated: 25-Sep-08

Multimodal Level of Service for Urban Streets

Diagram of Uban Street

Street: CALIFORNIA AVE

Date:

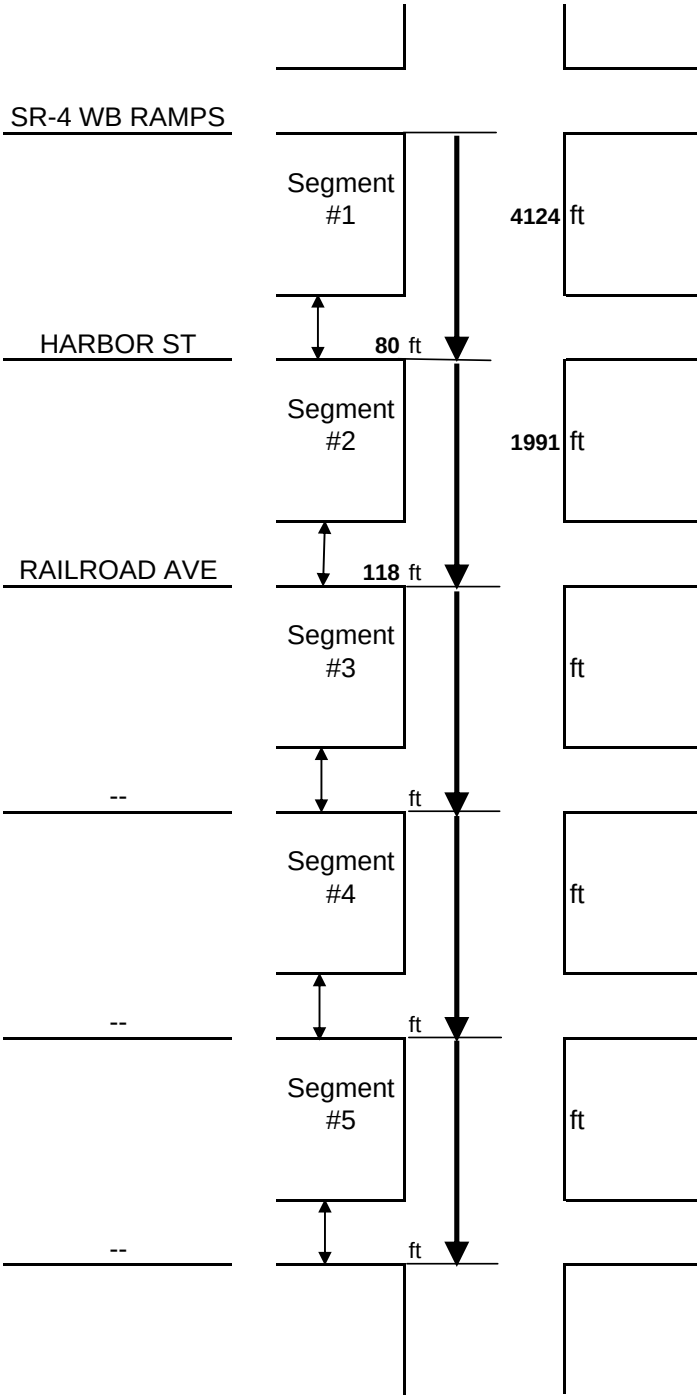
Limits: FROM SR-4 WB RAMPS TO RAILROAD AVE

Observer:

Analysis Direction:	WB

(NB, SB, EB, WB)
(NW, SE, NE, SW)

Data Entry Fields in Red



Intersect. Control	X-Street Lanes	X-Street Speed	X-Street 2-W vph	Right Turn Isl.
SIGNAL	5	35	1564	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	6	35	2515	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: CALIFORNIA AVE

Limits: FROM SR-4 WB RAMP

Observer: 0

Cross-Section #1
From: SR-4 WB RAMPS To: HARBOR ST

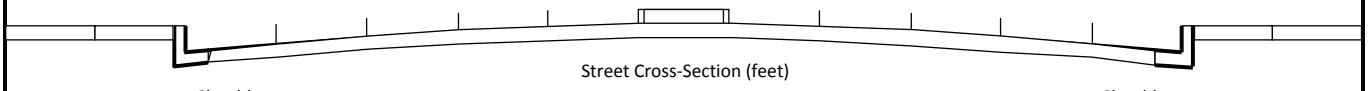
1

Ft/Trees	% Occ.
0	0%

WB

Pavement Cond:	3
Jay-Walking Legal:	no

EB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	3	0	0	12	12	0	12	12	0	0	6	0	5

Ped Vol: 0

Cross-Section #2
From: HARBOR ST To: RAILROAD AVE

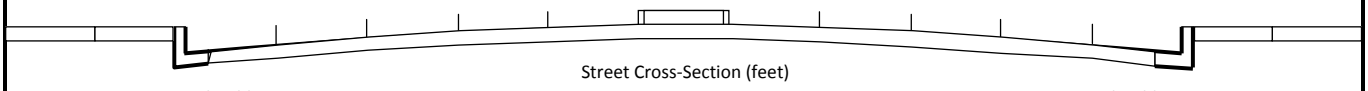
2

Ft/Trees	% Occ.
20	0%

WB

Pavement Cond:	3
Jay-Walking Legal:	no

EB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	5	15	0	0	0	12	0	12	0	0	0	6	0	5

0

Cross-Section #3
From: RAILROAD AVE To: --

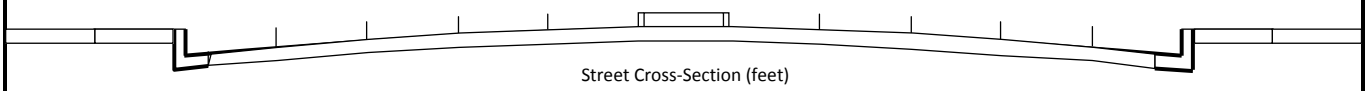
3

Ft/Trees	% Occ.

WB

Pavement Cond:	
Jay-Walking Legal:	

EB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: CALIFORNIA AVE

Limits: FROM SR-4 WB RAMP

Cross-Section #4

Observer: 0

From: -- To: --

4

Ft/Trees	% Occ.

WB

Pavement Cond:	
Jay-Walking Legal:	

EB

Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Cross-Section #5

From: -- To: --

5

Ft/Trees	% Occ.

WB

Pavement Cond:	
Jay-Walking Legal:	

EB

Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Urban Street Multimodal Level of Service
Data Collection Sheet - Vehicle Traffic

Direction: **WB**

Street: CALIFORNIA AVE Date: 0-Jan-00

Limits: M SR-4 WB RAMPS TO RAILROAI Observer: 0

Field Survey

	Segment And Downstream Signal		Speed Limit	Median Type	Left Turn Pocket	Drivewys Rightside	Unsig. Intersects
	From	To	(mph)	(0-3)	(y/n)	(#)	(#)
1	R-4 WB RAMP	HARBOR ST	40	0	y	13	
2	HARBOR ST	RAILROAD AVI	35	0	n	26	
3	RAILROAD AVI	--					
4	--	--					
5	--	--					

Traffic Counts K: 100 D: 100

	Segment And Downstream Signal		Vol	Heavy Vehicle	RTOR+ PermLeft	Left/Right Turns	Thru Adj. Sat.	PHF
	From	To	(1-wy)	(%)	veh	%	(vphgl)	
1	R-4 WB RAMP	HARBOR ST	900	2%	242	0%	1900	0.92
2	HARBOR ST	RAILROAD AVI	426	2%	262	0%	1900	0.92
3	RAILROAD AVI	--						
4	--	--						
5	--	--						

Arterial Traffic Performance & Signal Timing

			Field Survey		Signal Timing Data			
	Segment And Downstream Signal		Mean Speed	Average Stops	Cycle Length	Grn/Cycle for Thru	Ped Walk	Xing Ped Walk
	From	To	(mph)	(#/veh)	(secs)	(%)	(sec/cyc)	(sec/cyc)
1	R-4 WB RAMP	HARBOR ST	36.0	0.7	90.0	41%	28.0	14.0
2	HARBOR ST	RAILROAD AVI	31.5	0.6	80.0	14%	37.0	18.0
3	RAILROAD AVI	--						
4	--	--						
5	--	--						

Notes: Median = 0 if None, 1 if one-way st., 2 if Painted or TWLTL, 3 if Raised
Heavy Vehicles = Buses plus trucks plus recreational vehicles
Thru Adusted Saturation Flow rates computed per Signalized Intersections Chapter, HC
Signal data is at the downstream signal

Urban Street Multimodal Level of Service
Data Collection Sheet - Transit

Direction: **WB**

Street: CALIFORNIA AVE Date: 0-Jan-00

Limits: FROM SR-4 WB RAMPS TO RAILROAD AVE Observer: 0

Field Survey

Segment			Bus Stop	Shelters	Benches	CBD
	From	To	(#)	(% stops)	(% stops)	(yes/no)
1	R-4 WB RAMP	HARBOR ST	0	0	0	no
2	HARBOR ST	RAILROAD AVI	0	0	0	no
3	RAILROAD AVI	--				
4	--	--				
5	--	--				

Transit Performance Data

Segment			Route	Frequency	Load Factor	On-Time Perform.	Schedule Speed
	From	To	#'s	(bus/hr)	(pas/seat)	(%)	(mph)
1	R-4 WB RAMP	HARBOR ST					
2	HARBOR ST	RAILROAD AVI					
3	RAILROAD AVI	--					
4	--	--					
5	--	--					

Bus is On-Time if arrives within: 5 minutes of scheduled time.
Average Passenger Trip Length: 6.4 miles

Street: **CALIFORNIA AVE**

Direction=	Down	WB

1. Compute Eastbound Hourly Demand (v)

Segment & Downstream Signal	AADT (vpd)	Peak Factor K (#)	Dir. Factor D (#)	Pk.Hr.Fac. PHF (#)	Thru Traffic (%)	Demand v (vph)	from:
1	900	1.000	1.00	0.92	100%	900	traffic
2	426	1.000	1.00	0.92	100%	426	traffic
3	0	1.000	1.00	0	100%	#DIV/0!	traffic
4	0	1.000	1.00	0	100%	#DIV/0!	traffic
5	0	1.000	1.00	0	100%	#DIV/0!	traffic

2. Compute Eastbound Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1900	1	0.41	779	1.16	Over Cap.	xsec 1-3, traffic
2	1900	2	0.14	532	0.80	OK	xsec 1-3, traffic
3	0	0	0.00	1	#DIV/0!	--	xsec 1-3, traffic
4	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic
5	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	40	4124	36.0	traffic, layout
2	35	1991	31.5	traffic, layout
3	0	0	0	traffic, layout
4	0	0	0	traffic, layout
5	0	0	0	traffic, layout
Total/Ave.	38.4	6115	34.4	

4. Compute Stops & % Left Lane

Segment & Downstream Signal	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	0.93	y	0	traffic
2	1.56	n	0	traffic
3	#DIV/0!	0	0	traffic
4	#DIV/0!	0	0	traffic
5	#DIV/0!	0	0	traffic
Total/Ave	1.14	0.50	0.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weight. Ave.	Auto LOS
1	19.8%	39.7%	22.2%	10.4%	5.1%	2.7%	2.49	F (v/c>1)
2	17.4%	38.3%	23.6%	11.7%	5.8%	3.2%	2.60	B
3	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average	21.8%	40.6%	21.1%	9.5%	4.5%	2.4%	2.42	F (v/c>1)

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Pedestrian LOS

Street: **CALIFORNIA AVE**

1. Compute Pedestrian Density LOS

Seg.	Sidewalk Width (ft)	Ped Flow (pph)	Ped. Density LOS #	Ped. Density LOS	
1	5	0	0.00	A	from xsec1-3
2	5	0	0.00	A	from xsec1-3
3	0	0	N/A	N/A	from xsec1-3
4	0	0	N/A	N/A	from xsec4-5
5	0	0	N/A	N/A	from xsec4-5

Density LOS Lookup	
Ped/hr/ft	LOS
0	A
300	B
420	C
600	D
900	E
1380	F

2. Compute Pedestrian Segment LOS

Seg.	Outside Lane (ft)	Bike Ln + Park/Shldr (ft)	On-Street Parking Occ (%)	Barrier (ft/Tree)	Buffer Width (ft)	Dir. Traffic Volume (vph)	Traf. Lanes One-Dir (lanes)	Midblock Veh. Speed (mph)	Ped. Seg. LOS #	
1	0	15	0%	0	5	900	1	38.0	4.40	from xsec1-3
2	0	3	0%	20	0	426	2	33.3	3.07	from xsec1-3
3	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	from xsec1-3
4	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	from xsec4-5
5	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	from xsec4-5

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with intersection delay.

3. Compute Pedestrian Intersection LOS

Downstream Signal	RTOR+ Perm LT (vph)	X-Street Volume (vph)	X-Street PHF (#)	X-Street Speed (mph)	X-Street Lanes (#)	Ave Ped. Wait At Signal (sec)	Right Turn Channel Islands (#)	Ped. Intersect LOS #	
1	242	1564	0.92	35	5	21.4	0	4.37	from layout, traffic
2	262	2515	0.92	35	6	11.6	0	5.56	from layout, traffic
3	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	from layout, traffic
4	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	from layout, traffic
5	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	from layout, traffic

Pedestrian Delay computed per Chapter 18 method (eqn 18-5, HCM 2000).

4. Compute Roadway Crossing Difficulty Factor (RCDF)

Seg.	Signal Spacing (ft)	Cross St. Ped Wait (secs/cycle)	Divert Delay (sec)	Arterial X Distance (ft)	Midblock Veh Speed (mph)	Vehicle Vol 2-Dir (vph)	Wait To X (max=900) (sec)	Is J-Walking Allowed? (Yes/No)	
1	4124	32.1	802	45	38.0	900	159	no	from layout, traffic
2	1991	24.0	391	57	33.3	426	50	no	from layout, traffic
3	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	from layout, traffic
4	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	from layout, traffic
5	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	from layout, traffic

5. Compute Pedestrian Facility LOS

Segment & Downstream Signal	Min. Wait,Divert (sec)	Crossing LOS (#)	No Cross LOS (#)	RCDF (#)	Ped. NDLOS (#)	Ped. Density LOS #	Ped. Fac. LOS (#)	Ped. Facility LOS
1	159	6.00	3.97	1.00	3.97	0.00	3.97	E
2	50	5.00	3.81	1.00	3.81	0.00	3.81	E
3	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
4	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
5	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
Average							3.91	E

C. Compute Transit LOS

Street: **CALIFORNIA AVE**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	0	#DIV/0!	0%	0%	#DIV/0!	no	transit
2	0	#DIV/0!	0%	0%	#DIV/0!	no	transit
3	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
4	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
5	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus (mph)	from
1	4124	36.0	0	#DIV/0!	transit
2	1991	31.5	0	#DIV/0!	transit
3	0	0	0	#DIV/0!	transit
4	0	0	0	#DIV/0!	transit
5	0	0	0	#DIV/0!	transit
Total/Ave	6115	#DIV/0!		#DIV/0!	

3. Compute Transit Perceived Travel Time and Headway Factors

Segment	a1 factor	IVTTR min/mi	EWTTR min/mi	ATR min/mi	PTTR	Fptt	Fh
1	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
2	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
3	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
4	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
5	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00

IVTTR = In-Vehicle Travel Time Rate
EWTTR = Equivalent Wait Travel Time Rate
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor

4. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	#DIV/0!	3.97	#DIV/0!	F
2	#DIV/0!	3.81	#DIV/0!	F
3	#DIV/0!	#NUM!	#DIV/0!	F
4	#DIV/0!	#NUM!	#DIV/0!	F
5	#DIV/0!	#NUM!	#DIV/0!	F
Average			5.00	F

D. Compute Bicycle LOS

Street: **CALIFORNIA AVE**

1. Geometric Input Data

Segment & Downstream Signal	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Sig. Int Cross-Dist (ft)	Unsig.Conf Per Mile (conf/mi)	from
1	0	15	1	UD	80	16.6	xsec1-3, layout
2	0	3	2	UD	118	69.0	xsec1-3, layout
3	0	0	0	UD	0	#DIV/0!	xsec1-3, layout
4	0	0	0	UD	0	#DIV/0!	xsec4-5, layout
5	0	0	0	UD	0	#DIV/0!	xsec4-5, layout

2. Performance and Other Input Data

Segment & Downstream Signal	Traffic Volume (vph)	Heavy Vehicle (%)	Midblock Traffic Spd (mph)	On-Street Parking (%)	Pavement Rating (#)	from
1	900	2%	38.0	0%	3.0	traffic, xsec1-3
2	426	2%	33.3	0%	3.0	traffic, xsec1-3
3	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec1-3
4	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5
5	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5

Pavement Rating: 1=Poor, 5=Excellent

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with inte

3. Compute Bicycle LOS

Segment & Downstream Signal	Prelim. Eff. Width (Wv)	Effective Width (We)	Speed Factor (#)	Segment LOS (#)	Intersect LOS (#)	Bicycle Score (#)	Bicycle LOS
1	15.0	30.0	4.05	1.03	3.84	4.11	E
2	3.0	6.0	3.70	4.52	5.70	9.26	F
3	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average						5.78	F

E. LOS Summary

Title: CALIFORNIA AVE

Direction =	Down	WB

Date: Analyst:

Segment & Downstream Signal	Auto Stops LOS #1	Auto Speed LOS #2	Auto HCM LOS #3	Auto NCHRP 379 LOS #4	Transit LOS	Bicycle LOS	Pedestrian LOS
1	F (v/c>1)	F (v/c>1)	A	A	F	E	E
2	B	B	A	A	F	F	E
3	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
4	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
5	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
Facility	F (v/c>1)	#DIV/0!	B	A	F	F	E

Auto Performance Measures Summary WB

Seg+Sig	Stops	FFS	Speed	%FFS
1	0.93	40.0	36.0	90.0%
2	1.56	35.0	31.5	90.0%
3	#DIV/0!	0.0	0	#DIV/0!
4	#DIV/0!	0.0	0	#DIV/0!
5	#DIV/0!	0.0	0	#DIV/0!
Facility	1.14	38.4	34.4	89.6%

Spreadsheet created by: R.Dowling of Dowling Associates, Inc.
Under contract to:
Transportation Research Board
NCHRP 3-70 Multimodal Level of Service For Urban Streets

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Spreadsheet does not have data entry error checking.
Created: 8-Jun-07 Updated: 25-Sep-08

Multimodal Level of Service for Urban Streets

Diagram of Uban Street

Street: HARBOR ST

Date:

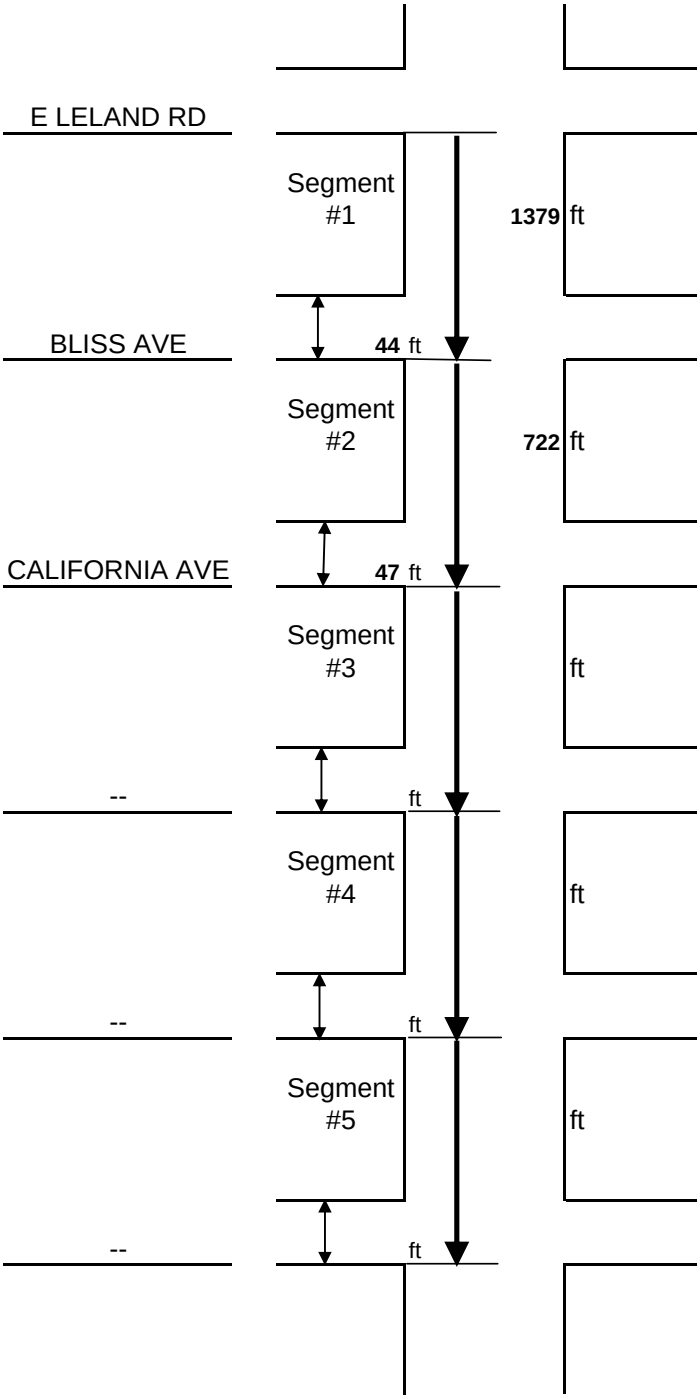
Limits: FROM E LELAND RD TO CALIFORNIA AVE

Observer:

Analysis Direction:	NB

(NB, SB, EB, WB)
(NW, SE, NE, SW)

Data Entry Fields in Red



Intersect. Control	X-Street Lanes	X-Street Speed	X-Street 2-W vph	Right Turn Isl.
SIGNAL	5	35	590	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	5	35	1269	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: HARBOR ST Limits: FROM E LELAND RD

Cross-Section #1 Observer: 0

From: E LELAND RD To: BLISS AVE

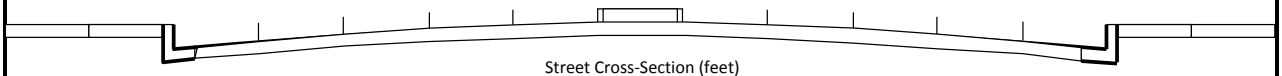
1

Ft/Trees	% Occ.
50	0%

NB

Pavement Cond:	5
Jay-Walking Legal:	no

SB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	5	5	0	0	12	12	15	12	12	0	0	5	3	5

Ped Vol: 0

Cross-Section #2

From: BLISS AVE To: CALIFORNIA AVE

2

Ft/Trees	% Occ.
0	0%

NB

Pavement Cond:	5
Jay-Walking Legal:	no

SB

Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	5	0	0	12	12	15	12	12	0	0	5	0	5

0

Cross-Section #3

From: CALIFORNIA AVE To: --

3

Ft/Trees	% Occ.

NB

Pavement Cond:	
Jay-Walking Legal:	

SB

Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: HARBOR ST

Limits: FROM E LELAND RD

Cross-Section #4

Observer: 0

From: -- To: --

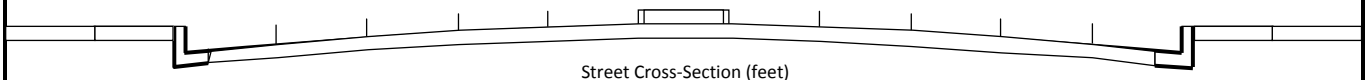
4

Ft/Trees	% Occ.

NB

Pavement Cond:	
Jay-Walking Legal:	

SB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Cross-Section #5

From: -- To: --

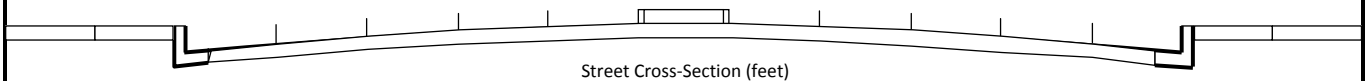
5

Ft/Trees	% Occ.

NB

Pavement Cond:	
Jay-Walking Legal:	

SB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Urban Street Multimodal Level of Service
Data Collection Sheet - Vehicle Traffic

Direction: **NB**

Street: HARBOR ST Date: 0-Jan-00

Limits: M E LELAND RD TO CALIFORNIA Observer: 0

Field Survey

	Segment And Downstream Signal		Speed Limit	Median Type	Left Turn Pocket	Drivewys Rightside	Unsig. Intersects
	From	To	(mph)	(0-3)	(y/n)	(#)	(#)
1	E LELAND RD	BLISS AVE	35	3	y	4	
2	BLISS AVE	ALIFORNIA AV	35	3	y	1	
3	ALIFORNIA AV	--					
4	--	--					
5	--	--					

Traffic Counts K: 100 D: 100

	Segment And Downstream Signal		Vol	Heavy Vehicle	RTOR+ PermLeft	Left/Right Turns	Thru Adj. Sat.	PHF
	From	To	(1-wy)	(%)	veh	%	(vphgl)	
1	E LELAND RD	BLISS AVE	737	2%	13	0%	1900	0.89
2	BLISS AVE	ALIFORNIA AV	801	2%	464	0%	1900	0.92
3	ALIFORNIA AV	--						
4	--	--						
5	--	--						

Arterial Traffic Performance & Signal Timing

			Field Survey		Signal Timing Data			
	Segment And Downstream Signal		Mean Speed	Average Stops	Cycle Length	Grn/Cycle for Thru	Ped Walk	Xing Ped Walk
	From	To	(mph)	(#/veh)	(secs)	(%)	(sec/cyc)	(sec/cyc)
1	E LELAND RD	BLISS AVE	31.5	0.3	90.0	62%	24.0	24.0
2	BLISS AVE	ALIFORNIA AV	31.5	0.9	90.0	20%	17.0	28.0
3	ALIFORNIA AV	--						
4	--	--						
5	--	--						

Notes: Median = 0 if None, 1 if one-way st., 2 if Painted or TWLTL, 3 if Raised
Heavy Vehicles = Buses plus trucks plus recreational vehicles
Thru Adusted Saturation Flow rates computed per Signalized Intersections Chapter, HC
Signal data is at the downstream signal

Urban Street Multimodal Level of Service
Data Collection Sheet - Transit

Direction: **NB**

Street: HARBOR ST Date: 0-Jan-00

Limits: FROM E LELAND RD TO CALIFORNIA AVE Observer: 0

Field Survey

Segment			Bus Stop	Shelters	Benches	CBD
	From	To	(#)	(% stops)	(% stops)	(yes/no)
1	E LELAND RD	BLISS AVE	1	0	1	no
2	BLISS AVE	ALIFORNIA AV	0	0	0	no
3	ALIFORNIA AV	--				
4	--	--				
5	--	--				

Transit Performance Data

Segment			Route	Frequency	Load Factor	On-Time Perform.	Schedule Speed
	From	To	#'s	(bus/hr)	(pas/seat)	(%)	(mph)
1	E LELAND RD	BLISS AVE					
			388-E	2	0.64	0.962	21
			391-W	2	0.34	0.962	20
2	BLISS AVE	ALIFORNIA AV					
3	ALIFORNIA AV	--					
4	--	--					
5	--	--					

Bus is On-Time if arrives within: 5 minutes of scheduled time.
Average Passenger Trip Length: 6.4 miles

Street: **HARBOR ST**

Direction=	**Down**	**NB**

1. Compute Eastbound Hourly Demand (v)

Segment & Downstream Signal	AADT (vpd)	Peak Factor K (#)	Dir. Factor D (#)	Pk.Hr.Fac. PHF (#)	Thru Traffic (%)	Demand v (vph)	from:
1	737	1.000	1.00	0.89	100%	737	traffic
2	801	1.000	1.00	0.92	100%	801	traffic
3	0	1.000	1.00	0	100%	#DIV/0!	traffic
4	0	1.000	1.00	0	100%	#DIV/0!	traffic
5	0	1.000	1.00	0	100%	#DIV/0!	traffic

2. Compute Eastbound Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1900	2	0.62	2356	0.31	OK	xsec 1-3, traffic
2	1900	2	0.20	760	1.05	Over Cap.	xsec 1-3, traffic
3	0	0	0.00	1	#DIV/0!	--	xsec 1-3, traffic
4	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic
5	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	35	1379	31.5	traffic, layout
2	35	722	31.5	traffic, layout
3	0	0	0	traffic, layout
4	0	0	0	traffic, layout
5	0	0	0	traffic, layout
Total/Ave.	35.0	2101	31.5	

4. Compute Stops & % Left Lane

Segment & Downstream Signal	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	0.96	y	3	traffic
2	6.80	y	3	traffic
3	#DIV/0!	0	0	traffic
4	#DIV/0!	0	0	traffic
5	#DIV/0!	0	0	traffic
Total/Ave	2.97	1.00	3.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weight. Ave.	Auto LOS
1	19.7%	39.7%	22.3%	10.4%	5.1%	2.8%	2.50	B
2	5.3%	19.7%	25.4%	22.3%	16.1%	11.1%	3.57	F (v/c>1)
3	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average	17.2%	38.1%	23.7%	11.8%	5.9%	3.2%	2.61	F (v/c>1)

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Pedestrian LOS

Street: **HARBOR ST**

1. Compute Pedestrian Density LOS

Seg.	Sidewalk Width (ft)	Ped Flow (pph)	Ped. Density LOS #	Ped. Density LOS	from
1	5	0	0.00	A	xsec1-3
2	5	0	0.00	A	xsec1-3
3	0	0	N/A	N/A	xsec1-3
4	0	0	N/A	N/A	xsec4-5
5	0	0	N/A	N/A	xsec4-5

Density LOS Lookup	
Ped/hr/ft	LOS
0	A
300	B
420	C
600	D
900	E
1380	F

2. Compute Pedestrian Segment LOS

Seg.	Outside Lane (ft)	Bike Ln + Park/Shldr (ft)	On-Street Parking Occ (%)	Barrier (ft/Tree)	Buffer Width (ft)	Dir. Traffic Volume (vph)	Traf. Lanes One-Dir (lanes)	Midblock Veh. Speed (mph)	Ped. Seg. LOS #	from
1	0	5	0%	50	5	737	2	33.3	2.89	xsec1-3
2	0	5	0%	0	0	801	2	33.3	3.46	xsec1-3
3	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec1-3
4	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5
5	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with intersection delay.

3. Compute Pedestrian Intersection LOS

Downstream Signal	RTOR+ Perm LT (vph)	X-Street Volume (vph)	X-Street PHF (#)	X-Street Speed (mph)	X-Street Lanes (#)	Ave Ped. Wait At Signal (sec)	Right Turn Channel Islands (#)	Ped. Intersect LOS #	from
1	13	590	0.89	35	5	24.2	0	2.84	layout, traffic
2	464	1269	0.92	35	5	29.6	0	4.36	layout, traffic
3	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
4	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
5	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic

Pedestrian Delay computed per Chapter 18 method (eqn 18-5, HCM 2000).

4. Compute Roadway Crossing Difficulty Factor (RCDF)

Seg.	Signal Spacing (ft)	Cross St. Ped Wait (secs/cycle)	Divert Delay (sec)	Arterial X Distance (ft)	Midblock Veh Speed (mph)	Vehicle Vol 2-Dir (vph)	Wait To X (max=900) (sec)	Is J-Walking Allowed? (Yes/No)	from
1	1379	24.2	275	73	33.3	737	539	no	layout, traffic
2	722	21.4	148	73	33.3	801	761	no	layout, traffic
3	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
4	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
5	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic

5. Compute Pedestrian Facility LOS

Segment & Downstream Signal	Min. Wait,Divert (sec)	Crossing LOS (#)	No Cross LOS (#)	RCDF (#)	Ped. NDLOS (#)	Ped. Density LOS #	Ped. Fac. LOS (#)	Ped. Facility LOS
1	275	6.00	3.15	1.00	3.15	0.00	3.15	D
2	148	6.00	3.67	1.00	3.67	0.00	3.67	E
3	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
4	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
5	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
Average							3.33	D

C. Compute Transit LOS

Street: **HARBOR ST**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	4	96%	0%	100%	0.49	no	transit
2	0	#DIV/0!	0%	0%	#DIV/0!	no	transit
3	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
4	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
5	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus (mph)	from
1	1379	31.5	1	20.5	transit
2	722	31.5	0	#DIV/0!	transit
3	0	0	0	#DIV/0!	transit
4	0	0	0	#DIV/0!	transit
5	0	0	0	#DIV/0!	transit
Total/Ave	2101	#DIV/0!		#DIV/0!	

3. Compute Transit Perceived Travel Time and Headway Factors

Segment	a1 factor	IVTTR min/mi	EWTTR min/mi	ATR min/mi	PTTR	Fptt	Fh
1	1.00	2.93	0.01	0.03	2.91	1.32	2.83
2	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
3	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
4	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
5	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00

IVTTR = In-Vehicle Travel Time Rate
EWTTR = Equivalent Wait Travel Time Rate
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor

4. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	3.74	3.15	0.86	A
2	#DIV/0!	3.67	#DIV/0!	F
3	#DIV/0!	#NUM!	#DIV/0!	F
4	#DIV/0!	#NUM!	#DIV/0!	F
5	#DIV/0!	#NUM!	#DIV/0!	F
Average			2.28	B

D. Compute Bicycle LOS

Street: **HARBOR ST**

1. Geometric Input Data

Segment & Downstream Signal	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Sig. Int Cross-Dist (ft)	Unsig.Conf Per Mile (conf/mi)	from
1	0	5	2	D	44	15.3	xsec1-3, layout
2	0	5	2	D	47	7.3	xsec1-3, layout
3	0	0	0	UD	0	#DIV/0!	xsec1-3, layout
4	0	0	0	UD	0	#DIV/0!	xsec4-5, layout
5	0	0	0	UD	0	#DIV/0!	xsec4-5, layout

2. Performance and Other Input Data

Segment & Downstream Signal	Traffic Volume (vph)	Heavy Vehicle (%)	Midblock Traffic Spd (mph)	On-Street Parking (%)	Pavement Rating (#)	from
1	737	2%	33.3	0%	5.0	traffic, xsec1-3
2	801	2%	33.3	0%	5.0	traffic, xsec1-3
3	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec1-3
4	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5
5	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5

Pavement Rating: 1=Poor, 5=Excellent

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with inte

3. Compute Bicycle LOS

Segment & Downstream Signal	Prelim. Eff. Width (Wv)	Effective Width (We)	Speed Factor (#)	Segment LOS (#)	Intersect LOS (#)	Bicycle Score (#)	Bicycle LOS
1	5.0	10.0	3.70	3.99	4.45	4.97	F
2	5.0	10.0	3.70	4.02	4.53	4.77	F
3	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average						4.90	F

E. LOS Summary

Title: HARBOR ST

Direction =	Down	NB

Date: Analyst:

Segment & Downstream Signal	Auto Stops LOS #1	Auto Speed LOS #2	Auto HCM LOS #3	Auto NCHRP 379 LOS #4	Transit LOS	Bicycle LOS	Pedestrian LOS
1	B	A	A	A	A	F	D
2	F (v/c>1)	F (v/c>1)	A	A	F	F	E
3	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
4	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
5	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
Facility	F (v/c>1)	#DIV/0!	A	A	B	F	D

Auto Performance Measures Summary NB

Seg+Sig	Stops	FFS	Speed	%FFS
1	0.96	35.0	31.5	90.0%
2	6.80	35.0	31.5	90.0%
3	#DIV/0!	0.0	0	#DIV/0!
4	#DIV/0!	0.0	0	#DIV/0!
5	#DIV/0!	0.0	0	#DIV/0!
Facility	2.97	35.0	31.5	90.0%

Spreadsheet created by: R.Dowling of Dowling Associates, Inc.
Under contract to:
Transportation Research Board
NCHRP 3-70 Multimodal Level of Service For Urban Streets

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Spreadsheet does not have data entry error checking.
Created: 8-Jun-07 Updated: 25-Sep-08

Multimodal Level of Service for Urban Streets

Diagram of Uban Street

Street: HARBOR ST

Date:

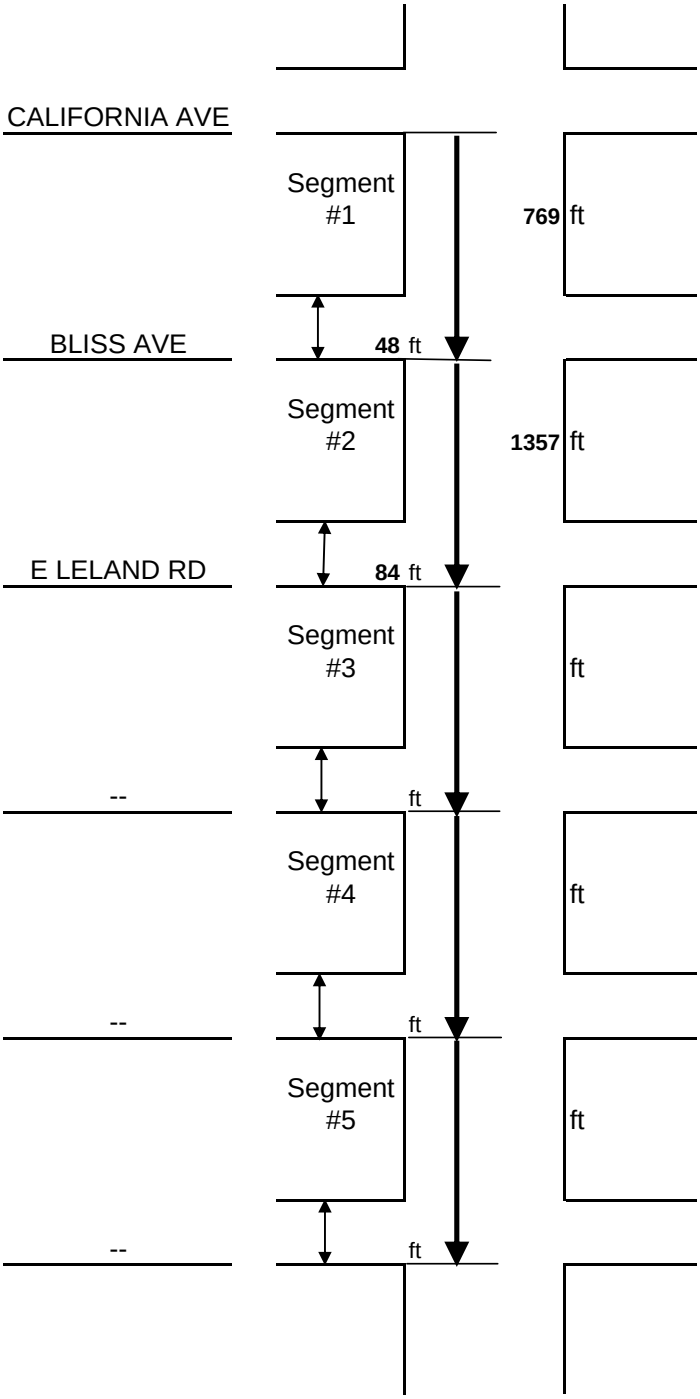
Limits: FROM CALIFORNIA AVE TO E LELAND RD

Observer:

Analysis Direction:	SB

(NB, SB, EB, WB)
(NW, SE, NE, SW)

Data Entry Fields in Red



Intersect. Control	X-Street Lanes	X-Street Speed	X-Street 2-W vph	Right Turn Isl.
SIGNAL	3	35	590	1

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	6	35	1918	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: HARBOR ST

Limits: FROM CALIFORNIA A

Observer: 0

Cross-Section #1
From: CALIFORNIA AVE To: BLISS AVE

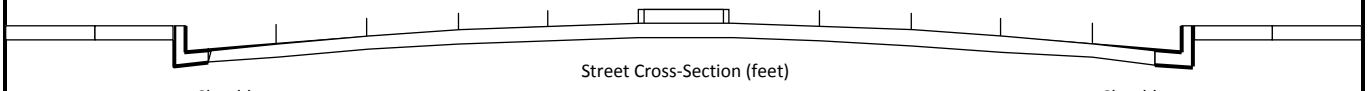
1

Ft/Trees	% Occ.
0	0%

SB

Pavement Cond:	5
Jay-Walking Legal:	no

NB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	5	0	0	12	12	15	12	12	0	0	5	0	5

Ped Vol: 0

Cross-Section #2
From: BLISS AVE To: E LELAND RD

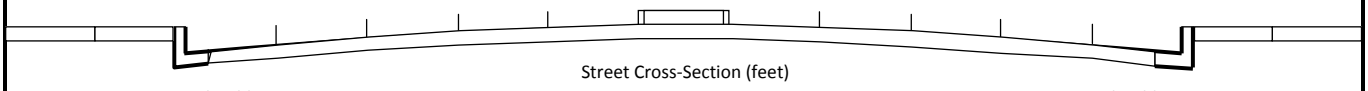
2

Ft/Trees	% Occ.
40	0%

SB

Pavement Cond:	5
Jay-Walking Legal:	no

NB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	3	5	0	0	12	12	15	12	12	0	0	5	5	5

0

Cross-Section #3
From: E LELAND RD To: --

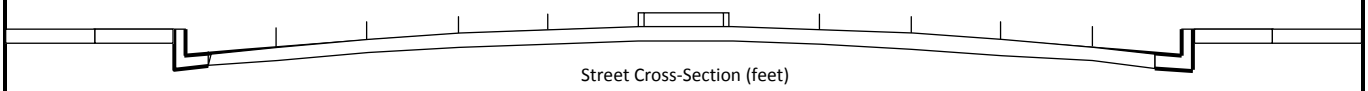
3

Ft/Trees	% Occ.

SB

Pavement Cond:	
Jay-Walking Legal:	

NB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: HARBOR ST

Limits: FROM CALIFORNIA A

Cross-Section #4

Observer: 0

From: -- To: --

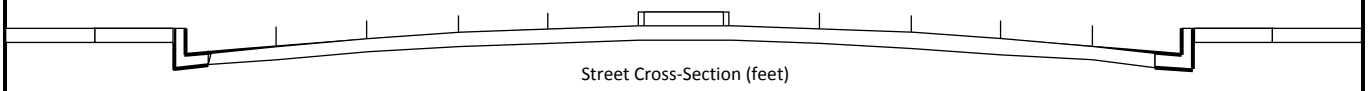
4

Ft/Trees	% Occ.

SB

Pavement Cond:	
Jay-Walking Legal:	

NB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Cross-Section #5

From: -- To: --

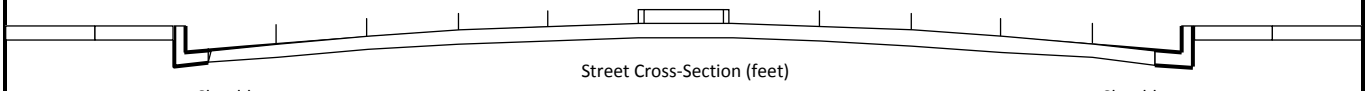
5

Ft/Trees	% Occ.

SB

Pavement Cond:	
Jay-Walking Legal:	

NB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Urban Street Multimodal Level of Service
Data Collection Sheet - Vehicle Traffic

Direction: **SB**

Street: HARBOR ST Date: 0-Jan-00

Limits: M CALIFORNIA AVE TO E LELAN Observer: 0

Field Survey

	Segment And Downstream Signal		Speed Limit	Median Type	Left Turn Pocket	Drivewys Rightside	Unsig. Intersects
	From	To	(mph)	(0-3)	(y/n)	(#)	(#)
1	ALIFORNIA AV	BLISS AVE	35	3	y	0	
2	BLISS AVE	E LELAND RD	35	3	y	5	
3	E LELAND RD	--					
4	--	--					
5	--	--					

Traffic Counts K: 100 D: 100

	Segment And Downstream Signal		Vol	Heavy Vehicle	RTOR+ PermLeft	Left/Right Turns	Thru Adj. Sat.	PHF
	From	To	(1-wy)	(%)	veh	%	(vphgl)	
1	ALIFORNIA AV	BLISS AVE	852	2%	174	0%	1900	0.90
2	BLISS AVE	E LELAND RD	984	2%	303	0%	1900	0.92
3	E LELAND RD	--						
4	--	--						
5	--	--						

Arterial Traffic Performance & Signal Timing

	Segment And Downstream Signal		Field Survey		Signal Timing Data			
			Mean Speed	Average Stops	Cycle Length	Grn/Cycle for Thru	Ped Walk	Xing Ped Walk
	From	To	(mph)	(#/veh)	(secs)	(%)	(sec/cyc)	(sec/cyc)
1	ALIFORNIA AV	BLISS AVE	31.5	0.2	90.0	62%	29.0	0.0
2	BLISS AVE	E LELAND RD	31.5	1.1	90.0	24%	24.0	28.0
3	E LELAND RD	--						
4	--	--						
5	--	--						

Notes: Median = 0 if None, 1 if one-way st., 2 if Painted or TWLTL, 3 if Raised
Heavy Vehicles = Buses plus trucks plus recreational vehicles
Thru Adusted Saturation Flow rates computed per Signalized Intersections Chapter, HC
Signal data is at the downstream signal

Urban Street Multimodal Level of Service
Data Collection Sheet - Transit

Direction: **SB**

Street: HARBOR ST Date: 0-Jan-00

Limits: FROM CALIFORNIA AVE TO E LELAND RD Observer: 0

Field Survey

Segment			Bus Stop	Shelters	Benches	CBD
	From	To	(#)	(% stops)	(% stops)	(yes/no)
1	ALIFORNIA AV	BLISS AVE	0	0	0	no
2	BLISS AVE	E LELAND RD	1	0	0	no
3	E LELAND RD	--				
4	--	--				
5	--	--				

Transit Performance Data

Segment			Route	Frequency	Load Factor	On-Time Perform.	Schedule Speed
	From	To	#'s	(bus/hr)	(pas/seat)	(%)	(mph)
1	ALIFORNIA AV	BLISS AVE					
2	BLISS AVE	E LELAND RD					
			388-W	2	0.77	0.962	13
			391-E	2	0.55	0.962	23
3	E LELAND RD	--					
4	--	--					
5	--	--					

Bus is On-Time if arrives within: 5 minutes of scheduled time.
Average Passenger Trip Length: 6.4 miles

A. Compute Auto LOS and Performance

Street: **HARBOR ST**

Direction= **Down** **SB**

1. Compute Eastbound Hourly Demand (v)

Segment & Downstream Signal	AADT (vpd)	Peak Factor K (#)	Dir. Factor D (#)	Pk.Hr.Fac. PHF (#)	Thru Traffic (%)	Demand v (vph)	from:
1	852	1.000	1.00	0.9	100%	852	traffic
2	984	1.000	1.00	0.92	100%	984	traffic
3	0	1.000	1.00	0	100%	#DIV/0!	traffic
4	0	1.000	1.00	0	100%	#DIV/0!	traffic
5	0	1.000	1.00	0	100%	#DIV/0!	traffic

2. Compute Eastbound Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1900	2	0.62	2356	0.36	OK	xsec 1-3, traffic
2	1900	2	0.24	912	1.08	Over Cap.	xsec 1-3, traffic
3	0	0	0.00	1	#DIV/0!	--	xsec 1-3, traffic
4	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic
5	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	35	769	31.5	traffic, layout
2	35	1357	31.5	traffic, layout
3	0	0	0	traffic, layout
4	0	0	0	traffic, layout
5	0	0	0	traffic, layout
Total/Ave.	35.0	2126	31.5	

4. Compute Stops & % Left Lane

Segment & Downstream Signal	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	1.65	y	3	traffic
2	4.36	y	3	traffic
3	#DIV/0!	0	0	traffic
4	#DIV/0!	0	0	traffic
5	#DIV/0!	0	0	traffic
Total/Ave	3.38	1.00	3.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weight. Ave.	Auto LOS
1	17.1%	38.0%	23.8%	11.8%	5.9%	3.3%	2.61	B
2	9.4%	28.8%	27.1%	17.8%	10.5%	6.3%	3.10	F (v/c>1)
3	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average	15.8%	37.0%	24.5%	12.6%	6.5%	3.6%	2.68	F (v/c>1)

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Pedestrian LOS

Street: **HARBOR ST**

1. Compute Pedestrian Density LOS

Seg.	Sidewalk Width (ft)	Ped Flow (pph)	Ped. Density LOS #	Ped. Density LOS	from
1	5	0	0.00	A	xsec1-3
2	5	0	0.00	A	xsec1-3
3	0	0	N/A	N/A	xsec1-3
4	0	0	N/A	N/A	xsec4-5
5	0	0	N/A	N/A	xsec4-5

Density LOS Lookup	
Ped/hr/ft	LOS
0	A
300	B
420	C
600	D
900	E
1380	F

2. Compute Pedestrian Segment LOS

Seg.	Outside Lane (ft)	Bike Ln + Park/Shldr (ft)	On-Street Parking Occ (%)	Barrier (ft/Tree)	Buffer Width (ft)	Dir. Traffic Volume (vph)	Traf. Lanes One-Dir (lanes)	Midblock Veh. Speed (mph)	Ped. Seg. LOS #	from
1	0	5	0%	0	0	852	2	33.3	3.55	xsec1-3
2	0	5	0%	40	3	984	2	33.3	3.31	xsec1-3
3	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec1-3
4	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5
5	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with intersection delay.

3. Compute Pedestrian Intersection LOS

Downstream Signal	RTOR+ Perm LT (vph)	X-Street Volume (vph)	X-Street PHF (#)	X-Street Speed (mph)	X-Street Lanes (#)	Ave Ped. Wait At Signal (sec)	Right Turn Channel Islands (#)	Ped. Intersect LOS #	from
1	174	590	0.90	35	3	20.7	1	3.11	layout, traffic
2	303	1918	0.92	35	6	24.2	0	4.92	layout, traffic
3	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
4	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
5	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic

Pedestrian Delay computed per Chapter 18 method (eqn 18-5, HCM 2000).

4. Compute Roadway Crossing Difficulty Factor (RCDF)

Seg.	Signal Spacing (ft)	Cross St. Ped Wait (secs/cycle)	Divert Delay (sec)	Arterial X Distance (ft)	Midblock Veh Speed (mph)	Vehicle Vol 2-Dir (vph)	Wait To X (max=900) (sec)	Is J-Walking Allowed? (Yes/No)	from
1	769	45.0	169	73	33.3	852	900	no	layout, traffic
2	1357	21.4	269	73	33.3	984	900	no	layout, traffic
3	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
4	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
5	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic

5. Compute Pedestrian Facility LOS

Segment & Downstream Signal	Min. Wait,Divert (sec)	Crossing LOS (#)	No Cross LOS (#)	RCDF (#)	Ped. NDLOS (#)	Ped. Density LOS #	Ped. Fac. LOS (#)	Ped. Facility LOS
1	169	6.00	3.42	1.00	3.42	0.00	3.42	D
2	269	6.00	3.74	1.00	3.74	0.00	3.74	E
3	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
4	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
5	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
Average							3.62	E

C. Compute Transit LOS

Street: **HARBOR ST**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	0	#DIV/0!	0%	0%	#DIV/0!	no	transit
2	4	96%	0%	0%	0.66	no	transit
3	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
4	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
5	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus (mph)	from
1	769	31.5	0	#DIV/0!	transit
2	1357	31.5	1	18.0	transit
3	0	0	0	#DIV/0!	transit
4	0	0	0	#DIV/0!	transit
5	0	0	0	#DIV/0!	transit
Total/Ave	2126	#DIV/0!		#DIV/0!	

3. Compute Transit Perceived Travel Time and Headway Factors

Segment	a1 factor	IVTTR min/mi	EWTTR min/mi	ATR min/mi	PTTR	Fptt	Fh
1	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
2	1.00	3.33	0.01	0.00	3.34	1.26	2.83
3	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
4	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
5	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00

IVTTR = In-Vehicle Travel Time Rate
EWTTR = Equivalent Wait Travel Time Rate
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor

4. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	#DIV/0!	3.42	#DIV/0!	F
2	3.56	3.74	1.23	A
3	#DIV/0!	#NUM!	#DIV/0!	F
4	#DIV/0!	#NUM!	#DIV/0!	F
5	#DIV/0!	#NUM!	#DIV/0!	F
Average			2.59	B

D. Compute Bicycle LOS

Street: **HARBOR ST**

1. Geometric Input Data

Segment & Downstream Signal	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Sig. Int Cross-Dist (ft)	Unsig.Conf Per Mile (conf/mi)	from
1	0	5	2	D	48	0.0	xsec1-3, layout
2	0	5	2	D	84	19.5	xsec1-3, layout
3	0	0	0	UD	0	#DIV/0!	xsec1-3, layout
4	0	0	0	UD	0	#DIV/0!	xsec4-5, layout
5	0	0	0	UD	0	#DIV/0!	xsec4-5, layout

2. Performance and Other Input Data

Segment & Downstream Signal	Traffic Volume (vph)	Heavy Vehicle (%)	Midblock Traffic Spd (mph)	On-Street Parking (%)	Pavement Rating (#)	from
1	852	2%	33.3	0%	5.0	traffic, xsec1-3
2	984	2%	33.3	0%	5.0	traffic, xsec1-3
3	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec1-3
4	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5
5	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5

Pavement Rating: 1=Poor, 5=Excellent

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with inte

3. Compute Bicycle LOS

Segment & Downstream Signal	Prelim. Eff. Width (Wv)	Effective Width (We)	Speed Factor (#)	Segment LOS (#)	Intersect LOS (#)	Bicycle Score (#)	Bicycle LOS
1	5.0	10.0	3.70	4.06	4.61	4.61	F
2	5.0	10.0	3.70	4.12	5.27	6.33	F
3	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average						5.71	F

E. LOS Summary

Title: HARBOR ST

Direction =	Down	SB	Date:	9/28/2008	Analyst:	AEN

Segment & Downstream Signal	Auto Stops LOS #1	Auto Speed LOS #2	Auto HCM LOS #3	Auto NCHRP 379 LOS #4	Transit LOS	Bicycle LOS	Pedestrian LOS
1	B	A	A	A	F	F	D
2	F (v/c>1)	F (v/c>1)	A	A	A	F	E
3	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
4	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
5	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
Facility	F (v/c>1)	#DIV/0!	A	A	B	F	E

Auto Performance Measures Summary SB

Seg+Sig	Stops	FFS	Speed	%FFS
1	1.65	35.0	31.5	90.0%
2	4.36	35.0	31.5	90.0%
3	#DIV/0!	0.0	0	#DIV/0!
4	#DIV/0!	0.0	0	#DIV/0!
5	#DIV/0!	0.0	0	#DIV/0!
Facility	3.38	35.0	31.5	90.0%

Spreadsheet created by: R.Dowling of Dowling Associates, Inc.
Under contract to:
Transportation Research Board
NCHRP 3-70 Multimodal Level of Service For Urban Streets

Spreadsheet is made available "As-Is" for TRB internal review.
No warranty as to accuracy or suitability for use.
Spreadsheet is unsupported.
Spreadsheet does not have data entry error checking.
Created: 8-Jun-07 Updated: 25-Sep-08

Multimodal Level of Service for Urban Streets

Diagram of Uban Street

Street: BLISS AVE

Date:

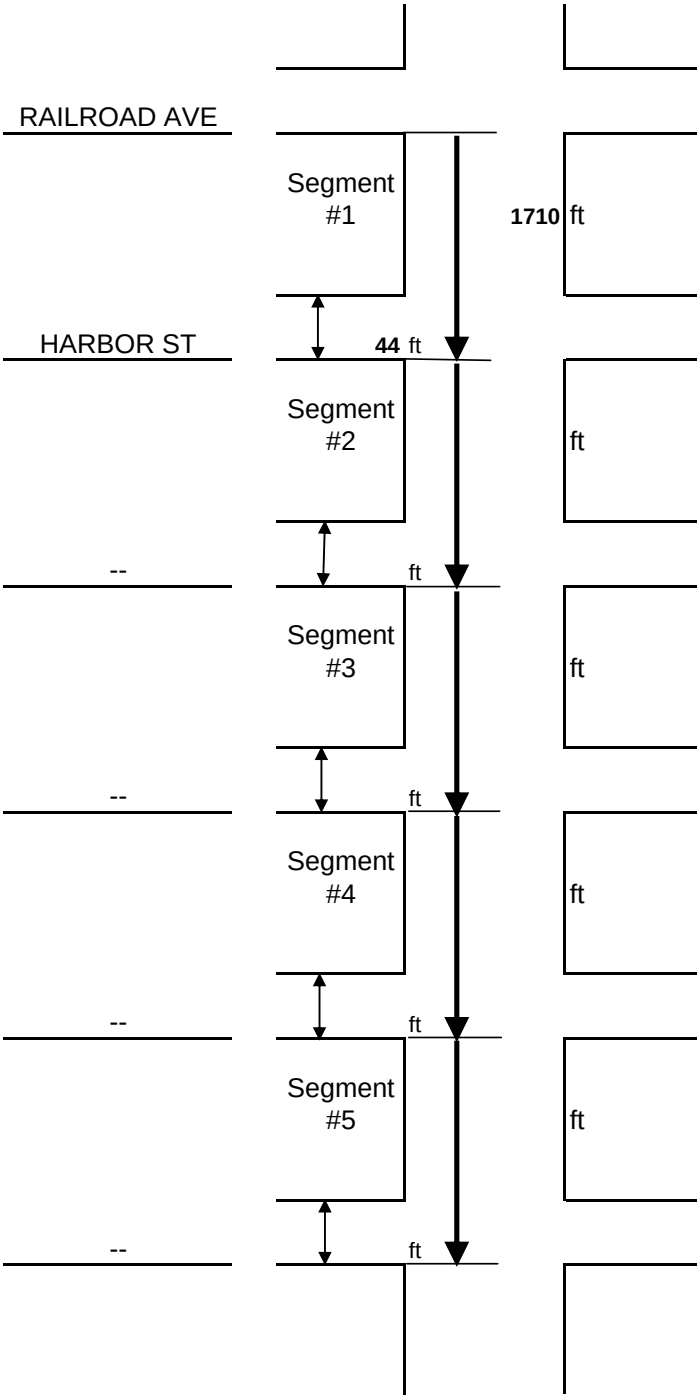
Limits: FROM RAILROAD AVE TO HARBOR ST

Observer:

Analysis Direction:	EB

(NB, SB, EB, WB)
(NW, SE, NE, SW)

Data Entry Fields in Red



Intersect. Control	X-Street Lanes	X-Street Speed	X-Street 2-W vph	Right Turn Isl.
SIGNAL	3	35	1589	1

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Multimodal Level of Service for Urban Streets

Street Cross-Section Data Street: BLISS AVE Limits: FROM RAILROAD A

Cross-Section #1 Observer: 0

From: RAILROAD AVE To: HARBOR ST

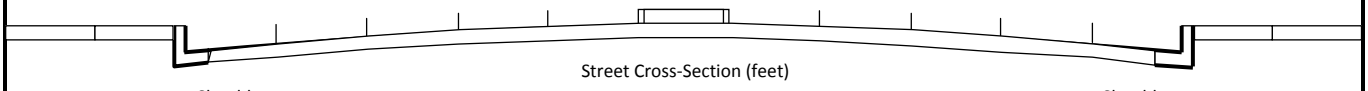
1

Ft/Trees	% Occ.
0	0%

EB

Pavement Cond:	2
Jay-Walking Legal:	no

WB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	2	0	0	0	12	0	12	0	0	0	2	0	10

Ped Vol: 0

Cross-Section #2

From: HARBOR ST To: --

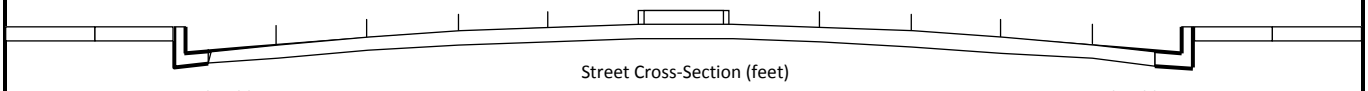
2

Ft/Trees	% Occ.

EB

Pavement Cond:	
Jay-Walking Legal:	

WB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Cross-Section #3

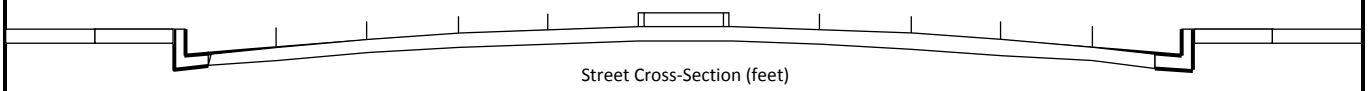
From: -- To: --

3

Ft/Trees	% Occ.

EB

Pavement Cond:	
Jay-Walking Legal:	



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: BLISS AVE

Limits: FROM RAILROAD A

Cross-Section #4

Observer: 0

From: -- To: --

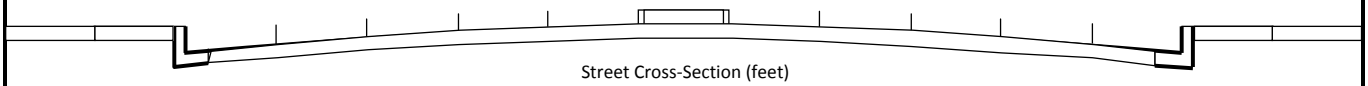
4

Ft/Trees	% Occ.

EB

Pavement Cond:	
Jay-Walking Legal:	

WB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Cross-Section #5

From: -- To: --

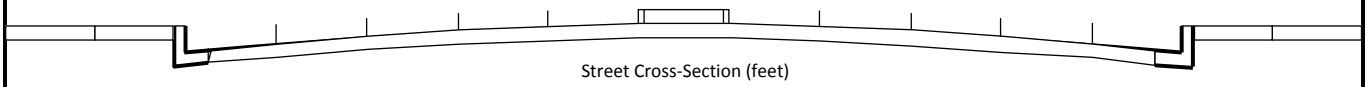
5

Ft/Trees	% Occ.
?	?

EB

Pavement Cond:	
Jay-Walking Legal:	

WB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Urban Street Multimodal Level of Service
Data Collection Sheet - Vehicle Traffic

Direction: **EB**

Street: BLISS AVE Date: 0-Jan-00

Limits: ƆM RAILROAD AVE TO HARBOR Observer: 0

Field Survey

	Segment And Downstream Signal		Speed Limit	Median Type	Left Turn Pocket	Drivewys Rightside	Unsig. Intersects
	From	To	(mph)	(0-3)	(y/n)	(#)	(#)
1	RAILROAD AVI	HARBOR ST	35	0	n	3	
2	HARBOR ST	--					
3	--	--					
4	--	--					
5	--	--					

Traffic Counts K: 100 D: 100

	Segment And Downstream Signal		Vol	Heavy Vehicle	RTOR+ PermLeft	Left/Right Turns	Thru Adj. Sat.	PHF
	From	To	(1-wy)	(%)	veh	%	(vphgl)	
1	RAILROAD AVI	HARBOR ST	561	2%	411	0%	1900	0.86
2	HARBOR ST	--						
3	--	--						
4	--	--						
5	--	--						

Arterial Traffic Performance & Signal Timing

	Segment And Downstream Signal		Field Survey		Signal Timing Data			
			Mean Speed	Average Stops	Cycle Length	Grn/Cycle for Thru	Ped Walk	Xing Ped Walk
	From	To	(mph)	(#/veh)	(secs)	(%)	(sec/cyc)	(sec/cyc)
1	RAILROAD AVI	HARBOR ST	31.5	0.8	90.0	29%	0.0	24.0
2	HARBOR ST	--	0.0					
3	--	--	0.0					
4	--	--	0.0					
5	--	--	0.0					

Notes: Median = 0 if None, 1 if one-way st., 2 if Painted or TWLTL, 3 if Raised
Heavy Vehicles = Buses plus trucks plus recreational vehicles
Thru Adusted Saturation Flow rates computed per Signalized Intersections Chapter, HC
Signal data is at the downstream signal

Urban Street Multimodal Level of Service
Data Collection Sheet - Transit

Direction: **EB**

Street: BLISS AVE Date: 0-Jan-00

Limits: FROM RAILROAD AVE TO HARBOR ST Observer: 0

Field Survey

Segment			Bus Stop	Shelters	Benches	CBD
	From	To	(#)	(% stops)	(% stops)	(yes/no)
1	RAILROAD AVE	HARBOR ST	0	0	0	no
2	HARBOR ST	--				
3	--	--				
4	--	--				
5	--	--				

Transit Performance Data

Segment			Route	Frequency	Load Factor	On-Time Perform.	Schedule Speed
	From	To	#'s	(bus/hr)	(pas/seat)	(%)	(mph)
1	RAILROAD AVE	HARBOR ST					
2	HARBOR ST	--					
3	--	--					
4	--	--					
5	--	--					

Bus is On-Time if arrives within: 5 minutes of scheduled time.
Average Passenger Trip Length: 6.4 miles

A. Compute Auto LOS and Performance

Street: **BLISS AVE**

Direction= **Down** **EB**

1. Compute Eastbound Hourly Demand (v)

Segment & Downstream Signal	AADT (vpd)	Peak Factor K (#)	Dir. Factor D (#)	Pk.Hr.Fac. PHF (#)	Thru Traffic (%)	Demand v (vph)	from:
1	561	1.000	1.00	0.86	100%	561	traffic
2	0	1.000	1.00	0	100%	#DIV/0!	traffic
3	0	1.000	1.00	0	100%	#DIV/0!	traffic
4	0	1.000	1.00	0	100%	#DIV/0!	traffic
5	0	1.000	1.00	0	100%	#DIV/0!	traffic

2. Compute Eastbound Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1900	1	0.29	551	1.02	Over Cap.	xsec 1-3, traffic
2	0	0	0.00	1	#DIV/0!	--	xsec 1-3, traffic
3	0	0	0.00	1	#DIV/0!	--	xsec 1-3, traffic
4	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic
5	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	35	1710	31.5	traffic, layout
2	0	0	0	traffic, layout
3	0	0	0	traffic, layout
4	0	0	0	traffic, layout
5	0	0	0	traffic, layout
Total/Ave.	35.0	1710	31.5	

4. Compute Stops & % Left Lane

Segment & Downstream Signal	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	2.32	n	0	traffic
2	#DIV/0!	0	0	traffic
3	#DIV/0!	0	0	traffic
4	#DIV/0!	0	0	traffic
5	#DIV/0!	0	0	traffic
Total/Ave	2.32	0.00	0.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weight. Ave.	Auto LOS
1	14.8%	36.1%	25.1%	13.3%	6.9%	3.8%	2.73	F (v/c>1)
2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
3	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average	14.8%	36.1%	25.1%	13.3%	6.9%	3.8%	2.73	F (v/c>1)

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Pedestrian LOS

Street: **BLISS AVE**

1. Compute Pedestrian Density LOS

Seg.	Sidewalk Width (ft)	Ped Flow (pph)	Ped. Density LOS #	Ped. Density LOS	
1	5	0	0.00	A	from
2	0	0	N/A	N/A	xsec1-3
3	0	0	N/A	N/A	xsec1-3
4	0	0	N/A	N/A	xsec1-3
5	0	0	N/A	N/A	xsec4-5
					xsec4-5

Density LOS Lookup	
Ped/hr/ft	LOS
0	A
300	B
420	C
600	D
900	E
1380	F

2. Compute Pedestrian Segment LOS

Seg.	Outside Lane (ft)	Bike Ln + Park/Shldr (ft)	On-Street Parking Occ (%)	Barrier (ft/Tree)	Buffer Width (ft)	Dir. Traffic Volume (vph)	Traf. Lanes One-Dir (lanes)	Midblock Veh. Speed (mph)	Ped. Seg. LOS #	
1	0	2	0%	0	0	561	1	33.3	4.05	xsec1-3
2	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec1-3
3	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec1-3
4	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5
5	0	0	?	?	0	#DIV/0!	0	0.0	#VALUE!	xsec4-5

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with intersection delay.

3. Compute Pedestrian Intersection LOS

Downstream Signal	RTOR+ Perm LT (vph)	X-Street Volume (vph)	X-Street PHF (#)	X-Street Speed (mph)	X-Street Lanes (#)	Ave Ped. Wait At Signal (sec)	Right Turn Channel Islands (#)	Ped. Intersect LOS #	
1	411	1589	0.86	35	3	45.0	1	4.71	layout, traffic
2	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
3	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
4	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
5	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic

Pedestrian Delay computed per Chapter 18 method (eqn 18-5, HCM 2000).

4. Compute Roadway Crossing Difficulty Factor (RCDF)

Seg.	Signal Spacing (ft)	Cross St. Ped Wait (secs/cycle)	Divert Delay (sec)	Arterial X Distance (ft)	Midblock Veh Speed (mph)	Vehicle Vol 2-Dir (vph)	Wait To X (max=900) (sec)	Is J-Walking Allowed? (Yes/No)	
1	1710	24.2	338	28	33.3	561	16	no	layout, traffic
2	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
3	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
4	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
5	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic

5. Compute Pedestrian Facility LOS

Segment & Downstream Signal	Min. Wait,Divert (sec)	Crossing LOS (#)	No Cross LOS (#)	RCDF (#)	Ped. NDLOS (#)	Ped. Density LOS #	Ped. Fac. LOS (#)	Ped. Facility LOS
1	16	2.00	3.93	1.00	3.93	0.00	3.93	E
2	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
3	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
4	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
5	#DIV/0!	#DIV/0!	#VALUE!	1.00	#VALUE!	N/A	#VALUE!	#VALUE!
Average							3.93	E

C. Compute Transit LOS

Street: **BLISS AVE**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	0	#DIV/0!	0%	0%	#DIV/0!	no	transit
2	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
3	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
4	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
5	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus (mph)	from
1	1710	31.5	0	#DIV/0!	transit
2	0	0	0	#DIV/0!	transit
3	0	0	0	#DIV/0!	transit
4	0	0	0	#DIV/0!	transit
5	0	0	0	#DIV/0!	transit
Total/Ave	1710	#DIV/0!		#DIV/0!	

3. Compute Transit Perceived Travel Time and Headway Factors

Segment	a1 factor	IVTTR min/mi	EWTTR min/mi	ATR min/mi	PTTR	Fptt	Fh
1	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
2	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
3	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
4	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
5	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00

IVTTR = In-Vehicle Travel Time Rate
EWTTR = Equivalent Wait Travel Time Rate
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor

4. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	#DIV/0!	3.93	#DIV/0!	F
2	#DIV/0!	#NUM!	#DIV/0!	F
3	#DIV/0!	#NUM!	#DIV/0!	F
4	#DIV/0!	#NUM!	#DIV/0!	F
5	#DIV/0!	#VALUE!	#DIV/0!	F
Average			5.00	F

D. Compute Bicycle LOS

Street: **BLISS AVE**

1. Geometric Input Data

Segment & Downstream Signal	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Sig. Int Cross-Dist (ft)	Unsig.Conf Per Mile (conf/mi)	from
1	0	2	1	UD	44	9.3	xsec1-3, layout
2	0	0	0	UD	0	#DIV/0!	xsec1-3, layout
3	0	0	0	UD	0	#DIV/0!	xsec1-3, layout
4	0	0	0	UD	0	#DIV/0!	xsec4-5, layout
5	0	0	0	UD	0	#DIV/0!	xsec4-5, layout

2. Performance and Other Input Data

Segment & Downstream Signal	Traffic Volume (vph)	Heavy Vehicle (%)	Midblock Traffic Spd (mph)	On-Street Parking (%)	Pavement Rating (#)	from
1	561	2%	33.3	0%	2.0	traffic, xsec1-3
2	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec1-3
3	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec1-3
4	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5
5	#DIV/0!	0%	0.0	?	0.0	traffic, xsec4-5

Pavement Rating: 1=Poor, 5=Excellent

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with inte

3. Compute Bicycle LOS

Segment & Downstream Signal	Prelim. Eff. Width (Wv)	Effective Width (We)	Speed Factor (#)	Segment LOS (#)	Intersect LOS (#)	Bicycle Score (#)	Bicycle LOS
1	2.0	4.0	3.70	6.13	5.51	6.87	F
2	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
3	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average						6.87	F

E. LOS Summary

Title: BLISS AVE

Direction =	Down	EB

Date: Analyst:

Segment & Downstream Signal	Auto Stops LOS #1	Auto Speed LOS #2	Auto HCM LOS #3	Auto NCHRP 379 LOS #4	Transit LOS	Bicycle LOS	Pedestrian LOS
1	F (v/c>1)	F (v/c>1)	A	A	F	F	E
2	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
3	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
4	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
5	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#VALUE!
Facility	F (v/c>1)	#DIV/0!	A	A	F	F	E

Auto Performance Measures Summary EB

Seg+Sig	Stops	FFS	Speed	%FFS
1	2.32	35.0	31.5	90.0%
2	#DIV/0!	0.0	0	#DIV/0!
3	#DIV/0!	0.0	0	#DIV/0!
4	#DIV/0!	0.0	0	#DIV/0!
5	#DIV/0!	0.0	0	#DIV/0!
Facility	2.32	35.0	31.5	90.0%

Spreadsheet created by: R.Dowling of Dowling Associates, Inc.
Under contract to:
Transportation Research Board
NCHRP 3-70 Multimodal Level of Service For Urban Streets

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Spreadsheet is unsupported.
Spreadsheet does not have data entry error checking.
Created: 8-Jun-07 Updated: 25-Sep-08

Multimodal Level of Service for Urban Streets

Diagram of Uban Street

Street: BLISS AVE

Date:

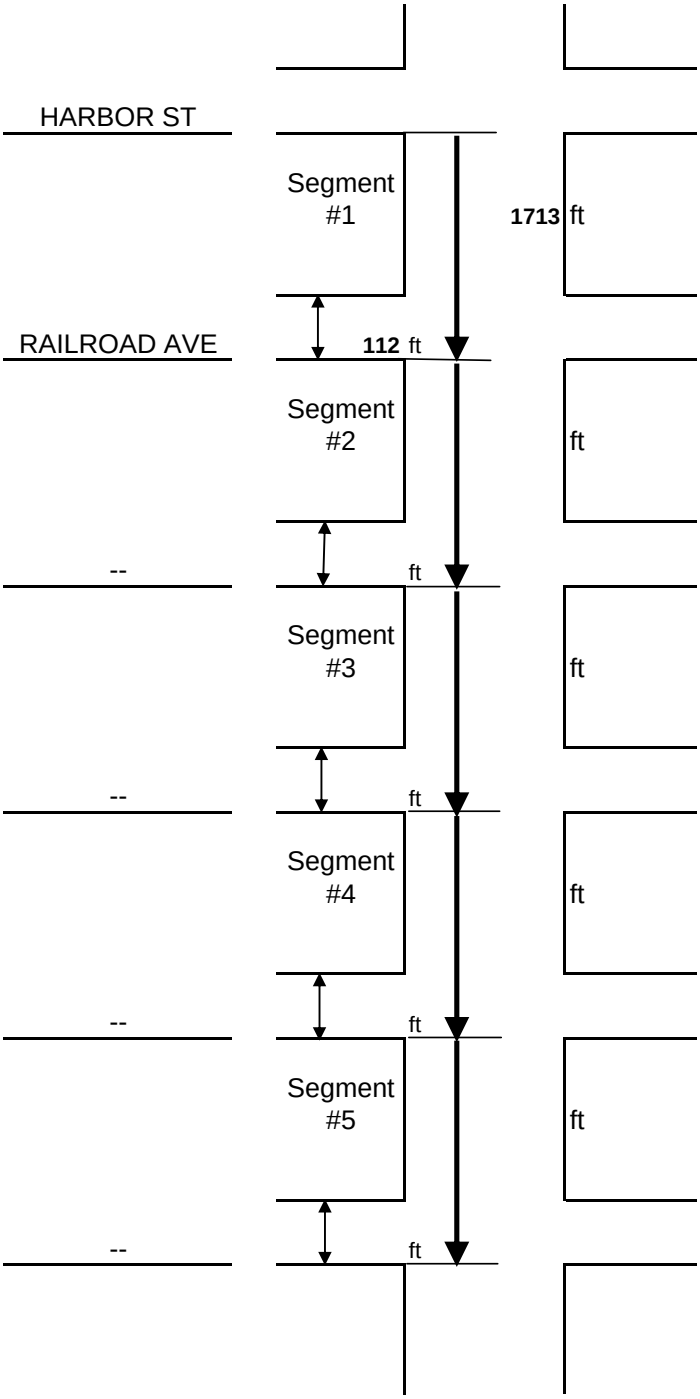
Limits: FROM HARBOR ST TO RAILROAD AVE

Observer:

Analysis Direction:	WB

(NB, SB, EB, WB)
(NW, SE, NE, SW)

Data Entry Fields in Red



Intersect. Control	X-Street Lanes	X-Street Speed	X-Street 2-W vph	Right Turn Isl.
SIGNAL	5	35	2539	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: BLISS AVE

Limits: FROM HARBOR ST

Observer: 0

Cross-Section #1
From: HARBOR ST To: RAILROAD AVE

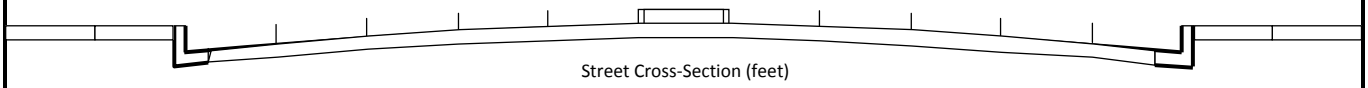
1

Ft/Trees	% Occ.
0	0%

WB

Pavement Cond:	2
Jay-Walking Legal:	no

EB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
10	0	2	0	0	0	12	0	12	0	0	0	2	0	5

Ped Vol: 0

Cross-Section #2
From: RAILROAD AVE To: --

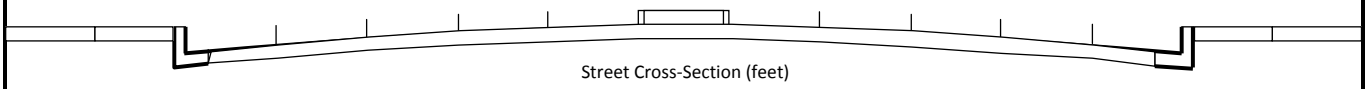
2

Ft/Trees	% Occ.

WB

Pavement Cond:	
Jay-Walking Legal:	

EB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Cross-Section #3
From: -- To: --

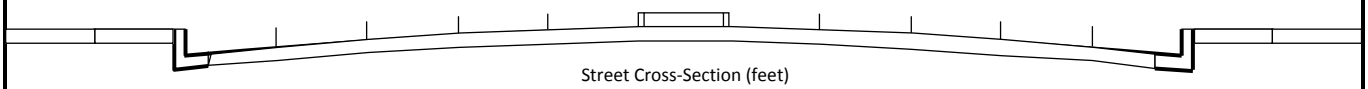
3

Ft/Trees	% Occ.

WB

Pavement Cond:	
Jay-Walking Legal:	

EB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: BLISS AVE

Limits: FROM HARBOR ST

Cross-Section #4

Observer: 0

From: -- To: --

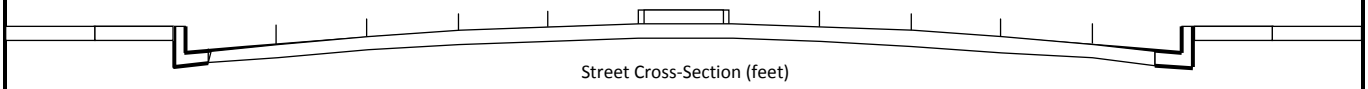
4

Ft/Trees	% Occ.

WB

Pavement Cond:	
Jay-Walking Legal:	

EB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Cross-Section #5

From: -- To: --

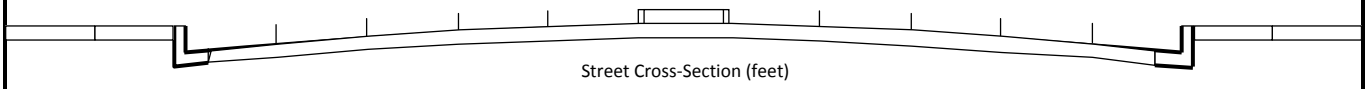
5

Ft/Trees	% Occ.

WB

Pavement Cond:	
Jay-Walking Legal:	

EB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Urban Street Multimodal Level of Service
Data Collection Sheet - Vehicle Traffic

Direction: **WB**

Street: BLISS AVE Date: 0-Jan-00

Limits: OM HARBOR ST TO RAILROAD A Observer: 0

Field Survey

	Segment And Downstream Signal		Speed Limit	Median Type	Left Turn Pocket	Drivewys Rightside	Unsig. Intersects
	From	To	(mph)	(0-3)	(y/n)	(#)	(#)
1	HARBOR ST	RAILROAD AVI	35	0	n	9	
2	RAILROAD AVI	--					
3	--	--					
4	--	--					
5	--	--					

Traffic Counts K: 100 D: 100

	Segment And Downstream Signal		Vol	Heavy Vehicle	RTOR+ PermLeft	Left/Right Turns	Thru Adj. Sat.	PHF
	From	To	(1-wy)	(%)	veh	%	(vphgl)	
1	HARBOR ST	RAILROAD AVI	201	2%	244	0%	1900	0.75
2	RAILROAD AVI	--						
3	--	--						
4	--	--						
5	--	--						

Arterial Traffic Performance & Signal Timing

			Field Survey		Signal Timing Data			
	Segment And Downstream Signal		Mean Speed	Average Stops	Cycle Length	Grn/Cycle for Thru	Ped Walk	Xing Ped Walk
	From	To	(mph)	(#/veh)	(secs)	(%)	(sec/cyc)	(sec/cyc)
1	HARBOR ST	RAILROAD AVI	31.5	0.8	80.0	19%	30.0	15.0
2	RAILROAD AVI	--	0.0					
3	--	--	0.0					
4	--	--	0.0					
5	--	--	0.0					

Notes: Median = 0 if None, 1 if one-way st., 2 if Painted or TWLTL, 3 if Raised
Heavy Vehicles = Buses plus trucks plus recreational vehicles
Thru Adusted Saturation Flow rates computed per Signalized Intersections Chapter, HC
Signal data is at the downstream signal

Urban Street Multimodal Level of Service
Data Collection Sheet - Transit

Direction: **WB**

Street: BLISS AVE Date: 0-Jan-00

Limits: FROM HARBOR ST TO RAILROAD AVE Observer: 0

Field Survey

Segment			Bus Stop	Shelters	Benches	CBD
	From	To	(#)	(% stops)	(% stops)	(yes/no)
1	HARBOR ST	RAILROAD AVE	0	0	0	no
2	RAILROAD AVE	--				
3	--	--				
4	--	--				
5	--	--				

Transit Performance Data

Segment			Route	Frequency	Load Factor	On-Time Perform.	Schedule Speed
	From	To	#'s	(bus/hr)	(pas/seat)	(%)	(mph)
1	HARBOR ST	RAILROAD AVE					
2	RAILROAD AVE	--					
3	--	--					
4	--	--					
5	--	--					

Bus is On-Time if arrives within: 5 minutes of scheduled time.
Average Passenger Trip Length: 6.4 miles

A. Compute Auto LOS and Performance

Street: **BLISS AVE**

Direction= **Down** **WB**

1. Compute Eastbound Hourly Demand (v)

Segment & Downstream Signal	AADT (vpd)	Peak Factor K (#)	Dir. Factor D (#)	Pk.Hr.Fac. PHF (#)	Thru Traffic (%)	Demand v (vph)	from:
1	201	1.000	1.00	0.75	100%	201	traffic
2	0	1.000	1.00	0	100%	#DIV/0!	traffic
3	0	1.000	1.00	0	100%	#DIV/0!	traffic
4	0	1.000	1.00	0	100%	#DIV/0!	traffic
5	0	1.000	1.00	0	100%	#DIV/0!	traffic

2. Compute Eastbound Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1900	1	0.19	361	0.56	OK	xsec 1-3, traffic
2	0	0	0.00	1	#DIV/0!	--	xsec 1-3, traffic
3	0	0	0.00	1	#DIV/0!	--	xsec 1-3, traffic
4	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic
5	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	35	1713	31.5	traffic, layout
2	0	0	0	traffic, layout
3	0	0	0	traffic, layout
4	0	0	0	traffic, layout
5	0	0	0	traffic, layout
Total/Ave.	35.0	1713	31.5	

4. Compute Stops & % Left Lane

Segment & Downstream Signal	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	2.53	n	0	traffic
2	#DIV/0!	0	0	traffic
3	#DIV/0!	0	0	traffic
4	#DIV/0!	0	0	traffic
5	#DIV/0!	0	0	traffic
Total/Ave	2.53	0.00	0.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weight. Ave.	Auto LOS
1	14.2%	35.4%	25.4%	13.7%	7.2%	4.1%	2.77	C
2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
3	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average	14.2%	35.4%	25.4%	13.7%	7.2%	4.1%	2.77	C

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Pedestrian LOS

Street: **BLISS AVE**

1. Compute Pedestrian Density LOS

Seg.	Sidewalk Width (ft)	Ped Flow (pph)	Ped. Density LOS #	Ped. Density LOS	
1	10	0	0.00	A	from
2	0	0	N/A	N/A	xsec1-3
3	0	0	N/A	N/A	xsec1-3
4	0	0	N/A	N/A	xsec1-3
5	0	0	N/A	N/A	xsec4-5
					xsec4-5

Density LOS Lookup	
Ped/hr/ft	LOS
0	A
300	B
420	C
600	D
900	E
1380	F

2. Compute Pedestrian Segment LOS

Seg.	Outside Lane (ft)	Bike Ln + Park/Shldr (ft)	On-Street Parking Occ (%)	Barrier (ft/Tree)	Buffer Width (ft)	Dir. Traffic Volume (vph)	Traf. Lanes One-Dir (lanes)	Midblock Veh. Speed (mph)	Ped. Seg. LOS #	
1	0	2	0%	0	0	201	1	33.3	2.84	xsec1-3
2	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec1-3
3	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec1-3
4	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5
5	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with intersection delay.

3. Compute Pedestrian Intersection LOS

Downstream Signal	RTOR+ Perm LT (vph)	X-Street Volume (vph)	X-Street PHF (#)	X-Street Speed (mph)	X-Street Lanes (#)	Ave Ped. Wait At Signal (sec)	Right Turn Channel Islands (#)	Ped. Intersect LOS #	
1	244	2539	0.75	35	5	15.6	0	6.36	layout, traffic
2	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
3	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
4	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
5	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic

Pedestrian Delay computed per Chapter 18 method (eqn 18-5, HCM 2000).

4. Compute Roadway Crossing Difficulty Factor (RCDF)

Seg.	Signal Spacing (ft)	Cross St. Ped Wait (secs/cycle)	Divert Delay (sec)	Arterial X Distance (ft)	Midblock Veh Speed (mph)	Vehicle Vol 2-Dir (vph)	Wait To X (max=900) (sec)	Is J-Walking Allowed? (Yes/No)	
1	1713	26.4	339	28	33.3	201	4	no	layout, traffic
2	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
3	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
4	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
5	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic

5. Compute Pedestrian Facility LOS

Segment & Downstream Signal	Min. Wait,Divert (sec)	Crossing LOS (#)	No Cross LOS (#)	RCDF (#)	Ped. NDLOS (#)	Ped. Density LOS #	Ped. Fac. LOS (#)	Ped. Facility LOS
1	4	1.00	3.91	1.00	3.91	0.00	3.91	E
2	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
3	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
4	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
5	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
Average							3.91	E

C. Compute Transit LOS

Street: **BLISS AVE**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	0	#DIV/0!	0%	0%	#DIV/0!	no	transit
2	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
3	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
4	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
5	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus (mph)	from
1	1713	31.5	0	#DIV/0!	transit
2	0	0	0	#DIV/0!	transit
3	0	0	0	#DIV/0!	transit
4	0	0	0	#DIV/0!	transit
5	0	0	0	#DIV/0!	transit
Total/Ave	1713	#DIV/0!		#DIV/0!	

3. Compute Transit Perceived Travel Time and Headway Factors

Segment	a1 factor	IVTTR min/mi	EWTTR min/mi	ATR min/mi	PTTR	Fptt	Fh
1	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
2	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
3	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
4	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
5	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00

IVTTR = In-Vehicle Travel Time Rate
EWTTR = Equivalent Wait Travel Time Rate
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor

4. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	#DIV/0!	3.91	#DIV/0!	F
2	#DIV/0!	#NUM!	#DIV/0!	F
3	#DIV/0!	#NUM!	#DIV/0!	F
4	#DIV/0!	#NUM!	#DIV/0!	F
5	#DIV/0!	#NUM!	#DIV/0!	F
Average			5.00	F

D. Compute Bicycle LOS

Street: **BLISS AVE**

1. Geometric Input Data

Segment & Downstream Signal	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Sig. Int Cross-Dist (ft)	Unsig.Conf Per Mile (conf/mi)	from
1	0	2	1	UD	112	27.7	xsec1-3, layout
2	0	0	0	UD	0	#DIV/0!	xsec1-3, layout
3	0	0	0	UD	0	#DIV/0!	xsec1-3, layout
4	0	0	0	UD	0	#DIV/0!	xsec4-5, layout
5	0	0	0	UD	0	#DIV/0!	xsec4-5, layout

2. Performance and Other Input Data

Segment & Downstream Signal	Traffic Volume (vph)	Heavy Vehicle (%)	Midblock Traffic Spd (mph)	On-Street Parking (%)	Pavement Rating (#)	from
1	201	2%	33.3	0%	2.0	traffic, xsec1-3
2	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec1-3
3	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec1-3
4	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5
5	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5

Pavement Rating: 1=Poor, 5=Excellent

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with inte

3. Compute Bicycle LOS

Segment & Downstream Signal	Prelim. Eff. Width (Wv)	Effective Width (We)	Speed Factor (#)	Segment LOS (#)	Intersect LOS (#)	Bicycle Score (#)	Bicycle LOS
1	2.0	4.0	3.70	5.68	5.88	8.67	F
2	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
3	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average						8.67	F

E. LOS Summary

Title: BLISS AVE

Direction =	Down	WB

Date: Analyst:

Segment & Downstream Signal	Auto Stops LOS #1	Auto Speed LOS #2	Auto HCM LOS #3	Auto NCHRP 379 LOS #4	Transit LOS	Bicycle LOS	Pedestrian LOS
1	C	B	A	A	F	F	E
2	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
3	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
4	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
5	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
Facility	C	#DIV/0!	A	A	F	F	E

Auto Performance Measures Summary WB

Seg+Sig	Stops	FFS	Speed	%FFS
1	2.53	35.0	31.5	90.0%
2	#DIV/0!	0.0	0	#DIV/0!
3	#DIV/0!	0.0	0	#DIV/0!
4	#DIV/0!	0.0	0	#DIV/0!
5	#DIV/0!	0.0	0	#DIV/0!
Facility	2.53	35.0	31.5	90.0%

Spreadsheet created by: R.Dowling of Dowling Associates, Inc.
Under contract to:
Transportation Research Board
NCHRP 3-70 Multimodal Level of Service For Urban Streets

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Spreadsheet does not have data entry error checking.
Created: 8-Jun-07 Updated: 25-Sep-08

Multimodal Level of Service for Urban Streets

Diagram of Uban Street

Street: RAILROAD AVE

Date:

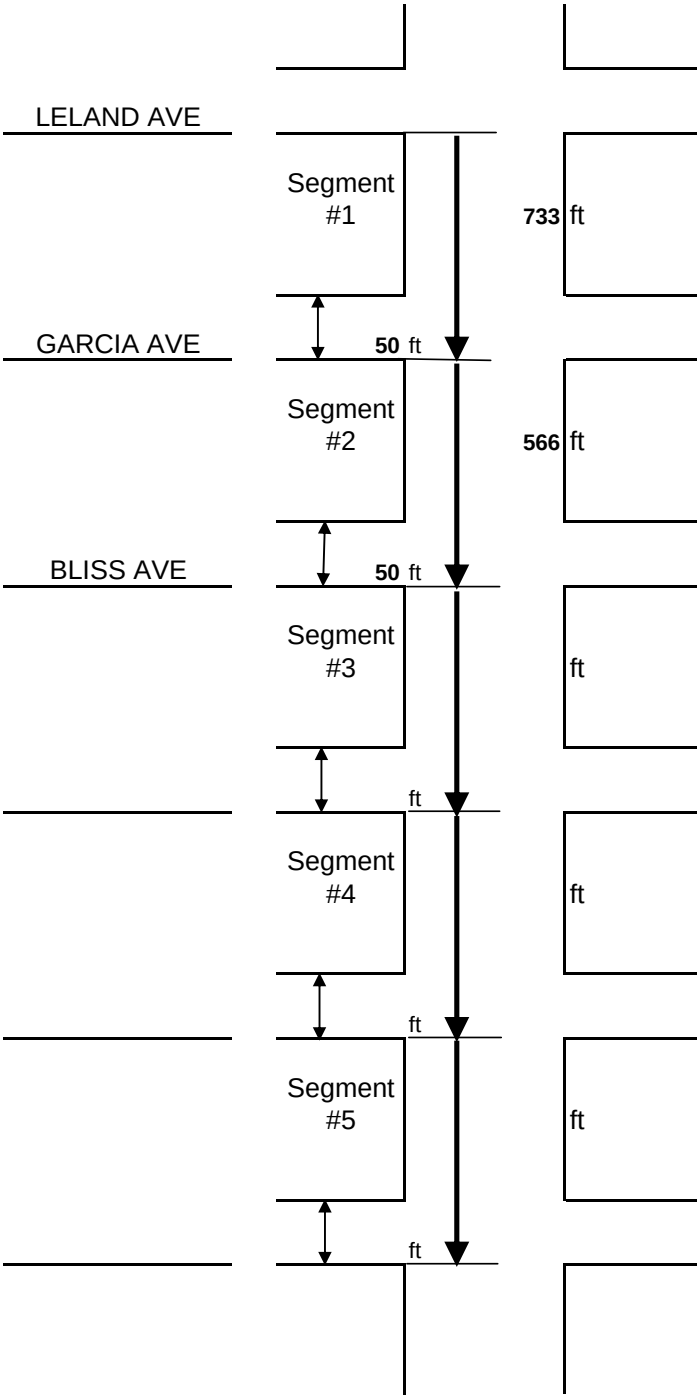
Limits: FROM LELAND RD TO BLISS AVE

Observer:

Analysis Direction:	NB

(NB, SB, EB, WB)
(NW, SE, NE, SW)

Data Entry Fields in Red



Intersect. Control	X-Street Lanes	X-Street Speed	X-Street 2-W vph	Right Turn Isl.
SIGNAL	4	35	639	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	5	35	385	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: RAILROAD AVE

Limits: FROM LELAND R

Observer: 0

Cross-Section #1
From: M LELAND RD TO BLISS To: GARCIA AVE

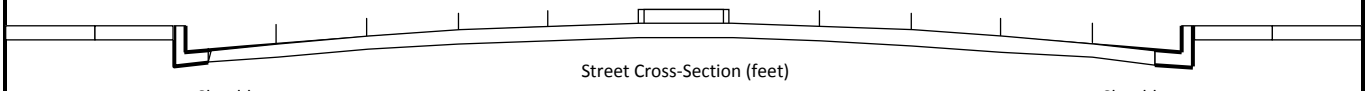
1

Ft/Trees	% Occ.
30	0%

NB

Pavement Cond:	5
Jay-Walking Legal:	NO

SB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	12	14	0	0	12	12	3	12	12	12	0	14	0	5

Ped Vol: 0

Cross-Section #2
From: GARCIA AVE To: BLISS AVE

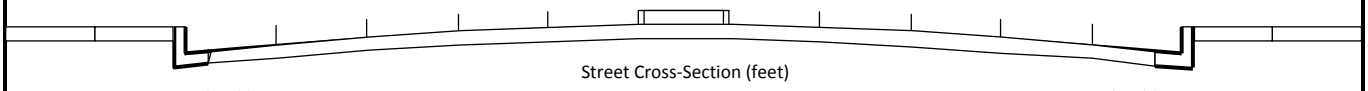
2

Ft/Trees	% Occ.
30	0%

NB

Pavement Cond:	5
Jay-Walking Legal:	NO

SB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	12	14	0	0	12	12	3	12	12	0	0	14	0	5

0

Cross-Section #3
From: BLISS AVE To: 0

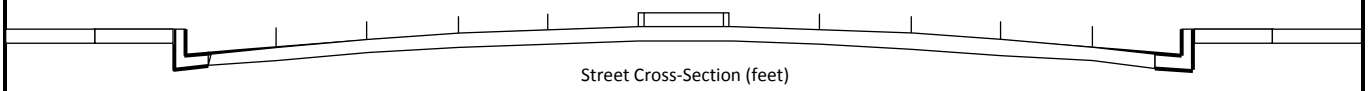
3

Ft/Trees	% Occ.

NB

Pavement Cond:	
Jay-Walking Legal:	

SB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Multimodal Level of Service for Urban Streets

Street Cross-Section Data | Street: RAILROAD AVE | Limits: FROM LELAND R

Cross-Section #4 | Observer: 0

From: M LELAND RD TO BLISS To: 0

4

Ft/Trees	% Occ.

NB | Pavement Cond: | Jay-Walking Legal: | SB

Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Cross-Section #5

From: 0 To: 0

5

Ft/Trees	% Occ.

NB | Pavement Cond: | Jay-Walking Legal: | SB

Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Urban Street Multimodal Level of Service
Data Collection Sheet - Vehicle Traffic

Direction: **NB**

Street: RAILROAD AVE Date: 0-Jan-00

ISS AVE

Limits: FROM LELAND RD TO BLISS AVE Observer: 0

Field Survey

	Segment And Downstream Signal		Speed Limit	Median Type	Left Turn Pocket	Drivewys Rightside	Unsig. Intersects
	From	To	(mph)	(0-3)	(y/n)	(#)	(#)
1	LELAND AVE	GARCIA AVE	35	3	yes	6	
2	GARCIA AVE	BLISS AVE	35	3	yes	4	
3	BLISS AVE	0					
4	0	0					
5	0	0					

Traffic Counts K: 100 D: 100

	Segment And Downstream Signal		Vol	Heavy Vehicle	RTOR+ PermLeft	Left/Right Turns	Thru Adj. Sat.	PHF
	From	To	(1-wy)	(%)	veh	%	(vphgl)	
1	LELAND AVE	GARCIA AVE	840	2%	471	0%	1900	0.92
2	GARCIA AVE	BLISS AVE	922	2%	18	0%	1900	0.88
3	BLISS AVE	0						
4	0	0						
5	0	0						

Arterial Traffic Performance & Signal Timing

			Field Survey		Signal Timing Data			
	Segment And Downstream Signal		Mean Speed	Average Stops	Cycle Length	Grn/Cycle for Thru	Ped Walk	Xing Ped Walk
	From	To	(mph)	(#/veh)	(secs)	(%)	(sec/cyc)	(sec/cyc)
1	LELAND AVE	GARCIA AVE	31.5	1.5	80.0	50%	12.0	21.0
2	GARCIA AVE	BLISS AVE	31.5	2.5	80.0	43%	12.0	28.0
3	BLISS AVE	0						
4	0	0						
5	0	0						

Notes: Median = 0 if None, 1 if one-way st., 2 if Painted or TWLTL, 3 if Raised
Heavy Vehicles = Buses plus trucks plus recreational vehicles
Thru Adusted Saturation Flow rates computed per Signalized Intersections Chapter, HC
Signal data is at the downstream signal

Urban Street Multimodal Level of Service
Data Collection Sheet - Transit

Direction: **NB**

Street: RAILROAD AVE Date: 0-Jan-00

ISS AVE

Limits: FROM LELAND RD TO BLISS AVE Observer: 0

Field Survey

Segment			Bus Stop	Shelters	Benches	CBD
	From	To	(#)	(% stops)	(% stops)	(yes/no)
1	LELAND AVE	GARCIA AVE	1	0	0	no
2	GARCIA AVE	BLISS AVE	0	0	0	no
3	BLISS AVE	0				
4	0	0				
5	0	0				

Transit Performance Data

Segment			Route	Frequency	Load Factor	On-Time Perform.	Schedule Speed
	From	To	#'s	(bus/hr)	(pas/seat)	(%)	(mph)
1	LELAND AVE	GARCIA AVE	380-W	2	0.55	0.962	14
2	GARCIA AVE	BLISS AVE	380-W	2	0.55	0.962	14
3	BLISS AVE	0					
4	0	0					
5	0	0					

Bus is On-Time if arrives within: 5 minutes of scheduled time.
Average Passenger Trip Length: 6.4 miles

A. Compute Auto LOS and Performance

Street: **RAILROAD AVE**

Direction= **FROM LELAND RD TO BLISS AVE** **NB**

1. Compute Eastbound Hourly Demand (v)

Segment & Downstream Signal	AADT (vpd)	Peak Factor K (#)	Dir. Factor D (#)	Pk.Hr.Fac. PHF (#)	Thru Traffic (%)	Demand v (vph)	from:
1	840	1.000	1.00	0.92	100%	840	traffic
2	922	1.000	1.00	0.88	100%	922	traffic
3	0	1.000	1.00	0	100%	#DIV/0!	traffic
4	0	1.000	1.00	0	100%	#DIV/0!	traffic
5	0	1.000	1.00	0	100%	#DIV/0!	traffic

2. Compute Eastbound Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1900	2	0.50	1900	0.44	OK	xsec 1-3, traffic
2	1900	2	0.43	1634	0.56	OK	xsec 1-3, traffic
3	0	0	0.00	1	#DIV/0!	--	xsec 1-3, traffic
4	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic
5	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	35	733	31.5	traffic, layout
2	35	566	31.5	traffic, layout
3	0	0	0	traffic, layout
4	0	0	0	traffic, layout
5	0	0	0	traffic, layout
Total/Ave.	35.0	1299	31.5	

4. Compute Stops & % Left Lane

Segment & Downstream Signal	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	10.88	yes	3	traffic
2	23.51	yes	3	traffic
3	#DIV/0!	0	0	traffic
4	#DIV/0!	0	0	traffic
5	#DIV/0!	0	0	traffic
Total/Ave	16.38	1.00	3.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weight. Ave.	Auto LOS
1	2.7%	11.6%	19.5%	23.5%	22.8%	19.8%	4.12	D
2	0.1%	0.6%	1.4%	3.2%	9.0%	85.8%	5.78	F
3	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average	0.7%	3.3%	7.3%	13.8%	25.0%	49.9%	5.09	F

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Pedestrian LOS

Street: **RAILROAD AVE**

1. Compute Pedestrian Density LOS

Seg.	Sidewalk Width (ft)	Ped Flow (pph)	Ped. Density LOS #	Ped. Density LOS	from
1	5	0	0.00	A	xsec1-3
2	5	0	0.00	A	xsec1-3
3	0	0	N/A	N/A	xsec1-3
4	0	0	N/A	N/A	xsec4-5
5	0	0	N/A	N/A	xsec4-5

Density LOS Lookup	
Ped/hr/ft	LOS
0	A
300	B
420	C
600	D
900	E
1380	F

2. Compute Pedestrian Segment LOS

Seg.	Outside Lane (ft)	Bike Ln + Park/Shldr (ft)	On-Street Parking Occ (%)	Barrier (ft/Tree)	Buffer Width (ft)	Dir. Traffic Volume (vph)	Traf. Lanes One-Dir (lanes)	Midblock Veh. Speed (mph)	Ped. Seg. LOS #	from
1	0	14	0%	30	12	840	2	33.3	2.12	xsec1-3
2	0	14	0%	30	12	922	2	33.3	2.28	xsec1-3
3	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec1-3
4	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5
5	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with intersection delay.

3. Compute Pedestrian Intersection LOS

Downstream Signal	RTOR+ Perm LT (vph)	X-Street Volume (vph)	X-Street PHF (#)	X-Street Speed (mph)	X-Street Lanes (#)	Ave Ped. Wait At Signal (sec)	Right Turn Channel Islands (#)	Ped. Intersect LOS #	from
1	471	639	0.92	35	4	28.9	0	3.57	layout, traffic
2	18	385	0.88	35	5	28.9	0	2.60	layout, traffic
3	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
4	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
5	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic

Pedestrian Delay computed per Chapter 18 method (eqn 18-5, HCM 2000).

4. Compute Roadway Crossing Difficulty Factor (RCDF)

Seg.	Signal Spacing (ft)	Cross St. Ped Wait (secs/cycle)	Divert Delay (sec)	Arterial X Distance (ft)	Midblock Veh Speed (mph)	Vehicle Vol 2-Dir (vph)	Wait To X (max=900) (sec)	Is J-Walking Allowed? (Yes/No)	from
1	733	21.8	150	91	33.3	840	900	NO	layout, traffic
2	566	16.9	116	79	33.3	922	900	NO	layout, traffic
3	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
4	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
5	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic

5. Compute Pedestrian Facility LOS

Segment & Downstream Signal	Min. Wait,Divert (sec)	Crossing LOS (#)	No Cross LOS (#)	RCDF (#)	Ped. NDLOS (#)	Ped. Density LOS #	Ped. Fac. LOS (#)	Ped. Facility LOS
1	150	6.00	3.06	1.00	3.06	0.00	3.06	D
2	116	6.00	2.90	1.00	2.90	0.00	2.90	D
3	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
4	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
5	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
Average							2.99	D

C. Compute Transit LOS

Street: **RAILROAD AVE**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	2	96%	0%	0%	0.55	no	transit
2	2	96%	0%	0%	0.55	no	transit
3	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
4	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
5	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus (mph)	from
1	733	31.5	1	14.0	transit
2	566	31.5	0	14.0	transit
3	0	0	0	#DIV/0!	transit
4	0	0	0	#DIV/0!	transit
5	0	0	0	#DIV/0!	transit
Total/Ave	1299	#DIV/0!		#DIV/0!	

3. Compute Transit Perceived Travel Time and Headway Factors

Segment	a1 factor	IVTTR min/mi	EWTTR min/mi	ATR min/mi	PTTR	Fptt	Fh
1	1.00	4.29	0.01	0.00	4.30	1.14	1.97
2	1.00	4.29	0.01	0.00	4.30	1.14	1.97
3	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
4	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
5	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00

IVTTR = In-Vehicle Travel Time Rate
EWTTR = Equivalent Wait Travel Time Rate
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor

4. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	2.25	3.06	3.08	C
2	2.25	2.90	3.06	C
3	#DIV/0!	#NUM!	#DIV/0!	F
4	#DIV/0!	#NUM!	#DIV/0!	F
5	#DIV/0!	#NUM!	#DIV/0!	F
Average			3.07	C

D. Compute Bicycle LOS

Street: **RAILROAD AVE**

1. Geometric Input Data

Segment & Downstream Signal	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Sig. Int Cross-Dist (ft)	Unsig.Conf Per Mile (conf/mi)	from
1	0	14	2	D	50	43.2	xsec1-3, layout
2	0	14	2	D	50	37.3	xsec1-3, layout
3	0	0	0	UD	0	#DIV/0!	xsec1-3, layout
4	0	0	0	UD	0	#DIV/0!	xsec4-5, layout
5	0	0	0	UD	0	#DIV/0!	xsec4-5, layout

2. Performance and Other Input Data

Segment & Downstream Signal	Traffic Volume (vph)	Heavy Vehicle (%)	Midblock Traffic Spd (mph)	On-Street Parking (%)	Pavement Rating (#)	from
1	840	2%	33.3	0%	5.0	traffic, xsec1-3
2	922	2%	33.3	0%	5.0	traffic, xsec1-3
3	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec1-3
4	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5
5	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5

Pavement Rating: 1=Poor, 5=Excellent

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with inte

3. Compute Bicycle LOS

Segment & Downstream Signal	Prelim. Eff. Width (Wv)	Effective Width (We)	Speed Factor (#)	Segment LOS (#)	Intersect LOS (#)	Bicycle Score (#)	Bicycle LOS
1	14.0	28.0	3.70	0.62	2.69	4.62	F
2	14.0	28.0	3.70	0.69	2.80	4.45	F
3	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average						4.55	F

E. LOS Summary

Title: RAILROAD AVE

Direction =	LAND RD TO E	NB	Date:	Analyst:

Segment & Downstream Signal	Auto Stops LOS #1	Auto Speed LOS #2	Auto HCM LOS #3	Auto NCHRP 379 LOS #4	Transit LOS	Bicycle LOS	Pedestrian LOS
1	D	A	A	A	C	F	D
2	F	A	A	A	C	F	D
3	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
4	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
5	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
Facility	F	#DIV/0!	A	A	C	F	D

Auto Performance Measures Summary NB

Seg+Sig	Stops	FFS	Speed	%FFS
1	10.88	35.0	31.5	90.0%
2	23.51	35.0	31.5	90.0%
3	#DIV/0!	0.0	0	#DIV/0!
4	#DIV/0!	0.0	0	#DIV/0!
5	#DIV/0!	0.0	0	#DIV/0!
Facility	16.38	35.0	31.5	90.0%

Spreadsheet created by: R.Dowling of Dowling Associates, Inc.
Under contract to:
Transportation Research Board
NCHRP 3-70 Multimodal Level of Service For Urban Streets

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Spreadsheet does not have data entry error checking.
Created: 8-Jun-07 Updated: 25-Sep-08

Multimodal Level of Service for Urban Streets

Diagram of Uban Street

Street: RAILROAD AVE

Date:

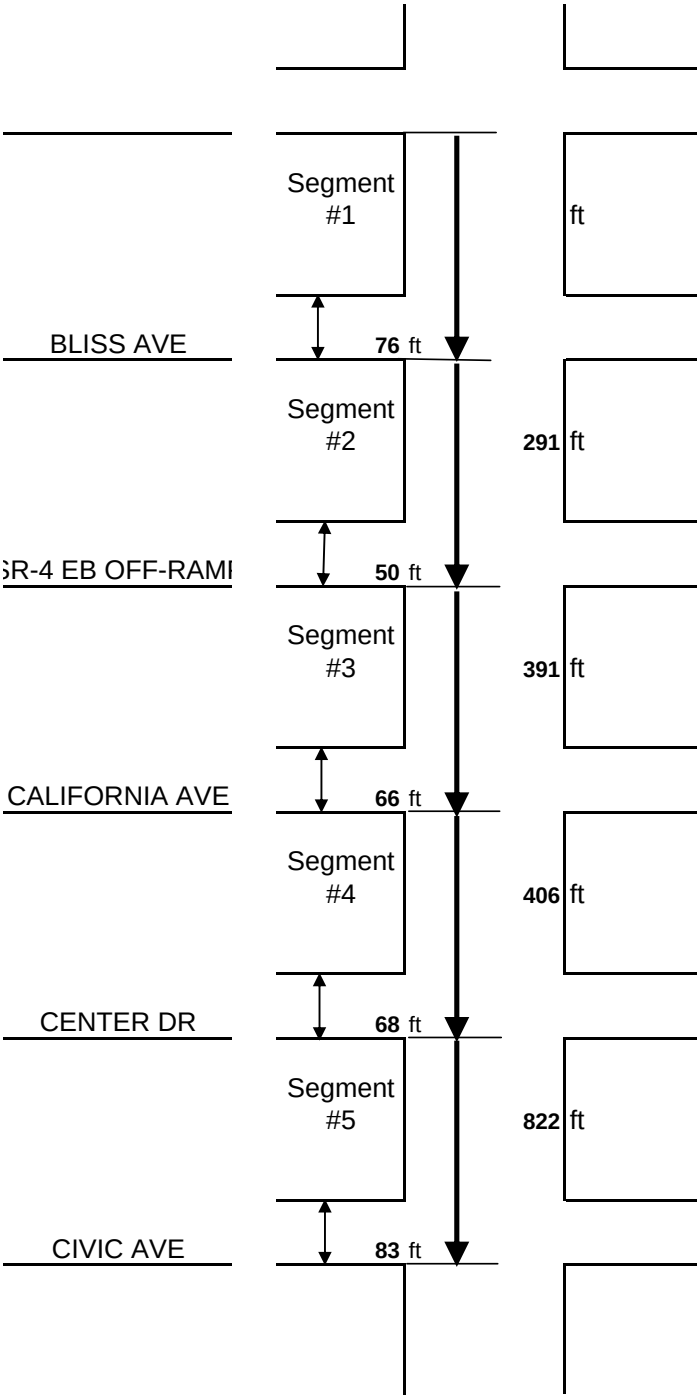
Limits: FROM BLISS AVE TO CIVIC AVE

Observer:

Analysis Direction:	NB

(NB, SB, EB, WB)
(NW, SE, NE, SW)

Data Entry Fields in Red



Intersect. Control	X-Street Lanes	X-Street Speed	X-Street 2-W vph	Right Turn Isl.
SIGNAL	5	35	385	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	2	35	1105	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	3	30	566	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	0	0	0	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	0	0	0	0

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: RAILROAD AVE

Limits: FROM BLISS AV

Observer: 0

Cross-Section #1
From: 0 To: BLISS AVE

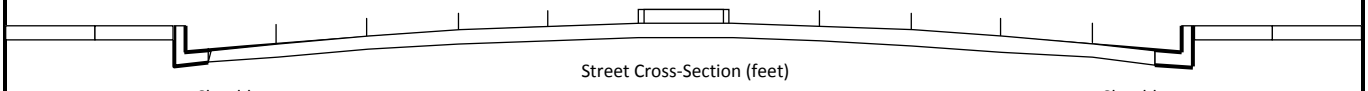
1

Ft/Trees	% Occ.

NB

Pavement Cond:	
Jay-Walking Legal:	

SB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Cross-Section #2
From: BLISS AVE To: SR-4 EB OFF-RAMP

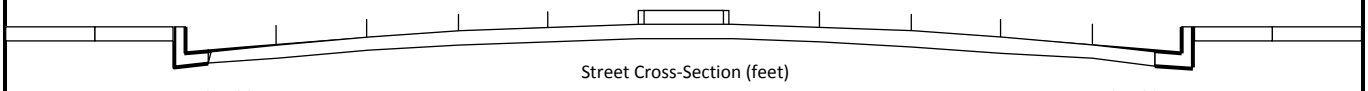
2

Ft/Trees	% Occ.
0	0%

NB

Pavement Cond:	5
Jay-Walking Legal:	no

SB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	8	0	12	12	12	10	12	12	12	0	8	0	5

0

Cross-Section #3
From: SR-4 EB OFF-RAMP To: CALIFORNIA AVE

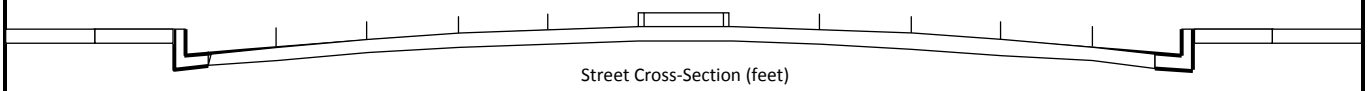
3

Ft/Trees	% Occ.
0	0

NB

Pavement Cond:	5
Jay-Walking Legal:	no

SB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
10	0	8	0	12	12	24	4	12	12	12	0	8	0	5

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: RAILROAD AVE

Limits: FROM BLISS AV

Cross-Section #4

Observer: 0

From: CALIFORNIA AVE To: CENTER DR

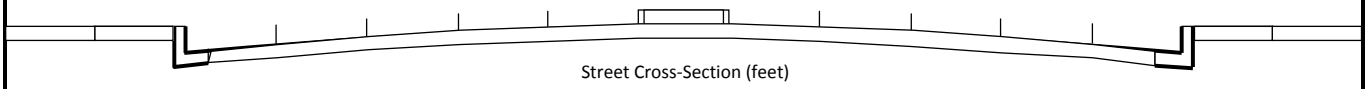
4

Ft/Trees	% Occ.
0	0

NB

Pavement Cond:	5
Jay-Walking Legal:	no

SB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
10	0	8	0	0	12	12	6	12	12	0	0	8	0	5

Ped Vol: 0

Cross-Section #5

From: CENTER DR To: CIVIC AVE

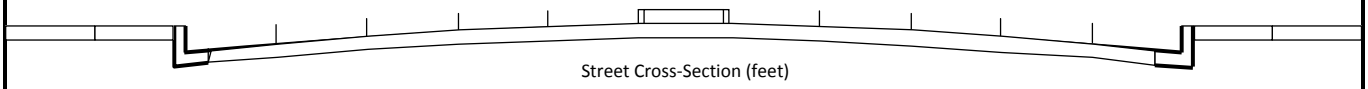
5

Ft/Trees	% Occ.
30	0

NB

Pavement Cond:	5
Jay-Walking Legal:	no

SB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	5	7	0	0	12	12	6	12	12	0	0	7	5	5

Ped Vol: 0

Urban Street Multimodal Level of Service
Data Collection Sheet - Vehicle Traffic

Direction: **NB**

Street: RAILROAD AVE Date: 0-Jan-00

Limits: FROM BLISS AVE TO CIVIC AVE Observer: 0

Field Survey

	Segment And Downstream Signal		Speed Limit	Median Type	Left Turn Pocket	Drivewys Rightside	Unsig. Intersects
	From	To	(mph)	(0-3)	(y/n)	(#)	(#)
1	0	BLISS AVE					
2	BLISS AVE	-4 EB OFF-RA	35	3	no	1	
3	-4 EB OFF-RA	ALIFORNIA AV	35	3	yes	0	
4	ALIFORNIA AV	CENTER DR	35	3	yes	0	
5	CENTER DR	CIVIC AVE	35	3	yes	4	

Traffic Counts K: 100 D: 100

	Segment And Downstream Signal		Vol	Heavy Vehicle	RTOR+ PermLeft	Left/Right Turns	Thru Adj. Sat.	PHF
	From	To	(1-wy)	(%)	veh	%	(vphgl)	
1	0	BLISS AVE						
2	BLISS AVE	-4 EB OFF-RA	1364	2%	823	0%	1900	0.93
3	-4 EB OFF-RA	ALIFORNIA AV	1325	2%	352	0%	1900	0.93
4	ALIFORNIA AV	CENTER DR	1135	2%	0	0%	1900	0.92
5	CENTER DR	CIVIC AVE	806	2%	5	0%	1900	0.95

Arterial Traffic Performance & Signal Timing

	Segment And Downstream Signal		Field Survey		Signal Timing Data			
			Mean Speed	Average Stops	Cycle Length	Grn/Cycle for Thru	Ped Walk	Xing Ped Walk
	From	To	(mph)	(#/veh)	(secs)	(%)	(sec/cyc)	(sec/cyc)
1	0	BLISS AVE						
2	BLISS AVE	-4 EB OFF-RA	31.5	1.3	80.0	36%	14.0	26.0
3	-4 EB OFF-RA	ALIFORNIA AV	31.5	0.4	80.0	53%	14.0	38.0
4	ALIFORNIA AV	CENTER DR	24.5	0.5	80.0	75%	0.0	22.0
5	CENTER DR	CIVIC AVE	14.0	0.3	80.0	50%	0.0	23.0

Notes: Median = 0 if None, 1 if one-way st., 2 if Painted or TWLTL, 3 if Raised
Heavy Vehicles = Buses plus trucks plus recreational vehicles
Thru Adusted Saturation Flow rates computed per Signalized Intersections Chapter, HC
Signal data is at the downstream signal

Urban Street Multimodal Level of Service
Data Collection Sheet - Transit

Direction: **NB**

Street: RAILROAD AVE Date: 0-Jan-00

Limits: FROM BLISS AVE TO CIVIC AVE Observer: 0

Field Survey

Segment			Bus Stop	Shelters	Benches	CBD
	From	To	(#)	(% stops)	(% stops)	(yes/no)
1	0	BLISS AVE	1	0	0	no
2	BLISS AVE	-4 EB OFF-RA	1	0	1	no
3	-4 EB OFF-RA	ALIFORNIA AV	0	0	0	no
4	ALIFORNIA AV	CENTER DR	0	0	0	no
5	CENTER DR	CIVIC AVE	0	0	0	no

Transit Performance Data

Segment			Route	Frequency	Load Factor	On-Time Perform.	Schedule Speed
	From	To	#'s	(bus/hr)	(pas/seat)	(%)	(mph)
1	0	BLISS AVE					
2	BLISS AVE	-4 EB OFF-RA	380-W	2	0.55	0.962	14
3	-4 EB OFF-RA	ALIFORNIA AV	380-W	2	0.55	0.962	14
4	ALIFORNIA AV	CENTER DR	380-W	2	0.55	0.962	14
5	CENTER DR	CIVIC AVE	380-W	2	0.55	0.962	14

Bus is On-Time if arrives within: 5 minutes of scheduled time.
Average Passenger Trip Length: 6.4 miles

A. Compute Auto LOS and Performance

Street: **RAILROAD AVE**

Direction= **Down** **NB**

1. Compute Eastbound Hourly Demand (v)

Segment & Downstream Signal	AADT (vpd)	Peak Factor K (#)	Dir. Factor D (#)	Pk.Hr.Fac. PHF (#)	Thru Traffic (%)	Demand v (vph)	from:
1	0	1.000	1.00	0	100%	0	traffic
2	1364	1.000	1.00	0.93	100%	1364	traffic
3	1325	1.000	1.00	0.93	100%	1325	traffic
4	1135	1.000	1.00	0.92	100%	1135	traffic
5	806	1.000	1.00	0.95	100%	806	traffic

2. Compute Eastbound Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	0	0	0.00	1	0.00	OK	xsec 1-3, traffic
2	1900	3	0.36	2052	0.66	OK	xsec 1-3, traffic
3	1900	4	0.53	4028	0.33	OK	xsec 1-3, traffic
4	1900	2	0.75	2850	0.40	OK	xsec 4-5, traffic
5	1900	2	0.50	1900	0.42	OK	xsec 4-5, traffic

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	0	0	0	traffic, layout
2	35	291	31.5	traffic, layout
3	35	391	31.5	traffic, layout
4	35	406	24.5	traffic, layout
5	35	822	14.0	traffic, layout
Total/Ave.	35.0	1910	19.7	

4. Compute Stops & % Left Lane

Segment & Downstream Signal	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	#DIV/0!	0	0	traffic
2	23.22	no	3	traffic
3	4.73	yes	3	traffic
4	6.24	yes	3	traffic
5	2.18	yes	3	traffic
Total/Ave	6.77	0.75	3.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weight. Ave.	Auto LOS
1	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
2	0.1%	0.4%	1.1%	2.5%	7.2%	88.8%	5.83	F
3	11.8%	32.5%	26.5%	15.6%	8.6%	5.0%	2.92	C
4	8.3%	26.8%	27.2%	19.0%	11.6%	7.1%	3.20	C
5	20.3%	40.0%	22.0%	10.2%	4.9%	2.7%	2.48	B
Average	6.8%	23.5%	26.7%	20.7%	13.6%	8.7%	3.37	C

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Pedestrian LOS

Street: **RAILROAD AVE**

1. Compute Pedestrian Density LOS

Seg.	Sidewalk Width (ft)	Ped Flow (pph)	Ped. Density LOS #	Ped. Density LOS	
1	0	0	N/A	N/A	from
2	5	0	0.00	A	xsec1-3
3	10	0	0.00	A	xsec1-3
4	10	0	0.00	A	xsec1-3
5	5	0	0.00	A	xsec4-5
					xsec4-5

Density LOS Lookup	
Ped/hr/ft	LOS
0	A
300	B
420	C
600	D
900	E
1380	F

2. Compute Pedestrian Segment LOS

Seg.	Outside Lane (ft)	Bike Ln + Park/Shldr (ft)	On-Street Parking Occ (%)	Barrier (ft/Tree)	Buffer Width (ft)	Dir. Traffic Volume (vph)	Traf. Lanes One-Dir (lanes)	Midblock Veh. Speed (mph)	Ped. Seg. LOS #	
1	0	0	0%	0	0	0	0	0.0	#NUM!	xsec1-3
2	12	8	0%	0	0	1,364	3	33.3	3.05	xsec1-3
3	12	8	0%	0	0	1,325	4	33.3	2.54	xsec1-3
4	0	8	0%	0	0	1,135	2	29.8	3.41	xsec4-5
5	0	7	0%	30	5	806	2	24.5	2.50	xsec4-5

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with intersection delay.

3. Compute Pedestrian Intersection LOS

Downstream Signal	RTOR+ Perm LT (vph)	X-Street Volume (vph)	X-Street PHF (#)	X-Street Speed (mph)	X-Street Lanes (#)	Ave Ped. Wait At Signal (sec)	Right Turn Channel Islands (#)	Ped. Intersect LOS #	
1	0	385	0.00	35	5	#DIV/0!	0	#DIV/0!	layout, traffic
2	823	1105	0.93	35	2	27.2	0	4.62	layout, traffic
3	352	566	0.93	30	3	27.2	0	3.16	layout, traffic
4	0	0	0.92	0	0	40.0	0	1.93	layout, traffic
5	5	0	0.95	0	0	40.0	0	1.94	layout, traffic

Pedestrian Delay computed per Chapter 18 method (eqn 18-5, HCM 2000).

4. Compute Roadway Crossing Difficulty Factor (RCDF)

Seg.	Signal Spacing (ft)	Cross St. Ped Wait (secs/cycle)	Divert Delay (sec)	Arterial X Distance (ft)	Midblock Veh Speed (mph)	Vehicle Vol 2-Dir (vph)	Wait To X (max=900) (sec)	Is J-Walking Allowed? (Yes/No)	
1	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
2	291	18.2	65	98	33.3	1,364	900	no	layout, traffic
3	391	11.0	80	104	33.3	1,325	900	no	layout, traffic
4	406	21.0	88	70	29.8	1,135	900	no	layout, traffic
5	822	20.3	167	68	24.5	806	579	no	layout, traffic

5. Compute Pedestrian Facility LOS

Segment & Downstream Signal	Min. Wait,Divert (sec)	Crossing LOS (#)	No Cross LOS (#)	RCDF (#)	Ped. NDLOS (#)	Ped. Density LOS #	Ped. Fac. LOS (#)	Ped. Facility LOS
1	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
2	65	6.00	3.59	1.00	3.59	0.00	3.59	E
3	80	6.00	3.11	1.00	3.11	0.00	3.11	D
4	88	6.00	3.11	1.00	3.11	0.00	3.11	D
5	167	6.00	2.83	1.00	2.83	0.00	2.83	D
Average							3.06	D

C. Compute Transit LOS

Street: **RAILROAD AVE**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	0	#DIV/0!	0%	0%	#DIV/0!	no	transit
2	2	96%	0%	100%	0.55	no	transit
3	2	96%	0%	0%	0.55	no	transit
4	2	96%	0%	0%	0.55	no	transit
5	2	96%	0%	0%	0.55	no	transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus (mph)	from
1	0	0	1	#DIV/0!	transit
2	291	31.5	1	14.0	transit
3	391	31.5	0	14.0	transit
4	406	24.5	0	14.0	transit
5	822	14.0	0	14.0	transit
Total/Ave	1910	#DIV/0!		#DIV/0!	

3. Compute Transit Perceived Travel Time and Headway Factors

Segment	a1 factor	IVTTR min/mi	EWTTR min/mi	ATR min/mi	PTTR	Fptt	Fh
1	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
2	1.00	4.29	0.01	0.03	4.27	1.14	1.97
3	1.00	4.29	0.01	0.00	4.30	1.14	1.97
4	1.00	4.29	0.01	0.00	4.30	1.14	1.97
5	1.00	4.29	0.01	0.00	4.30	1.14	1.97

IVTTR = In-Vehicle Travel Time Rate
EWTTR = Equivalent Wait Travel Time Rate
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor

4. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	#DIV/0!	#NUM!	#DIV/0!	F
2	2.26	3.59	3.15	C
3	2.25	3.11	3.09	C
4	2.25	3.11	3.09	C
5	2.25	2.83	3.05	C
Average			3.08	C

D. Compute Bicycle LOS

Street: **RAILROAD AVE**

1. Geometric Input Data

Segment & Downstream Signal	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Sig. Int Cross-Dist (ft)	Unsig.Conf Per Mile (conf/mi)	from
1	0	0	0	UD	76	#DIV/0!	xsec1-3, layout
2	12	8	3	D	50	18.1	xsec1-3, layout
3	12	8	4	D	66	0.0	xsec1-3, layout
4	0	8	2	D	68	0.0	xsec4-5, layout
5	0	7	2	D	83	25.7	xsec4-5, layout

2. Performance and Other Input Data

Segment & Downstream Signal	Traffic Volume (vph)	Heavy Vehicle (%)	Midblock Traffic Spd (mph)	On-Street Parking (%)	Pavement Rating (#)	from
1	0	0%	0.0	0%	0.0	traffic, xsec1-3
2	1364	2%	33.3	0%	5.0	traffic, xsec1-3
3	1325	2%	33.3	0%	5.0	traffic, xsec1-3
4	1135	2%	29.8	0%	5.0	traffic, xsec4-5
5	806	2%	24.5	0%	5.0	traffic, xsec4-5

Pavement Rating: 1=Poor, 5=Excellent

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with inte

3. Compute Bicycle LOS

Segment & Downstream Signal	Prelim. Eff. Width (Wv)	Effective Width (We)	Speed Factor (#)	Segment LOS (#)	Intersect LOS (#)	Bicycle Score (#)	Bicycle LOS
1	0.0	0.0	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
2	20.0	28.0	3.70	0.66	1.46	3.64	E
3	20.0	28.0	3.70	0.50	1.47	2.98	D
4	8.0	16.0	3.36	3.32	4.53	4.40	F
5	7.0	14.0	2.49	3.18	4.64	5.39	F
Average						4.42	F

E. LOS Summary

Title: RAILROAD AVE

Direction =	Down	NB

Date: Analyst:

Segment & Downstream Signal	Auto Stops LOS #1	Auto Speed LOS #2	Auto HCM LOS #3	Auto NCHRP 379 LOS #4	Transit LOS	Bicycle LOS	Pedestrian LOS
1	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
2	F	A	A	A	C	E	E
3	C	A	A	A	C	D	D
4	C	B	B	B	C	F	D
5	B	C	D	D	C	F	D
Facility	C	#DIV/0!	C	C	C	F	D

Auto Performance Measures Summary NB

Seg+Sig	Stops	FFS	Speed	%FFS
1	#DIV/0!	0.0	0	#DIV/0!
2	23.22	35.0	31.5	90.0%
3	4.73	35.0	31.5	90.0%
4	6.24	35.0	24.5	70.0%
5	2.18	35.0	14.0	40.0%
Facility	6.77	35.0	19.7	56.3%

Spreadsheet created by: R.Dowling of Dowling Associates, Inc.
Under contract to:
Transportation Research Board
NCHRP 3-70 Multimodal Level of Service For Urban Streets

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Created: 8-Jun-07 Updated: 25-Sep-08

Multimodal Level of Service for Urban Streets

Diagram of Uban Street

Street: RAILROAD AVE

Date:

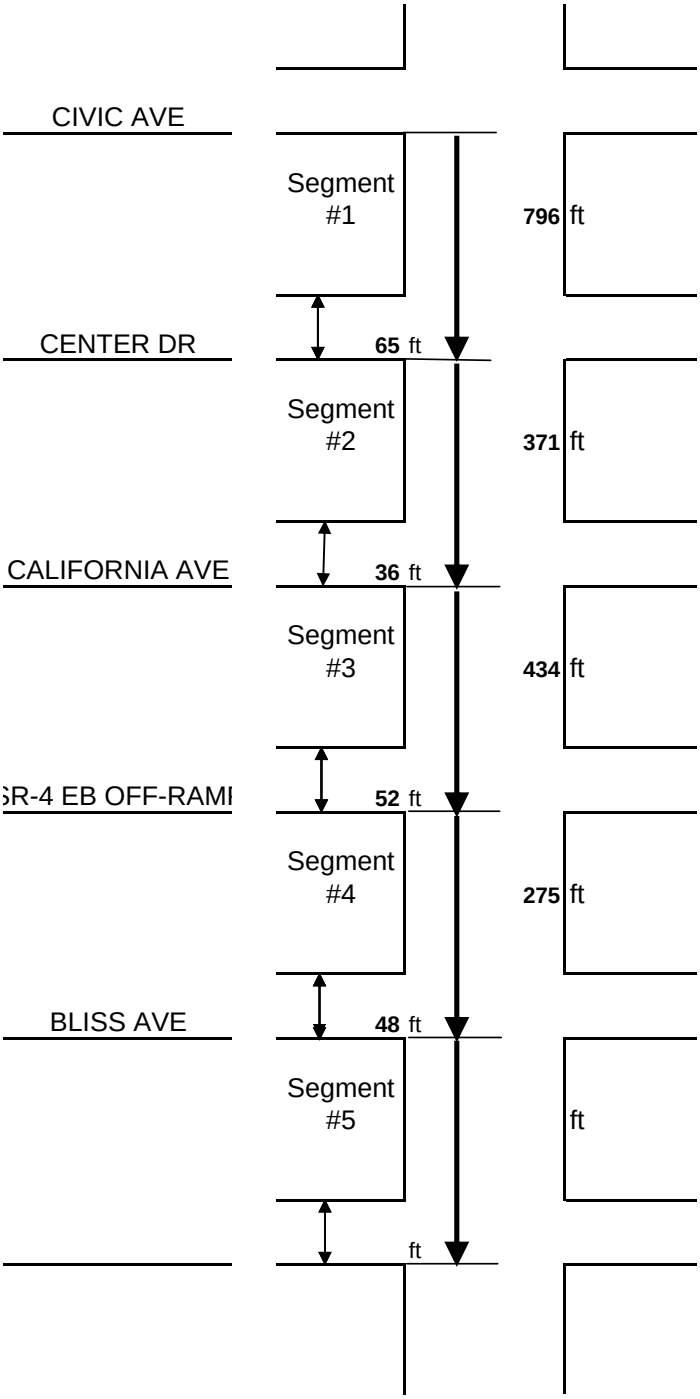
Limits: FROM CIVIC AVE TO BLISS AVE

Observer:

Analysis Direction:	SB

(NB, SB, EB, WB)
(NW, SE, NE, SW)

Data Entry Fields in Red



Intersect. Control	X-Street Lanes	X-Street Speed	X-Street 2-W vph	Right Turn Isl.
SIGNAL	4	30	684	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	3	30	566	1

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	4	35	1105	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	3	35	385	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: RAILROAD AVE

Limits: FROM CIVIC AVI

Observer: 0

Cross-Section #1
From: CIVIC AVE To: CENTER DR

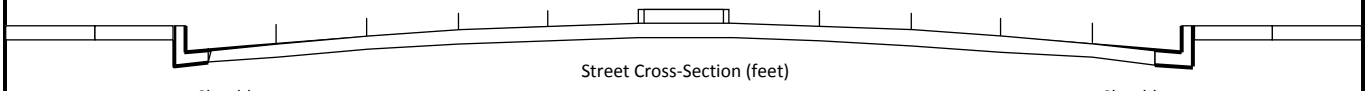
1

Ft/Trees	% Occ.
30	0%

SB

Pavement Cond:	5
Jay-Walking Legal:	YES

NB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	5	7	0	0	12	12	6	12	12	0	0	7	5	5

Ped Vol: 0

Cross-Section #2
From: CENTER DR To: CALIFORNIA AVE

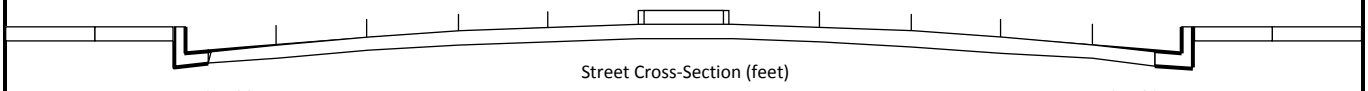
2

Ft/Trees	% Occ.
0	0%

SB

Pavement Cond:	5
Jay-Walking Legal:	YES

NB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	8	0	0	12	12	6	12	12	0	0	8	0	10

0

Cross-Section #3
From: CALIFORNIA AVE To: SR-4 EB OFF-RAMP

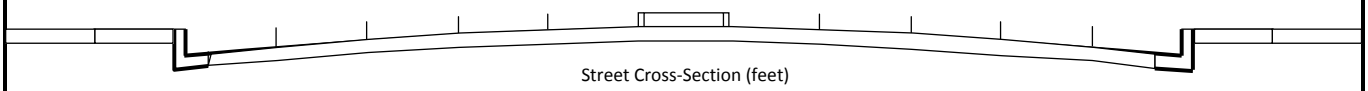
3

Ft/Trees	% Occ.
0	0

SB

Pavement Cond:	5
Jay-Walking Legal:	YES

NB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	8	0	12	12	12	4	24	12	12	0	8	0	10

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: RAILROAD AVE Limits: FROM CIVIC AV

Cross-Section #4 Observer: 0

From: SR-4 EB OFF-RAMP To: BLISS AVE

4

Ft/Trees	% Occ.
0	0

SB

Pavement Cond:	5
Jay-Walking Legal:	YES

NB

Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	8	0	12	12	12	10	12	12	12	0	8	0	5

Ped Vol: 0

Cross-Section #5

From: BLISS AVE To: 0

5

Ft/Trees	% Occ.

SB

Pavement Cond:	
Jay-Walking Legal:	

NB

Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol: 0

Urban Street Multimodal Level of Service
Data Collection Sheet - Vehicle Traffic

Direction: **SB**

Street: RAILROAD AVE Date: 0-Jan-00

Limits: FROM CIVIC AVE TO BLISS AVE Observer: 0

Field Survey

	Segment And Downstream Signal		Speed Limit	Median Type	Left Turn Pocket	Drivewys Rightside	Unsig. Intersects
	From	To	(mph)	(0-3)	(y/n)	(#)	(#)
1	CIVIC AVE	CENTER DR	35	3	n	2	
2	CENTER DR	ALIFORNIA AV	35	3	y	0	
3	ALIFORNIA AV	-4 EB OFF-RA	35	3	y	0	
4	-4 EB OFF-RA	BLISS AVE	35	3	y	0	
5	BLISS AVE	0					

Traffic Counts K: 100 D: 100

	Segment And Downstream Signal		Vol	Heavy Vehicle	RTOR+ PermLeft	Left/Right Turns	Thru Adj. Sat.	PHF
	From	To	(1-wy)	(%)	veh	%	(vphgl)	
1	CIVIC AVE	CENTER DR	859	2%	350	0%	1900	0.92
2	CENTER DR	ALIFORNIA AV	1522	2%	565	0%	1900	0.83
3	ALIFORNIA AV	-4 EB OFF-RA	1232	2%	0	0%	1900	0.88
4	-4 EB OFF-RA	BLISS AVE	1553	2%	50	0%	1900	0.92
5	BLISS AVE	0						

Arterial Traffic Performance & Signal Timing

	Segment And Downstream Signal		Field Survey		Signal Timing Data			
			Mean Speed	Average Stops	Cycle Length	Grn/Cycle for Thru	Ped Walk	Xing Ped Walk
	From	To	(mph)	(#/veh)	(secs)	(%)	(sec/cyc)	(sec/cyc)
1	CIVIC AVE	CENTER DR	31.5	0.29	80.0	75%	18.0	23.0
2	CENTER DR	ALIFORNIA AV	31.5	0.4	80.0	55%	20.0	36.0
3	ALIFORNIA AV	-4 EB OFF-RA	31.5	0.5	80.0	66%	14.0	28.0
4	-4 EB OFF-RA	BLISS AVE	24.5	0.7	80.0	49%	16.0	28.0
5	BLISS AVE	0						

Notes: Median = 0 if None, 1 if one-way st., 2 if Painted or TWLTL, 3 if Raised
Heavy Vehicles = Buses plus trucks plus recreational vehicles
Thru Adusted Saturation Flow rates computed per Signalized Intersections Chapter, HC
Signal data is at the downstream signal

Urban Street Multimodal Level of Service
Data Collection Sheet - Transit

Direction: **SB**

Street: RAILROAD AVE Date: 0-Jan-00

Limits: FROM CIVIC AVE TO BLISS AVE Observer: 0

Field Survey

Segment			Bus Stop	Shelters	Benches	CBD
	From	To	(#)	(% stops)	(% stops)	(yes/no)
1	CIVIC AVE	CENTER DR	1	0	0	no
2	CENTER DR	ALIFORNIA AV	0	0	0	no
3	ALIFORNIA AV	-4 EB OFF-RA	0	0	0	no
4	-4 EB OFF-RA	BLISS AVE	0	0	0	no
5	BLISS AVE	0	1	0	1	no

Transit Performance Data

Segment			Route	Frequency	Load Factor	On-Time Perform.	Schedule Speed
	From	To	#'s	(bus/hr)	(pas/seat)	(%)	(mph)
1	CIVIC AVE	CENTER DR	380-E	2	64%	0.962	13
2	CENTER DR	ALIFORNIA AV	380-E	2	0.64	0.962	13
3	ALIFORNIA AV	-4 EB OFF-RA	380-E	2	0.64	0.962	13
4	-4 EB OFF-RA	BLISS AVE	380-E	2	0.64	0.962	13
5	BLISS AVE	0					

Bus is On-Time if arrives within: 5 minutes of scheduled time.
Average Passenger Trip Length: 6.4 miles

A. Compute Auto LOS and Performance

Street: **RAILROAD AVE**

Direction= **Down** **SB**

1. Compute Eastbound Hourly Demand (v)

Segment & Downstream Signal	AADT (vpd)	Peak Factor K (#)	Dir. Factor D (#)	Pk.Hr.Fac. PHF (#)	Thru Traffic (%)	Demand v (vph)	from:
1	859	1.000	1.00	0.92	100%	859	traffic
2	1522	1.000	1.00	0.83	100%	1522	traffic
3	1232	1.000	1.00	0.88	100%	1232	traffic
4	1553	1.000	1.00	0.92	100%	1553	traffic
5	0	1.000	1.00	0	100%	#DIV/0!	traffic

2. Compute Eastbound Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1900	2	0.75	2850	0.30	OK	xsec 1-3, traffic
2	1900	2	0.55	2090	0.73	OK	xsec 1-3, traffic
3	1900	3	0.66	3762	0.33	OK	xsec 1-3, traffic
4	1900	3	0.49	2793	0.56	OK	xsec 4-5, traffic
5	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	35	796	31.5	traffic, layout
2	35	371	31.5	traffic, layout
3	35	434	31.5	traffic, layout
4	35	275	24.5	traffic, layout
5	0	0	0	traffic, layout
Total/Ave.	35.0	1876	30.2	

4. Compute Stops & % Left Lane

Segment & Downstream Signal	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	1.92	n	3	traffic
2	5.84	y	3	traffic
3	6.20	y	3	traffic
4	12.67	y	3	traffic
5	#DIV/0!	0	0	traffic
Total/Ave	5.26	0.75	3.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weight. Ave.	Auto LOS
1	16.1%	37.3%	24.4%	12.4%	6.3%	3.5%	2.66	B
2	6.7%	23.2%	26.6%	20.8%	13.8%	8.9%	3.38	C
3	6.1%	21.8%	26.3%	21.5%	14.7%	9.7%	3.46	C
4	1.3%	5.8%	11.7%	19.0%	26.8%	35.5%	4.71	E
5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average	9.7%	29.3%	27.1%	17.6%	10.3%	6.1%	3.08	C

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Pedestrian LOS

Street: **RAILROAD AVE**

1. Compute Pedestrian Density LOS

Seg.	Sidewalk Width (ft)	Ped Flow (pph)	Ped. Density LOS #	Ped. Density LOS	from
1	5	0	0.00	A	xsec1-3
2	5	0	0.00	A	xsec1-3
3	5	0	0.00	A	xsec1-3
4	5	0	0.00	A	xsec4-5
5	0	0	N/A	N/A	xsec4-5

Density LOS Lookup	
Ped/hr/ft	LOS
0	A
300	B
420	C
600	D
900	E
1380	F

2. Compute Pedestrian Segment LOS

Seg.	Outside Lane (ft)	Bike Ln + Park/Shldr (ft)	On-Street Parking Occ (%)	Barrier (ft/Tree)	Buffer Width (ft)	Dir. Traffic Volume (vph)	Traf. Lanes One-Dir (lanes)	Midblock Veh. Speed (mph)	Ped. Seg. LOS #	from
1	0	7	0%	30	5	859	2	33.3	2.80	xsec1-3
2	0	8	0%	0	0	1,522	2	33.3	4.48	xsec1-3
3	12	8	0%	0	0	1,232	3	33.3	3.00	xsec1-3
4	12	8	0%	0	0	1,553	3	29.8	3.14	xsec4-5
5	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with intersection delay.

3. Compute Pedestrian Intersection LOS

Downstream Signal	RTOR+ Perm LT (vph)	X-Street Volume (vph)	X-Street PHF (#)	X-Street Speed (mph)	X-Street Lanes (#)	Ave Ped. Wait At Signal (sec)	Right Turn Channel Islands (#)	Ped. Intersect LOS #	from
1	350	684	0.92	30	4	24.0	0	3.31	layout, traffic
2	565	566	0.83	30	3	22.5	1	3.39	layout, traffic
3	0	1105	0.88	35	4	27.2	0	3.48	layout, traffic
4	50	385	0.92	35	3	25.6	0	2.58	layout, traffic
5	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic

Pedestrian Delay computed per Chapter 18 method (eqn 18-5, HCM 2000).

4. Compute Roadway Crossing Difficulty Factor (RCDF)

Seg.	Signal Spacing (ft)	Cross St. Ped Wait (secs/cycle)	Divert Delay (sec)	Arterial X Distance (ft)	Midblock Veh Speed (mph)	Vehicle Vol 2-Dir (vph)	Wait To X (max=900) (sec)	Is J-Walking Allowed? (Yes/No)	from
1	796	20.3	162	68	33.3	859	735	YES	layout, traffic
2	371	12.1	77	70	33.3	1,522	900	YES	layout, traffic
3	434	16.9	91	104	33.3	1,232	900	YES	layout, traffic
4	275	16.9	61	98	29.8	1,553	900	YES	layout, traffic
5	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic

5. Compute Pedestrian Facility LOS

Segment & Downstream Signal	Min. Wait,Divert (sec)	Crossing LOS (#)	No Cross LOS (#)	RCDF (#)	Ped. NDLOS (#)	Ped. Density LOS #	Ped. Fac. LOS (#)	Ped. Facility LOS
1	162	6.00	3.23	1.20	3.87	0.00	3.87	E
2	77	6.00	3.78	1.20	4.53	0.00	4.53	F
3	91	6.00	3.33	1.20	3.99	0.00	3.99	E
4	61	6.00	3.17	1.20	3.81	0.00	3.81	E
5	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
Average							4.02	E

C. Compute Transit LOS

Street: **RAILROAD AVE**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	2	96%	0%	0%	0.64	no	transit
2	2	96%	0%	0%	0.64	no	transit
3	2	96%	0%	0%	0.64	no	transit
4	2	96%	0%	0%	0.64	no	transit
5	0	#DIV/0!	0%	100%	#DIV/0!	no	transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus (mph)	from
1	796	31.5	1	13.0	transit
2	371	31.5	0	13.0	transit
3	434	31.5	0	13.0	transit
4	275	24.5	0	13.0	transit
5	0	0	1	#DIV/0!	transit
Total/Ave	1876	#DIV/0!		#DIV/0!	

3. Compute Transit Perceived Travel Time and Headway Factors

Segment	a1 factor	IVTTR min/mi	EWTTR min/mi	ATR min/mi	PTTR	Fptt	Fh
1	1.00	4.62	0.01	0.00	4.63	1.11	1.97
2	1.00	4.62	0.01	0.00	4.63	1.11	1.97
3	1.00	4.62	0.01	0.00	4.63	1.11	1.97
4	1.00	4.62	0.01	0.00	4.63	1.11	1.97
5	#DIV/0!	#DIV/0!	#DIV/0!	0.03	#DIV/0!	#DIV/0!	0.00

IVTTR = In-Vehicle Travel Time Rate
EWTTR = Equivalent Wait Travel Time Rate
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor

4. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	2.19	3.87	3.30	C
2	2.19	4.53	3.40	C
3	2.19	3.99	3.32	C
4	2.19	3.81	3.29	C
5	#DIV/0!	#NUM!	#DIV/0!	F
Average			3.32	C

D. Compute Bicycle LOS

Street: **RAILROAD AVE**

1. Geometric Input Data

Segment & Downstream Signal	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Sig. Int Cross-Dist (ft)	Unsig.Conf Per Mile (conf/mi)	from
1	0	7	2	D	65	13.3	xsec1-3, layout
2	0	8	2	D	36	0.0	xsec1-3, layout
3	12	8	3	D	52	0.0	xsec1-3, layout
4	12	8	3	D	48	0.0	xsec4-5, layout
5	0	0	0	UD	0	#DIV/0!	xsec4-5, layout

2. Performance and Other Input Data

Segment & Downstream Signal	Traffic Volume (vph)	Heavy Vehicle (%)	Midblock Traffic Spd (mph)	On-Street Parking (%)	Pavement Rating (#)	from
1	859	2%	33.3	0%	5.0	traffic, xsec1-3
2	1522	2%	33.3	0%	5.0	traffic, xsec1-3
3	1232	2%	33.3	0%	5.0	traffic, xsec1-3
4	1553	2%	29.8	0%	5.0	traffic, xsec4-5
5	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5

Pavement Rating: 1=Poor, 5=Excellent

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with inte

3. Compute Bicycle LOS

Segment & Downstream Signal	Prelim. Eff. Width (Wv)	Effective Width (We)	Speed Factor (#)	Segment LOS (#)	Intersect LOS (#)	Bicycle Score (#)	Bicycle LOS
1	7.0	14.0	3.70	3.58	4.43	4.81	F
2	8.0	16.0	3.70	3.62	4.56	4.48	F
3	20.0	28.0	3.70	0.64	1.45	3.00	D
4	20.0	28.0	3.36	0.63	1.55	3.00	D
5	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average						4.06	E

E. LOS Summary

Title: RAILROAD AVE

Direction =	Down	SB

Date: Analyst:

Segment & Downstream Signal	Auto Stops LOS #1	Auto Speed LOS #2	Auto HCM LOS #3	Auto NCHRP 379 LOS #4	Transit LOS	Bicycle LOS	Pedestrian LOS
1	B	A	A	A	C	F	E
2	C	A	A	A	C	F	F
3	C	A	A	A	C	D	E
4	E	B	B	B	C	D	E
5	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
Facility	C	#DIV/0!	A	A	C	E	E

Auto Performance Measures Summary SB

Seg+Sig	Stops	FFS	Speed	%FFS
1	1.92	35.0	31.5	90.0%
2	5.84	35.0	31.5	90.0%
3	6.20	35.0	31.5	90.0%
4	12.67	35.0	24.5	70.0%
5	#DIV/0!	0.0	0	#DIV/0!
Facility	5.26	35.0	30.2	86.4%

Spreadsheet created by: R.Dowling of Dowling Associates, Inc.
Under contract to:
Transportation Research Board
NCHRP 3-70 Multimodal Level of Service For Urban Streets

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Created: 8-Jun-07 Updated: 25-Sep-08

Multimodal Level of Service for Urban Streets

Diagram of Uban Street

Street: RAILROAD AVE

Date:

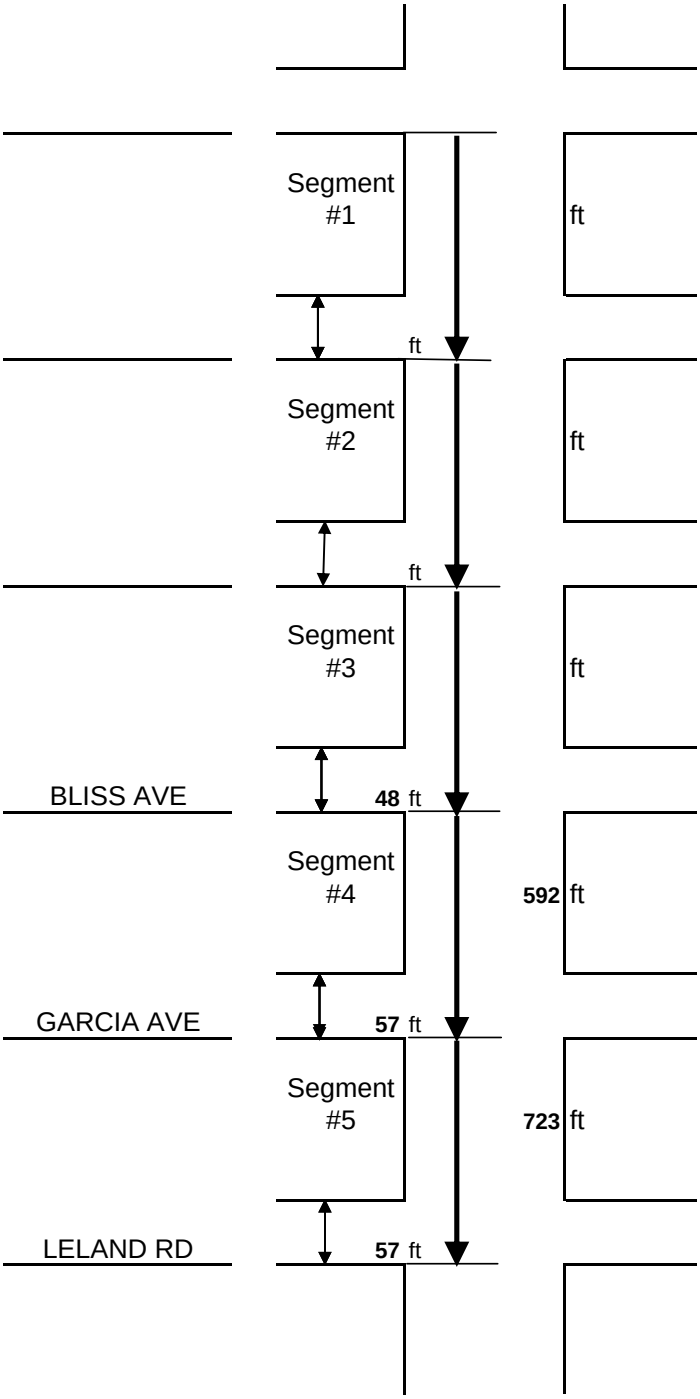
Limits: FROM BLISS AVE TO LELAND RD

Observer:

Analysis Direction:	SB

(NB, SB, EB, WB)
(NW, SE, NE, SW)

Data Entry Fields in Red



Intersect. Control	X-Street Lanes	X-Street Speed	X-Street 2-W vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	3	35	384	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	6	35	2661	0

Multimodal Level of Service for Urban Streets

Street Cross-Section Data | Street: RAILROAD AVE | Limits: FROM BLISS AVE

Observer: 0

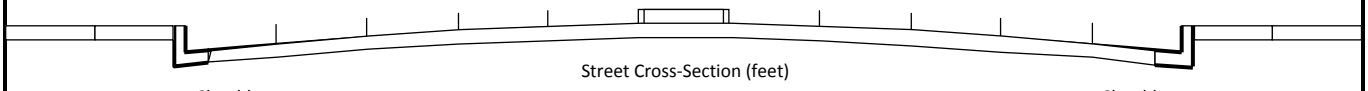
Cross-Section #1

From: M BLISS AVE TO LELANI To: 0

1

Ft/Trees	% Occ.		Pavement Cond:
		SB	Jay-Walking Legal:

NB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5														

Ped Vol:

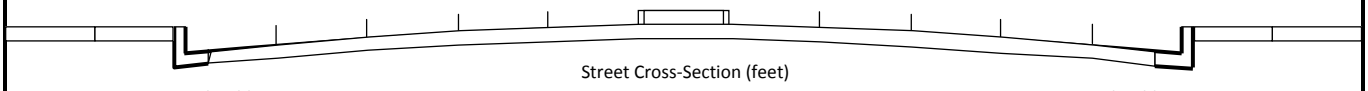
Cross-Section #2

From: 0 To: 0

2

Ft/Trees	% Occ.		Pavement Cond:
		SB	Jay-Walking Legal:

NB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5														

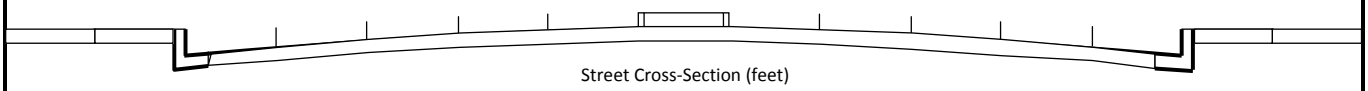
Cross-Section #3

From: 0 To: BLISS AVE

3

Ft/Trees	% Occ.		Pavement Cond:
		SB	Jay-Walking Legal:

NB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5														

Multimodal Level of Service for Urban Streets

Street Cross-Section Data | Street: RAILROAD AVE | Limits: FROM BLISS AVE

Cross-Section #4 | Observer: 0

From: M BLISS AVE TO LELANI To: GARCIA AVE

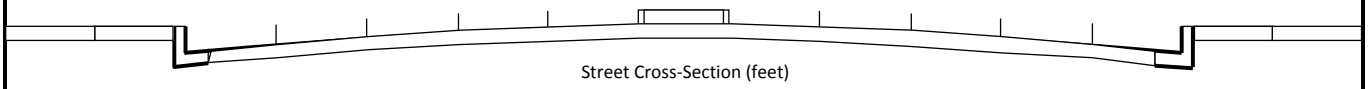
4

Ft/Trees	% Occ.
0	0

SB

Pavement Cond:	5
Jay-Walking Legal:	YES

NB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	14	0	0	12	12	3	12	12	0	0	14	12	5

Ped Vol: 0

Cross-Section #5

From: GARCIA AVE To: LELAND RD

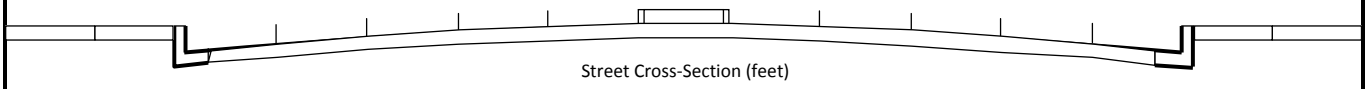
5

Ft/Trees	% Occ.
0	0

SB

Pavement Cond:	5
Jay-Walking Legal:	YES

NB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	14	0	0	12	12	3	12	12	0	0	14	12	5

Ped Vol: 0

Urban Street Multimodal Level of Service
Data Collection Sheet - Vehicle Traffic

Direction: **SB**

Street: RAILROAD AVE Date: 0-Jan-00
_AND RD
Limits: FROM BLISS AVE TO LELAND RD Observer: 0

Field Survey

	Segment And Downstream Signal		Speed Limit (mph)	Median Type (0-3)	Left Turn Pocket (y/n)	Drivewys Rightside (#)	Unsig. Intersects (#)
	From	To					
1	0	0					
2	0	0					
3	0	BLISS AVE					
4	BLISS AVE	GARCIA AVE	35	3	y	3	
5	GARCIA AVE	LELAND RD	35	3	y	2	

Traffic Counts K: 100 D: 100

	Segment And Downstream Signal		Vol (1-wy)	Heavy Vehicle (%)	RTOR+ PermLeft veh	Left/Right Turns %	Thru Adj. Sat. (vphgl)	PHF
	From	To						
1	0	0						
2	0	0						
3	0	BLISS AVE						
4	BLISS AVE	GARCIA AVE	1526	2%	60	0%	1900	0.92
5	GARCIA AVE	LELAND RD	1377	2%	657	0%	1900	0.92

Arterial Traffic Performance & Signal Timing

	Segment And Downstream Signal		Field Survey		Signal Timing Data			
			Mean Speed (mph)	Average Stops (#/veh)	Cycle Length (secs)	Grn/Cycle for Thru (%)	Ped Walk (sec/cyc)	Xing Ped Walk (sec/cyc)
	From	To						
1	0	0						
2	0	0						
3	0	BLISS AVE						
4	BLISS AVE	GARCIA AVE	24.5	1.1	80.0	50%	12.0	21.0
5	GARCIA AVE	LELAND RD	14.0	0.8	140.0	29%	20.0	26.0

Notes: Median = 0 if None, 1 if one-way st., 2 if Painted or TWLTL, 3 if Raised
Heavy Vehicles = Buses plus trucks plus recreational vehicles
Thru Adusted Saturation Flow rates computed per Signalized Intersections Chapter, HC
Signal data is at the downstream signal

Urban Street Multimodal Level of Service
Data Collection Sheet - Transit

Direction: **SB**

Street: RAILROAD AVE Date: 0-Jan-00
_AND RD
Limits: FROM BLISS AVE TO LELAND RD Observer: 0

Field Survey

Segment			Bus Stop	Shelters	Benches	CBD
	From	To	(#)	(% stops)	(% stops)	(yes/no)
1	0	0				
2	0	0				
3	0	BLISS AVE				
4	BLISS AVE	GARCIA AVE	0	0	0	no
5	GARCIA AVE	LELAND RD	1	0	1	no

Transit Performance Data

Segment			Route	Frequency	Load Factor	On-Time Perform.	Schedule Speed
	From	To	#'s	(bus/hr)	(pas/seat)	(%)	(mph)
1	0	0					
2	0	0					
3	0	BLISS AVE					
4	BLISS AVE	GARCIA AVE	380-E	2	0.64	0.962	13
5	GARCIA AVE	LELAND RD	380-E	2	0.64	0.962	13

Bus is On-Time if arrives within: 5 minutes of scheduled time.
Average Passenger Trip Length: 6.4 miles

A. Compute Auto LOS and Performance

Street: **RAILROAD AVE**

Direction= **FROM BLISS AVE TO LELAND RD** **SB**

1. Compute Eastbound Hourly Demand (v)

Segment & Downstream Signal	AADT (vpd)	Peak Factor K (#)	Dir. Factor D (#)	Pk.Hr.Fac. PHF (#)	Thru Traffic (%)	Demand v (vph)	from:
1	0	1.000	1.00	0	100%	0	traffic
2	0	1.000	1.00	0	100%	0	traffic
3	0	1.000	1.00	0	100%	0	traffic
4	1526	1.000	1.00	0.92	100%	1526	traffic
5	1377	1.000	1.00	0.92	100%	1377	traffic

2. Compute Eastbound Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	0	0	0.00	1	0.00	OK	xsec 1-3, traffic
2	0	0	0.00	1	0.00	OK	xsec 1-3, traffic
3	0	0	0.00	1	0.00	OK	xsec 1-3, traffic
4	1900	2	0.50	1900	0.80	OK	xsec 4-5, traffic
5	1900	2	0.29	1102	1.25	Over Cap.	xsec 4-5, traffic

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	0	0	0	traffic, layout
2	0	0	0	traffic, layout
3	0	0	0	traffic, layout
4	35	592	24.5	traffic, layout
5	35	723	14.0	traffic, layout
Total/Ave.	35.0	1315	17.3	

4. Compute Stops & % Left Lane

Segment & Downstream Signal	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	#DIV/0!	0	0	traffic
2	#DIV/0!	0	0	traffic
3	#DIV/0!	0	0	traffic
4	9.72	y	3	traffic
5	5.77	y	3	traffic
Total/Ave	7.55	1.00	3.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weight. Ave.	Auto LOS
1	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
3	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	2.6%	11.1%	19.0%	23.4%	23.2%	20.7%	4.15	D
5	6.8%	23.5%	26.7%	20.7%	13.6%	8.7%	3.37	F (v/c>1)
Average	6.1%	21.9%	26.3%	21.4%	14.6%	9.6%	3.45	F (v/c>1)

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Pedestrian LOS

Street: **RAILROAD AVE**

1. Compute Pedestrian Density LOS

Seg.	Sidewalk Width (ft)	Ped Flow (pph)	Ped. Density LOS #	Ped. Density LOS	from
1	5	0	0.00	A	xsec1-3
2	5	0	0.00	A	xsec1-3
3	5	0	0.00	A	xsec1-3
4	5	0	0.00	A	xsec4-5
5	5	0	0.00	A	xsec4-5

Density LOS Lookup	
Ped/hr/ft	LOS
0	A
300	B
420	C
600	D
900	E
1380	F

2. Compute Pedestrian Segment LOS

Seg.	Outside Lane (ft)	Bike Ln + Park/Shldr (ft)	On-Street Parking Occ (%)	Barrier (ft/Tree)	Buffer Width (ft)	Dir. Traffic Volume (vph)	Traf. Lanes One-Dir (lanes)	Midblock Veh. Speed (mph)	Ped. Seg. LOS #	from
1	0	0	0%	0	0	0	0	0.0	#DIV/0!	xsec1-3
2	0	0	0%	0	0	0	0	0.0	#DIV/0!	xsec1-3
3	0	0	0%	0	0	0	0	0.0	#DIV/0!	xsec1-3
4	0	14	0%	0	0	1,526	2	29.8	3.97	xsec4-5
5	0	14	0%	0	0	1,377	2	24.5	3.66	xsec4-5

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with intersection delay.

3. Compute Pedestrian Intersection LOS

Downstream Signal	RTOR+ Perm LT (vph)	X-Street Volume (vph)	X-Street PHF (#)	X-Street Speed (mph)	X-Street Lanes (#)	Ave Ped. Wait At Signal (sec)	Right Turn Channel Islands (#)	Ped. Intersect LOS #	from
1	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
2	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
3	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
4	60	384	0.92	35	3	28.9	0	2.60	layout, traffic
5	657	2661	0.92	35	6	51.4	0	6.42	layout, traffic

Pedestrian Delay computed per Chapter 18 method (eqn 18-5, HCM 2000).

4. Compute Roadway Crossing Difficulty Factor (RCDF)

Seg.	Signal Spacing (ft)	Cross St. Ped Wait (secs/cycle)	Divert Delay (sec)	Arterial X Distance (ft)	Midblock Veh Speed (mph)	Vehicle Vol 2-Dir (vph)	Wait To X (max=900) (sec)	Is J-Walking Allowed? (Yes/No)	from
1	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
2	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
3	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
4	592	21.8	124	79	29.8	1,526	900	YES	layout, traffic
5	723	46.4	161	79	24.5	1,377	900	YES	layout, traffic

5. Compute Pedestrian Facility LOS

Segment & Downstream Signal	Min. Wait,Divert (sec)	Crossing LOS (#)	No Cross LOS (#)	RCDF (#)	Ped. NDLOS (#)	Ped. Density LOS #	Ped. Fac. LOS (#)	Ped. Facility LOS
1	#DIV/0!	#DIV/0!	#DIV/0!	1.00	#DIV/0!	0.00	#DIV/0!	#DIV/0!
2	#DIV/0!	#DIV/0!	#DIV/0!	1.00	#DIV/0!	0.00	#DIV/0!	#DIV/0!
3	#DIV/0!	#DIV/0!	#DIV/0!	1.00	#DIV/0!	0.00	#DIV/0!	#DIV/0!
4	124	6.00	3.44	1.20	4.13	0.00	4.13	E
5	161	6.00	4.18	1.20	5.02	0.00	5.02	F
Average							4.62	F

C. Compute Transit LOS

Street: **RAILROAD AVE**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
2	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
3	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
4	2	96%	0%	0%	0.64	no	transit
5	2	96%	0%	100%	0.64	no	transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus (mph)	from
1	0	0	0	#DIV/0!	transit
2	0	0	0	#DIV/0!	transit
3	0	0	0	#DIV/0!	transit
4	592	24.5	0	13.0	transit
5	723	14.0	1	13.0	transit
Total/Ave	1315	#DIV/0!		#DIV/0!	

3. Compute Transit Perceived Travel Time and Headway Factors

Segment	a1 factor	IVTTR min/mi	EWTTR min/mi	ATR min/mi	PTTR	Fptt	Fh
1	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
2	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
3	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
4	1.00	4.62	0.01	0.00	4.63	1.11	1.97
5	1.00	4.62	0.01	0.03	4.60	1.11	1.97

IVTTR = In-Vehicle Travel Time Rate
EWTTR = Equivalent Wait Travel Time Rate
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor

4. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	#DIV/0!	#DIV/0!	#DIV/0!	F
2	#DIV/0!	#DIV/0!	#DIV/0!	F
3	#DIV/0!	#DIV/0!	#DIV/0!	F
4	2.19	4.13	3.34	C
5	2.19	5.02	3.46	C
Average			3.41	C

D. Compute Bicycle LOS

Street: **RAILROAD AVE**

1. Geometric Input Data

Segment & Downstream Signal	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Sig. Int Cross-Dist (ft)	Unsig.Conf Per Mile (conf/mi)	from
1	0	0	0	UD	0	#DIV/0!	xsec1-3, layout
2	0	0	0	UD	0	#DIV/0!	xsec1-3, layout
3	0	0	0	UD	48	#DIV/0!	xsec1-3, layout
4	0	14	2	D	57	26.8	xsec4-5, layout
5	0	14	2	D	57	14.6	xsec4-5, layout

2. Performance and Other Input Data

Segment & Downstream Signal	Traffic Volume (vph)	Heavy Vehicle (%)	Midblock Traffic Spd (mph)	On-Street Parking (%)	Pavement Rating (#)	from
1	0	0%	0.0	0%	0.0	traffic, xsec1-3
2	0	0%	0.0	0%	0.0	traffic, xsec1-3
3	0	0%	0.0	0%	0.0	traffic, xsec1-3
4	1526	2%	29.8	0%	5.0	traffic, xsec4-5
5	1377	2%	24.5	0%	5.0	traffic, xsec4-5

Pavement Rating: 1=Poor, 5=Excellent

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with inte

3. Compute Bicycle LOS

Segment & Downstream Signal	Prelim. Eff. Width (Wv)	Effective Width (We)	Speed Factor (#)	Segment LOS (#)	Intersect LOS (#)	Bicycle Score (#)	Bicycle LOS
1	0.0	0.0	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
2	0.0	0.0	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
3	0.0	0.0	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	14.0	28.0	3.36	0.83	3.44	4.26	F
5	14.0	28.0	2.49	0.52	3.30	3.74	E
Average						3.98	E

E. LOS Summary

Title: RAILROAD AVE

Direction =	SS AVE TO LE	SB

Date: Analyst:

Segment & Downstream Signal	Auto Stops LOS #1	Auto Speed LOS #2	Auto HCM LOS #3	Auto NCHRP 379 LOS #4	Transit LOS	Bicycle LOS	Pedestrian LOS
1	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#DIV/0!
2	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#DIV/0!
3	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#DIV/0!
4	D	B	B	B	C	F	E
5	F (v/c>1)	F (v/c>1)	D	D	C	E	F
Facility	F (v/c>1)	#DIV/0!	D	D	C	E	F

Auto Performance Measures Summary SB

Seg+Sig	Stops	FFS	Speed	%FFS
1	#DIV/0!	0.0	0	#DIV/0!
2	#DIV/0!	0.0	0	#DIV/0!
3	#DIV/0!	0.0	0	#DIV/0!
4	9.72	35.0	24.5	70.0%
5	5.77	35.0	14.0	40.0%
Facility	7.55	35.0	17.3	49.6%

Spreadsheet created by: R.Dowling of Dowling Associates, Inc.
Under contract to:
Transportation Research Board
NCHRP 3-70 Multimodal Level of Service For Urban Streets

Spreadsheet is made available "As-Is" for TRB internal review.
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Spreadsheet is unsupported.
Spreadsheet does not have data entry error checking.
Created: 8-Jun-07 Updated: 25-Sep-08

Multimodal Level of Service for Urban Streets

Diagram of Uban Street

Street: E LELAND RD

Date:

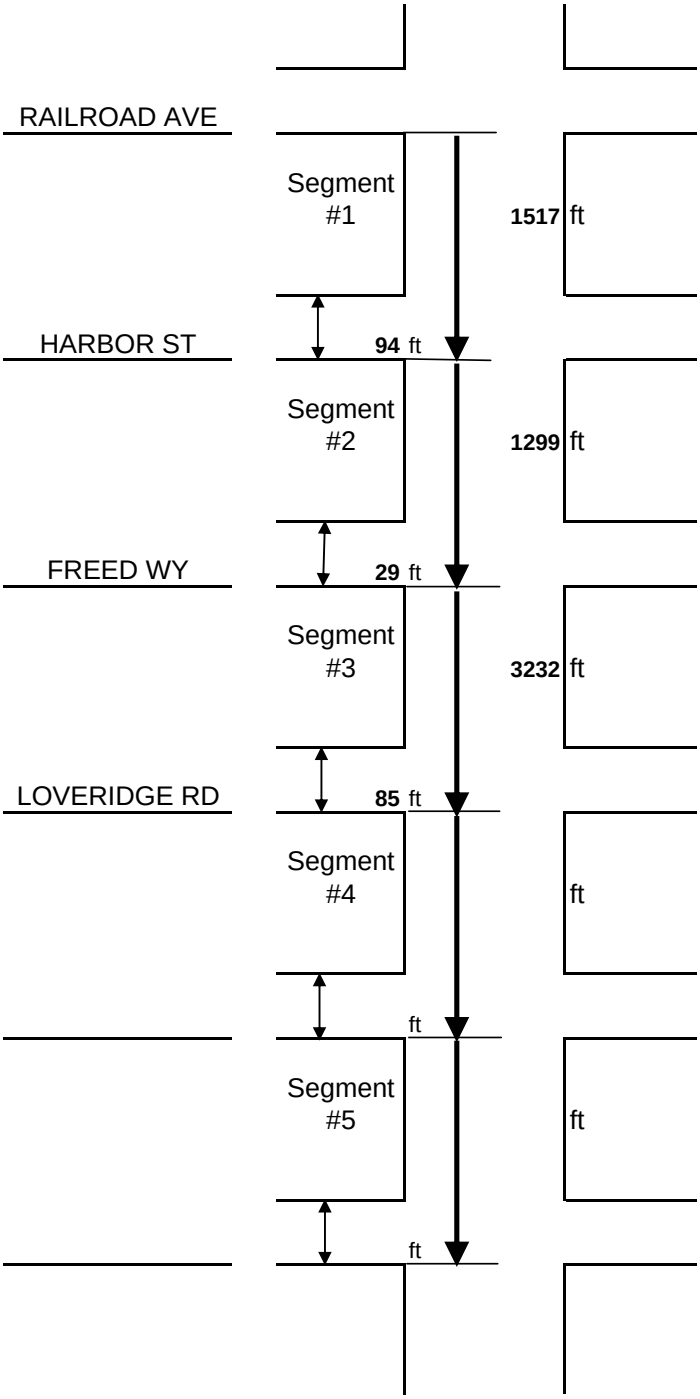
Limits: FROM RAILROAD AVE TO LOVERIDGE RD

Observer:

Analysis Direction:	EB

(NB, SB, EB, WB)
(NW, SE, NE, SW)

Data Entry Fields in Red



Intersect. Control	X-Street Lanes	X-Street Speed	X-Street 2-W vph	Right Turn Isl.
SIGNAL	5	35	2252	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	2	35	129	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	6	35	1328	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: E LELAND RD

Limits: FROM RAILROAD AVI

Observer: 0

Cross-Section #1
From: RAILROAD AVE To: HARBOR ST

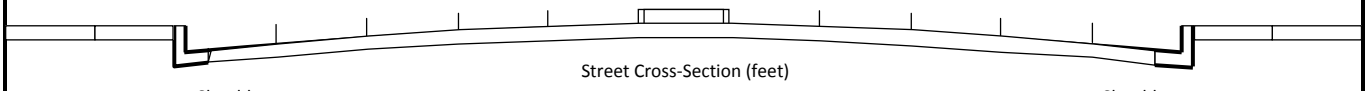
1

Ft/Trees	% Occ.
0	0%

EB

Pavement Cond:	5
Jay-Walking Legal:	no

WB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
10	0	0	8	0	12	12	15	12	12	0	8	0	0	5

Ped Vol: 0

Cross-Section #2
From: HARBOR ST To: FREED WY

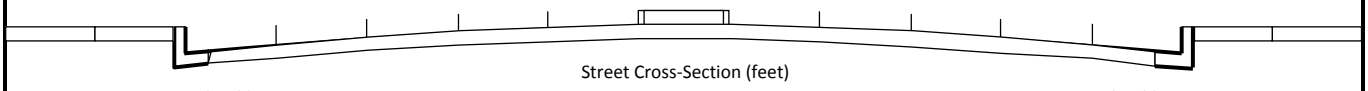
2

Ft/Trees	% Occ.
0	0%

EB

Pavement Cond:	5
Jay-Walking Legal:	no

WB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	0	8	0	12	12	15	12	12	0	8	0	0	5

0

Cross-Section #3
From: FREED WY To: LOVERIDGE RD

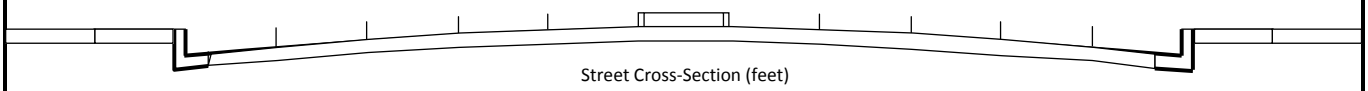
3

Ft/Trees	% Occ.
0	0

EB

Pavement Cond:	5
Jay-Walking Legal:	no

WB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	0	8	0	12	12	15	12	12	0	8	0	0	5

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

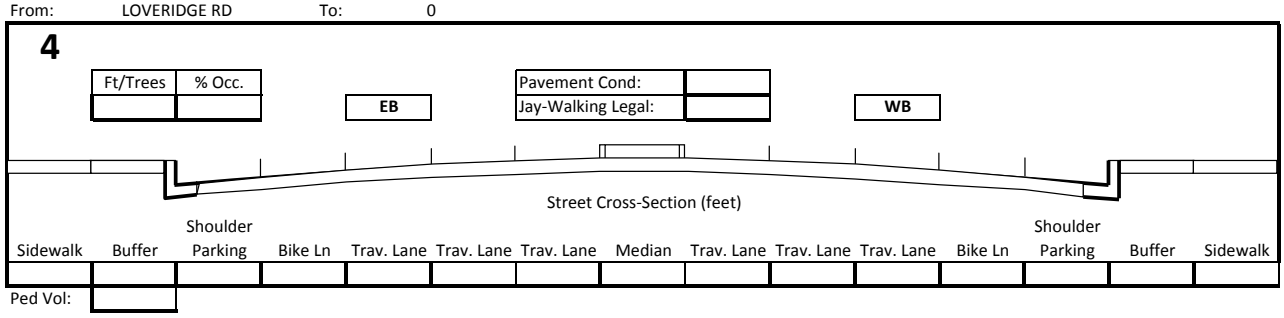
Street: E LELAND RD

Limits: FROM RAILROAD AVI

Cross-Section #4

Observer: 0

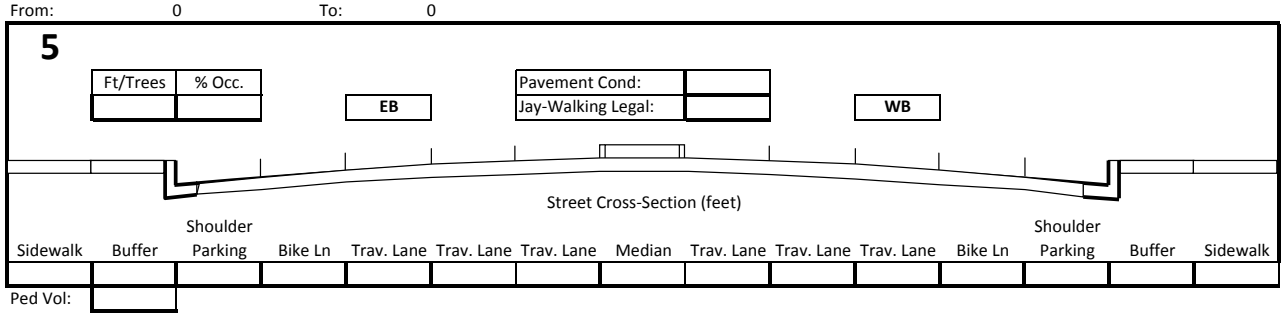
From: LOVERIDGE RD To: 0



Ped Vol:

Cross-Section #5

From: 0 To: 0



Ped Vol:

Urban Street Multimodal Level of Service
Data Collection Sheet - Vehicle Traffic

Direction: **EB**

Street: E LELAND RD Date: 0-Jan-00

Limits: M RAILROAD AVE TO LOVERIDG Observer: 0

Field Survey

	Segment And Downstream Signal		Speed Limit	Median Type	Left Turn Pocket	Drivewys Rightside	Unsig. Intersects
	From	To	(mph)	(0-3)	(y/n)	(#)	(#)
1	RAILROAD AVI	HARBOR ST	35	3	yes	9	
2	HARBOR ST	FREED WY	35	3	yes	2	
3	FREED WY	OVERIDGE RI	35	3	yes	7	
4	OVERIDGE RI	0					
5	0	0					

Traffic Counts K: 100 D: 100

	Segment And Downstream Signal		Vol	Heavy Vehicle	RTOR+ PermLeft	Left/Right Turns	Thru Adj. Sat.	PHF
	From	To	(1-wy)	(%)	veh	%	(vphgl)	
1	RAILROAD AVI	HARBOR ST	1262	2%	181	0%	1900	0.92
2	HARBOR ST	FREED WY	1447	2%	65	0%	1900	0.93
3	FREED WY	OVERIDGE RI	1341	2%	525	0%	1900	0.92
4	OVERIDGE RI	0						
5	0	0						

Arterial Traffic Performance & Signal Timing

	Segment And Downstream Signal		Field Survey		Signal Timing Data			
			Mean Speed	Average Stops	Cycle Length	Grn/Cycle for Thru	Ped Walk	Xing Ped Walk
	From	To	(mph)	(#/veh)	(secs)	(%)	(sec/cyc)	(sec/cyc)
1	RAILROAD AVI	HARBOR ST	31.5	0.4	140.0	36%	27.0	25.0
2	HARBOR ST	FREED WY	31.5	0.01	100.0	100%	0.0	0.0
3	FREED WY	OVERIDGE RI	31.5	0.7	70.0	36%	26.0	29.0
4	OVERIDGE RI	0						
5	0	0						

Notes: Median = 0 if None, 1 if one-way st., 2 if Painted or TWLTL, 3 if Raised
Heavy Vehicles = Buses plus trucks plus recreational vehicles
Thru Adusted Saturation Flow rates computed per Signalized Intersections Chapter, HC
Signal data is at the downstream signal

Urban Street Multimodal Level of Service
Data Collection Sheet - Transit

Direction: **EB**

Street: E LELAND RD

Date: 0-Jan-00

Limits: FROM RAILROAD AVE TO LOVERIDGE RD

Observer: 0

Field Survey

Segment			Bus Stop	Shelters	Benches	CBD
	From	To	(#)	(% stops)	(% stops)	(yes/no)
1	RAILROAD AVI	HARBOR ST	1	1	1	no
2	HARBOR ST	FREED WY	2	0	0.5	no
3	FREED WY	OVERIDGE RI	2	0	0.5	no
4	OVERIDGE RI	0				
5	0	0				

Transit Performance Data

Segment			Route	Frequency	Load Factor	On-Time Perform.	Schedule Speed
	From	To	#'s	(bus/hr)	(pas/seat)	(%)	(mph)
1	RAILROAD AVI	HARBOR ST	380-E	2	0.64	0.962	13
			390-E	2	0.45	0.962	20
2	HARBOR ST	FREED WY	387-E	1	0.57	0.962	13
			391-E	2	0.55	0.962	23
			390-E	2	0.45	0.962	20
3	FREED WY	OVERIDGE RI	387-E	1	0.57	0.962	13
			391-E	3	0.55	0.962	23
			390-E	2	0.45	0.962	20
4	OVERIDGE RI	0					
5	0	0					

Bus is On-Time if arrives within: 5 minutes of scheduled time.
Average Passenger Trip Length: 6.4 miles

A. Compute Auto LOS and Performance

Street: **E LELAND RD**

Direction= **Down** **EB**

1. Compute Eastbound Hourly Demand (v)

Segment & Downstream Signal	AADT (vpd)	Peak Factor K (#)	Dir. Factor D (#)	Pk.Hr.Fac. PHF (#)	Thru Traffic (%)	Demand v (vph)	from:
1	1262	1.000	1.00	0.92	100%	1262	traffic
2	1447	1.000	1.00	0.93	100%	1447	traffic
3	1341	1.000	1.00	0.92	100%	1341	traffic
4	0	1.000	1.00	0	100%	#DIV/0!	traffic
5	0	1.000	1.00	0	100%	#DIV/0!	traffic

2. Compute Eastbound Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1900	2	0.36	1368	0.92	OK	xsec 1-3, traffic
2	1900	2	1.00	3800	0.38	OK	xsec 1-3, traffic
3	1900	2	0.36	1368	0.98	OK	xsec 1-3, traffic
4	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic
5	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	35	1517	31.5	traffic, layout
2	35	1299	31.5	traffic, layout
3	35	3232	31.5	traffic, layout
4	0	0	0	traffic, layout
5	0	0	0	traffic, layout
Total/Ave.	35.0	6048	31.5	

4. Compute Stops & % Left Lane

Segment & Downstream Signal	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	1.29	yes	3	traffic
2	0.04	yes	3	traffic
3	1.11	yes	3	traffic
4	#DIV/0!	0	0	traffic
5	#DIV/0!	0	0	traffic
Total/Ave	0.93	1.00	3.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weight. Ave.	Auto LOS
1	24.2%	41.3%	19.8%	8.6%	4.0%	2.1%	2.33	B
2	30.4%	41.8%	16.6%	6.6%	3.0%	1.6%	2.15	B
3	25.0%	41.5%	19.3%	8.3%	3.9%	2.0%	2.31	B
4	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average	25.9%	41.7%	18.9%	8.0%	3.7%	2.0%	2.28	B

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Pedestrian LOS

Street: **E LELAND RD**

1. Compute Pedestrian Density LOS

Seg.	Sidewalk Width (ft)	Ped Flow (pph)	Ped. Density LOS #	Ped. Density LOS	from
1	10	0	0.00	A	xsec1-3
2	5	0	0.00	A	xsec1-3
3	5	0	0.00	A	xsec1-3
4	0	0	N/A	N/A	xsec4-5
5	0	0	N/A	N/A	xsec4-5

Density LOS Lookup	
Ped/hr/ft	LOS
0	A
300	B
420	C
600	D
900	E
1380	F

2. Compute Pedestrian Segment LOS

Seg.	Outside Lane (ft)	Bike Ln + Park/Shldr (ft)	On-Street Parking Occ (%)	Barrier (ft/Tree)	Buffer Width (ft)	Dir. Traffic Volume (vph)	Traf. Lanes One-Dir (lanes)	Midblock Veh. Speed (mph)	Ped. Seg. LOS #	from
1	0	8	0%	0	0	1,262	2	33.3	3.66	xsec1-3
2	0	8	0%	0	0	1,447	2	33.3	4.15	xsec1-3
3	0	8	0%	0	0	1,341	2	33.3	4.03	xsec1-3
4	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5
5	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with intersection delay.

3. Compute Pedestrian Intersection LOS

Downstream Signal	RTOR+ Perm LT (vph)	X-Street Volume (vph)	X-Street PHF (#)	X-Street Speed (mph)	X-Street Lanes (#)	Ave Ped. Wait At Signal (sec)	Right Turn Channel Islands (#)	Ped. Intersect LOS #	from
1	181	2252	0.92	35	5	45.6	0	5.15	layout, traffic
2	65	129	0.93	35	2	50.0	0	2.29	layout, traffic
3	525	1328	0.92	35	6	13.8	0	4.51	layout, traffic
4	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
5	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic

Pedestrian Delay computed per Chapter 18 method (eqn 18-5, HCM 2000).

4. Compute Roadway Crossing Difficulty Factor (RCDF)

Seg.	Signal Spacing (ft)	Cross St. Ped Wait (secs/cycle)	Divert Delay (sec)	Arterial X Distance (ft)	Midblock Veh Speed (mph)	Vehicle Vol 2-Dir (vph)	Wait To X (max=900) (sec)	Is J-Walking Allowed? (Yes/No)	from
1	1517	47.2	313	79	33.3	1,262	900	no	layout, traffic
2	1299	50.0	272	79	33.3	1,447	900	no	layout, traffic
3	3232	12.0	622	79	33.3	1,341	900	no	layout, traffic
4	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
5	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic

5. Compute Pedestrian Facility LOS

Segment & Downstream Signal	Min. Wait,Divert (sec)	Crossing LOS (#)	No Cross LOS (#)	RCDF (#)	Ped. NDLOS (#)	Ped. Density LOS #	Ped. Fac. LOS (#)	Ped. Facility LOS
1	313	6.00	3.90	1.00	3.90	0.00	3.90	E
2	272	6.00	3.43	1.00	3.43	0.00	3.43	D
3	622	6.00	3.88	1.00	3.88	0.00	3.88	E
4	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
5	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
Average							3.79	E

C. Compute Transit LOS

Street: **E LELAND RD**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	4	96%	100%	100%	0.55	no	transit
2	5	96%	0%	50%	0.51	no	transit
3	6	96%	0%	50%	0.52	no	transit
4	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
5	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus (mph)	from
1	1517	31.5	1	16.5	transit
2	1299	31.5	2	19.8	transit
3	3232	31.5	2	20.3	transit
4	0	0	0	#DIV/0!	transit
5	0	0	0	#DIV/0!	transit
Total/Ave	6048	#DIV/0!		#DIV/0!	

3. Compute Transit Perceived Travel Time and Headway Factors

Segment	a1 factor	IVTTR min/mi	EWTTR min/mi	ATR min/mi	PTTR	Fptt	Fh
1	1.00	3.64	0.01	0.23	3.41	1.25	2.83
2	1.00	3.03	0.01	0.02	3.03	1.30	3.04
3	1.00	2.95	0.01	0.02	2.95	1.32	3.19
4	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
5	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00

IVTTR = In-Vehicle Travel Time Rate
EWTTR = Equivalent Wait Travel Time Rate
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor

4. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	3.53	3.90	1.29	A
2	3.97	3.43	0.56	A
3	4.20	3.88	0.28	A
4	#DIV/0!	#NUM!	#DIV/0!	F
5	#DIV/0!	#NUM!	#DIV/0!	F
Average			0.59	A

D. Compute Bicycle LOS

Street: **E LELAND RD**

1. Geometric Input Data

Segment & Downstream Signal	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Sig. Int Cross-Dist (ft)	Unsig.Conf Per Mile (conf/mi)	from
1	0	8	2	D	94	31.3	xsec1-3, layout
2	0	8	2	D	29	8.1	xsec1-3, layout
3	0	8	2	D	85	11.4	xsec1-3, layout
4	0	0	0	UD	0	#DIV/0!	xsec4-5, layout
5	0	0	0	UD	0	#DIV/0!	xsec4-5, layout

2. Performance and Other Input Data

Segment & Downstream Signal	Traffic Volume (vph)	Heavy Vehicle (%)	Midblock Traffic Spd (mph)	On-Street Parking (%)	Pavement Rating (#)	from
1	1262	2%	33.3	0%	5.0	traffic, xsec1-3
2	1447	2%	33.3	0%	5.0	traffic, xsec1-3
3	1341	2%	33.3	0%	5.0	traffic, xsec1-3
4	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5
5	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5

Pavement Rating: 1=Poor, 5=Excellent

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with inte

3. Compute Bicycle LOS

Segment & Downstream Signal	Prelim. Eff. Width (Wv)	Effective Width (We)	Speed Factor (#)	Segment LOS (#)	Intersect LOS (#)	Bicycle Score (#)	Bicycle LOS
1	8.0	16.0	3.70	3.47	5.04	6.21	F
2	8.0	16.0	3.70	3.53	4.21	4.44	F
3	8.0	16.0	3.70	3.50	4.98	5.41	F
4	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average						5.40	F

E. LOS Summary

Title: E LELAND RD

Direction =	Down	EB

Date: Analyst:

Segment & Downstream Signal	Auto Stops LOS #1	Auto Speed LOS #2	Auto HCM LOS #3	Auto NCHRP 379 LOS #4	Transit LOS	Bicycle LOS	Pedestrian LOS
1	B	F (v/c>1)	A	A	A	F	E
2	B	A	A	A	A	F	D
3	B	F (v/c>1)	A	A	A	F	E
4	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
5	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
Facility	B	#DIV/0!	A	A	A	F	E

Auto Performance Measures Summary EB

Seg+Sig	Stops	FFS	Speed	%FFS
1	1.29	35.0	31.5	90.0%
2	0.04	35.0	31.5	90.0%
3	1.11	35.0	31.5	90.0%
4	#DIV/0!	0.0	0	#DIV/0!
5	#DIV/0!	0.0	0	#DIV/0!
Facility	0.93	35.0	31.5	90.0%

Spreadsheet created by: R.Dowling of Dowling Associates, Inc.
Under contract to:
Transportation Research Board
NCHRP 3-70 Multimodal Level of Service For Urban Streets

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Spreadsheet is unsupported.
Spreadsheet does not have data entry error checking.
Created: 8-Jun-07 Updated: 25-Sep-08

Multimodal Level of Service for Urban Streets

Diagram of Uban Street

Street: E LELAND RD

Date:

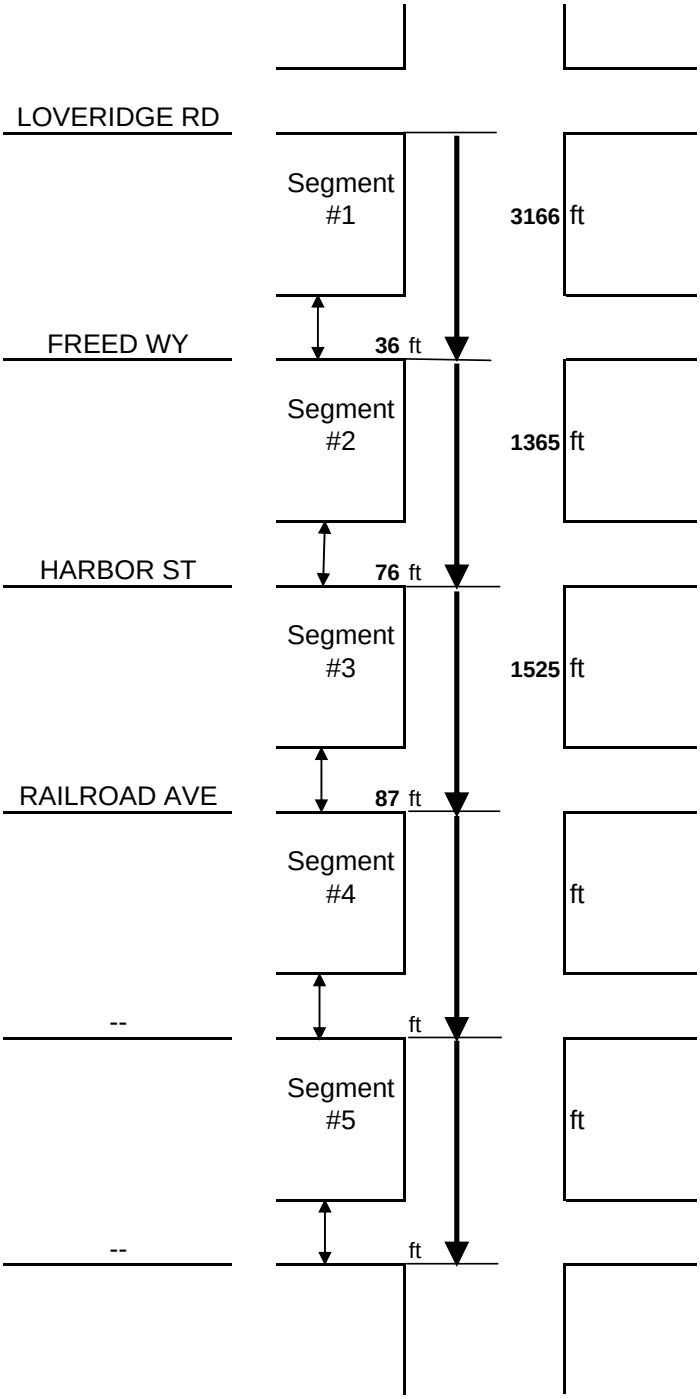
Limits: FROM LOVERIDGE RD TO RAILROAD AVE

Observer:

Analysis Direction:	WB

(NB, SB, EB, WB)
(NW, SE, NE, SW)

Data Entry Fields in Red



Intersect. Control	X-Street Lanes	X-Street Speed	X-Street 2-W vph	Right Turn Isl.
SIGNAL	3	35	129	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	5	35	2252	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	7	35	2946	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: E LELAND RD

Limits: FROM LOVERIDGE R

Observer: 0

Cross-Section #1
From: LOVERIDGE RD To: FREED WY

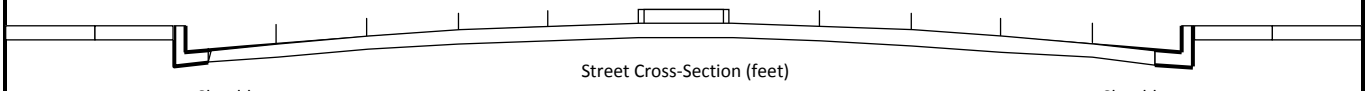
1

Ft/Trees	% Occ.
0	0%

WB

Pavement Cond:	5
Jay-Walking Legal:	no

EB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	0	8	0	12	12	15	12	12	0	8	0	0	5

Ped Vol: 0

Cross-Section #2
From: FREED WY To: HARBOR ST

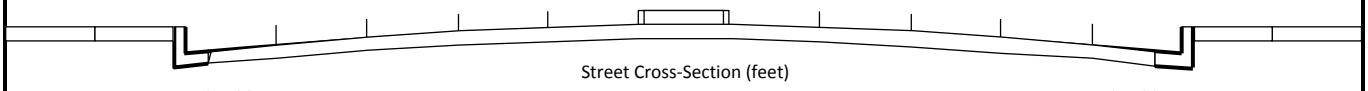
2

Ft/Trees	% Occ.
0	0%

WB

Pavement Cond:	5
Jay-Walking Legal:	no

EB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	0	8	0	12	12	15	12	12	0	8	0	0	5

0

Cross-Section #3
From: HARBOR ST To: RAILROAD AVE

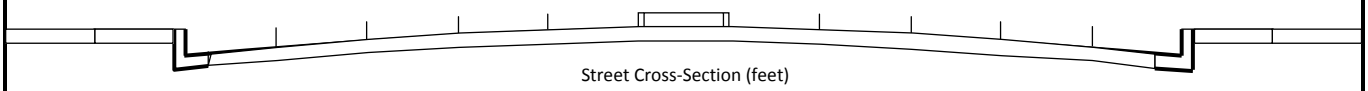
3

Ft/Trees	% Occ.
0	0

WB

Pavement Cond:	5
Jay-Walking Legal:	no

EB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	0	8	0	12	12	15	12	12	0	8	0	0	10

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: E LELAND RD

Limits: FROM LOVERIDGE R

Cross-Section #4

Observer: 0

From: RAILROAD AVE To: --

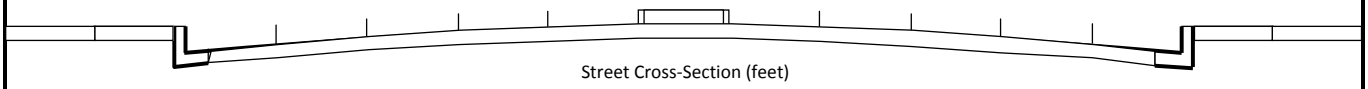
4

Ft/Trees	% Occ.

WB

Pavement Cond:	
Jay-Walking Legal:	

EB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Cross-Section #5

From: -- To: --

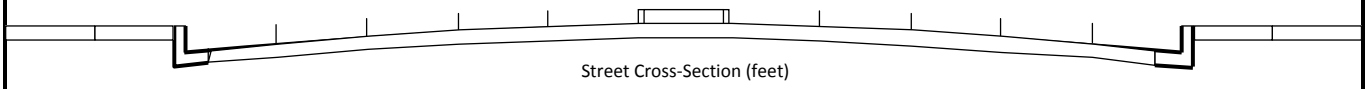
5

Ft/Trees	% Occ.

WB

Pavement Cond:	
Jay-Walking Legal:	

EB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Urban Street Multimodal Level of Service
Data Collection Sheet - Vehicle Traffic

Direction: **WB**

Street: E LELAND RD Date: 0-Jan-00

Limits: M LOVERIDGE RD TO RAILROAD Observer: 0

Field Survey

	Segment And Downstream Signal		Speed Limit	Median Type	Left Turn Pocket	Drivewys Rightside	Unsig. Intersects
	From	To	(mph)	(0-3)	(y/n)	(#)	(#)
1	OVERIDGE RI	FREED WY	35	3	y	4	
2	FREED WY	HARBOR ST	35	3	y	2	
3	HARBOR ST	RAILROAD AVI	35	3	y	7	
4	RAILROAD AVI	--					
5	--	--					

Traffic Counts K: 100 D: 58.44

	Segment And Downstream Signal		Vol	Heavy Vehicle	RTOR+ PermLeft	Left/Right Turns	Thru Adj. Sat.	PHF
	From	To	(1-wy)	(%)	veh	%	(vphgl)	
1	OVERIDGE RI	FREED WY	594	2%	62	0%	1900	0.81
2	FREED WY	HARBOR ST	559	2%	318	0%	1900	0.92
3	HARBOR ST	RAILROAD AVI	1133	2%	368	0%	1900	0.92
4	RAILROAD AVI	--						
5	--	--						

Arterial Traffic Performance & Signal Timing

	Segment And Downstream Signal		Field Survey		Signal Timing Data			
			Mean Speed	Average Stops	Cycle Length	Grn/Cycle for Thru	Ped Walk	Xing Ped Walk
	From	To	(mph)	(#/veh)	(secs)	(%)	(sec/cyc)	(sec/cyc)
1	OVERIDGE RI	FREED WY	31.5	0.04	0.0	100%	0.0	0.0
2	FREED WY	HARBOR ST	31.5	1.9	140.0	25%	26.0	26.0
3	HARBOR ST	RAILROAD AVI	31.5	2.9	140.0	31%	28.0	20.0
4	RAILROAD AVI	--						
5	--	--						

Notes: Median = 0 if None, 1 if one-way st., 2 if Painted or TWLTL, 3 if Raised
Heavy Vehicles = Buses plus trucks plus recreational vehicles
Thru Adusted Saturation Flow rates computed per Signalized Intersections Chapter, HC
Signal data is at the downstream signal

Urban Street Multimodal Level of Service
Data Collection Sheet - Transit

Direction: **WB**

Street: E LELAND RD Date: 0-Jan-00

Limits: FROM LOVERIDGE RD TO RAILROAD AVE Observer: 0

Field Survey

Segment			Bus Stop	Shelters	Benches	CBD
	From	To	(#)	(% stops)	(% stops)	(yes/no)
1	OVERIDGE RI	FREED WY	3	0	0	no
2	FREED WY	HARBOR ST	0	0	0	no
3	HARBOR ST	RAILROAD AVI	2	0.5	0.5	no
4	RAILROAD AVI	--				
5	--	--				

Transit Performance Data

Segment			Route	Frequency	Load Factor	On-Time Perform.	Schedule Speed
	From	To	#'s	(bus/hr)	(pas/seat)	(%)	(mph)
1	OVERIDGE RI	FREED WY					
			387-W	1	0.43	0.962	21
			391-W	2	0.34	0.962	20
			390-W	2	?	0.962	19
2	FREED WY	HARBOR ST					
3	HARBOR ST	RAILROAD AVI					
			380-W	2	0.55	0.962	14
			390-W	2	?	0.962	19
4	RAILROAD AVI	--					
5	--	--					

Bus is On-Time if arrives within: 5 minutes of scheduled time.
Average Passenger Trip Length: 6.4 miles

A. Compute Auto LOS and Performance

Street: **E LELAND RD**

Direction= **Down** **WB**

1. Compute Eastbound Hourly Demand (v)

Segment & Downstream Signal	AADT (vpd)	Peak Factor K (#)	Dir. Factor D (#)	Pk.Hr.Fac. PHF (#)	Thru Traffic (%)	Demand v (vph)	from:
1	594	1.000	0.58	0.81	100%	594	traffic
2	559	1.000	0.58	0.92	100%	559	traffic
3	1133	1.000	0.58	0.92	100%	1133	traffic
4	0	1.000	0.58	0	100%	#DIV/0!	traffic
5	0	1.000	0.58	0	100%	#DIV/0!	traffic

2. Compute Eastbound Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1900	2	1.00	3800	0.16	OK	xsec 1-3, traffic
2	1900	2	0.25	950	0.59	OK	xsec 1-3, traffic
3	1900	2	0.31	1178	0.96	OK	xsec 1-3, traffic
4	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic
5	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	35	3166	31.5	traffic, layout
2	35	1365	31.5	traffic, layout
3	35	1525	31.5	traffic, layout
4	0	0	0	traffic, layout
5	0	0	0	traffic, layout
Total/Ave.	35.0	6056	31.5	

4. Compute Stops & % Left Lane

Segment & Downstream Signal	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	0.07	y	3	traffic
2	7.50	y	3	traffic
3	9.90	y	3	traffic
4	#DIV/0!	0	0	traffic
5	#DIV/0!	0	0	traffic
Total/Ave	4.22	1.00	3.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weight. Ave.	Auto LOS
1	23.5%	41.2%	20.1%	8.8%	4.2%	2.2%	2.35	B
2	4.5%	17.4%	24.2%	23.1%	17.9%	12.9%	3.71	D
3	2.5%	10.7%	18.5%	23.2%	23.6%	21.4%	4.19	D
4	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average	13.2%	34.3%	25.9%	14.5%	7.7%	4.4%	2.82	C

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Pedestrian LOS

Street: **E LELAND RD**

1. Compute Pedestrian Density LOS

Seg.	Sidewalk Width (ft)	Ped Flow (pph)	Ped. Density LOS #	Ped. Density LOS	
1	5	0	0.00	A	from xsec1-3
2	5	0	0.00	A	from xsec1-3
3	5	0	0.00	A	from xsec1-3
4	0	0	N/A	N/A	from xsec4-5
5	0	0	N/A	N/A	from xsec4-5

Density LOS Lookup	
Ped/hr/ft	LOS
0	A
300	B
420	C
600	D
900	E
1380	F

2. Compute Pedestrian Segment LOS

Seg.	Outside Lane (ft)	Bike Ln + Park/Shldr (ft)	On-Street Parking Occ (%)	Barrier (ft/Tree)	Buffer Width (ft)	Dir. Traffic Volume (vph)	Traf. Lanes One-Dir (lanes)	Midblock Veh. Speed (mph)	Ped. Seg. LOS #	from
1	0	8	0%	0	0	594	2	33.3	3.17	xsec1-3
2	0	8	0%	0	0	559	2	33.3	3.02	xsec1-3
3	0	8	0%	0	0	1,133	2	33.3	3.76	xsec1-3
4	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5
5	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with intersection delay.

3. Compute Pedestrian Intersection LOS

Downstream Signal	RTOR+ Perm LT (vph)	X-Street Volume (vph)	X-Street PHF (#)	X-Street Speed (mph)	X-Street Lanes (#)	Ave Ped. Wait At Signal (sec)	Right Turn Channel Islands (#)	Ped. Intersect LOS #	from
1	62	129	0.81	35	3	0.0	0	2.19	layout, traffic
2	318	2252	0.92	35	5	46.4	0	5.37	layout, traffic
3	368	2946	0.92	35	7	44.8	0	6.33	layout, traffic
4	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
5	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic

Pedestrian Delay computed per Chapter 18 method (eqn 18-5, HCM 2000).

4. Compute Roadway Crossing Difficulty Factor (RCDF)

Seg.	Signal Spacing (ft)	Cross St. Ped Wait (secs/cycle)	Divert Delay (sec)	Arterial X Distance (ft)	Midblock Veh Speed (mph)	Vehicle Vol 2-Dir (vph)	Wait To X (max=900) (sec)	Is J-Walking Allowed? (Yes/No)	from
1	3166	0.0	603	79	33.3	594	340	no	layout, traffic
2	1365	46.4	283	79	33.3	559	278	no	layout, traffic
3	1525	51.4	316	79	33.3	1,133	900	no	layout, traffic
4	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
5	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic

5. Compute Pedestrian Facility LOS

Segment & Downstream Signal	Min. Wait,Divert (sec)	Crossing LOS (#)	No Cross LOS (#)	RCDF (#)	Ped. NDLOS (#)	Ped. Density LOS #	Ped. Fac. LOS (#)	Ped. Facility LOS
1	340	6.00	3.10	1.00	3.10	0.00	3.10	D
2	278	6.00	3.75	1.00	3.75	0.00	3.75	E
3	316	6.00	4.20	1.00	4.20	0.00	4.20	E
4	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
5	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
Average							3.52	E

C. Compute Transit LOS

Street: **E LELAND RD**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	5	96%	0%	0%	0.22	no	transit
2	0	#DIV/0!	0%	0%	#DIV/0!	no	transit
3	4	96%	50%	50%	0.28	no	transit
4	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
5	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus (mph)	from
1	3166	31.5	3	19.8	transit
2	1365	31.5	0	#DIV/0!	transit
3	1525	31.5	2	16.5	transit
4	0	0	0	#DIV/0!	transit
5	0	0	0	#DIV/0!	transit
Total/Ave	6056	#DIV/0!		#DIV/0!	

3. Compute Transit Perceived Travel Time and Headway Factors

Segment	a1 factor	IVTTR min/mi	EWTTR min/mi	ATR min/mi	PTTR	Fptt	Fh
1	1.00	3.03	0.01	0.00	3.04	1.30	3.04
2	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
3	1.00	3.64	0.01	0.12	3.53	1.23	2.83
4	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
5	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00

IVTTR = In-Vehicle Travel Time Rate
EWTTR = Equivalent Wait Travel Time Rate
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor

4. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	3.96	3.10	0.52	A
2	#DIV/0!	3.75	#DIV/0!	F
3	3.49	4.20	1.40	A
4	#DIV/0!	#NUM!	#DIV/0!	F
5	#DIV/0!	#NUM!	#DIV/0!	F
Average			1.75	A

D. Compute Bicycle LOS

Street: **E LELAND RD**

1. Geometric Input Data

Segment & Downstream Signal	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Sig. Int Cross-Dist (ft)	Unsig.Conf Per Mile (conf/mi)	from
1	0	8	2	D	36	6.7	xsec1-3, layout
2	0	8	2	D	76	7.7	xsec1-3, layout
3	0	8	2	D	87	24.2	xsec1-3, layout
4	0	0	0	UD	0	#DIV/0!	xsec4-5, layout
5	0	0	0	UD	0	#DIV/0!	xsec4-5, layout

2. Performance and Other Input Data

Segment & Downstream Signal	Traffic Volume (vph)	Heavy Vehicle (%)	Midblock Traffic Spd (mph)	On-Street Parking (%)	Pavement Rating (#)	from
1	594	2%	33.3	0%	5.0	traffic, xsec1-3
2	559	2%	33.3	0%	5.0	traffic, xsec1-3
3	1133	2%	33.3	0%	5.0	traffic, xsec1-3
4	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5
5	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5

Pavement Rating: 1=Poor, 5=Excellent

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with inte

3. Compute Bicycle LOS

Segment & Downstream Signal	Prelim. Eff. Width (Wv)	Effective Width (We)	Speed Factor (#)	Segment LOS (#)	Intersect LOS (#)	Bicycle Score (#)	Bicycle LOS
1	8.0	16.0	3.70	3.15	3.60	3.99	E
2	8.0	16.0	3.70	3.06	4.11	4.28	F
3	8.0	16.0	3.70	3.42	4.82	5.60	F
4	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average						4.46	F

E. LOS Summary

Title: E LELAND RD

Direction =	Down	WB

Date: Analyst:

Segment & Downstream Signal	Auto Stops LOS #1	Auto Speed LOS #2	Auto HCM LOS #3	Auto NCHRP 379 LOS #4	Transit LOS	Bicycle LOS	Pedestrian LOS
1	B	A	A	A	A	E	D
2	D	A	A	A	F	F	E
3	D	A	A	A	A	F	E
4	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
5	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
Facility	C	#DIV/0!	A	A	A	F	E

Auto Performance Measures Summary WB

Seg+Sig	Stops	FFS	Speed	%FFS
1	0.07	35.0	31.5	90.0%
2	7.50	35.0	31.5	90.0%
3	9.90	35.0	31.5	90.0%
4	#DIV/0!	0.0	0	#DIV/0!
5	#DIV/0!	0.0	0	#DIV/0!
Facility	4.22	35.0	31.5	90.0%

Spreadsheet created by: R.Dowling of Dowling Associates, Inc.
Under contract to:
Transportation Research Board
NCHRP 3-70 Multimodal Level of Service For Urban Streets

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Created: 8-Jun-07 Updated: 25-Sep-08

Multimodal Level of Service for Urban Streets

Diagram of Uban Street

Street: CALIFORNIA AVE

Date:

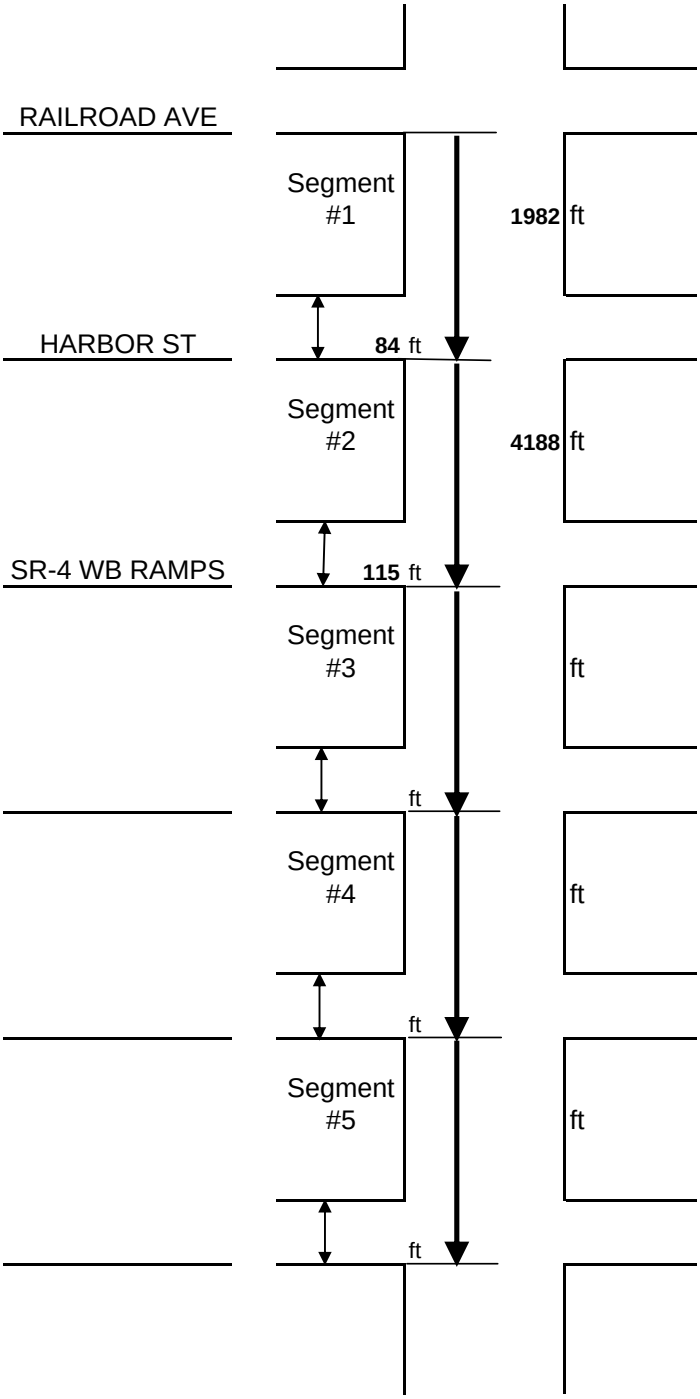
Limits: FROM RAILROAD AVE TO SR-4 WB RAMPS

Observer:

Analysis Direction:	EB

(NB, SB, EB, WB)
(NW, SE, NE, SW)

Data Entry Fields in Red



Intersect. Control	X-Street Lanes	X-Street Speed	X-Street 2-W vph	Right Turn Isl.
SIGNAL	7	35	2070	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	5	35	917	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: CALIFORNIA AVE

Limits: FROM RAILROAD AVE

Cross-Section #1

Observer: 0

From: RAILROAD AVE To: HARBOR ST

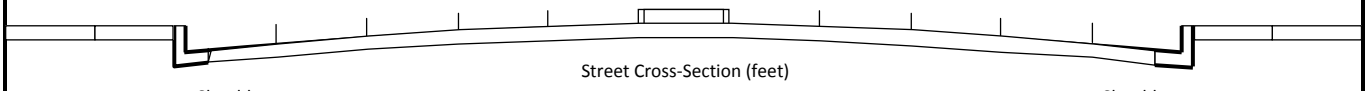
1

Ft/Trees	% Occ.
0	0%

EB

Pavement Cond:	5
Jay-Walking Legal:	no

WB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	6	0	0	12	12	0	12	12	0	0	15	5	5

Ped Vol: 0

Cross-Section #2

From: HARBOR ST To: SR-4 WB RAMPS

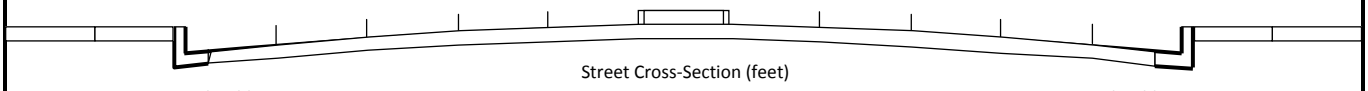
2

Ft/Trees	% Occ.
0	0%

EB

Pavement Cond:	5
Jay-Walking Legal:	no

WB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	6	0	12	12	12	0	12	12	12	0	3	0	5

0

Cross-Section #3

From: SR-4 WB RAMPS To: 0

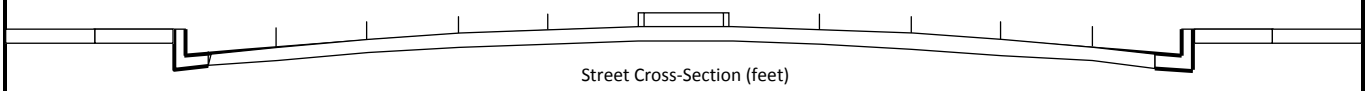
3

Ft/Trees	% Occ.

EB

Pavement Cond:	
Jay-Walking Legal:	

WB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: CALIFORNIA AVE

Limits: FROM RAILROAD AVE

Cross-Section #4

Observer: 0

From: 0 To: 0

4

Ft/Trees	% Occ.

EB

Pavement Cond:	
Jay-Walking Legal:	

WB

Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Cross-Section #5

From: 0 To: 0

5

Ft/Trees	% Occ.

EB

Pavement Cond:	
Jay-Walking Legal:	

WB

Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Urban Street Multimodal Level of Service
Data Collection Sheet - Vehicle Traffic

Direction: **EB**

Street: CALIFORNIA AVE Date: 0-Jan-00

Limits: M RAILROAD AVE TO SR-4 WB R/ Observer: 0

Field Survey

	Segment And Downstream Signal		Speed Limit	Median Type	Left Turn Pocket	Drivewys Rightside	Unsig. Intersects
	From	To	(mph)	(0-3)	(y/n)	(#)	(#)
1	RAILROAD AVI	HARBOR ST	35	0	y	0	
2	HARBOR ST	R-4 WB RAMP	40	0	y	1	
3	R-4 WB RAMP	0					
4	0	0					
5	0	0					

Traffic Counts K: 100 D: 100

	Segment And Downstream Signal		Vol	Heavy Vehicle	RTOR+ PermLeft	Left/Right Turns	Thru Adj. Sat.	PHF
	From	To	(1-wy)	(%)	veh	%	(vphgl)	
1	RAILROAD AVI	HARBOR ST	309	2%	685	0%	1900	0.92
2	HARBOR ST	R-4 WB RAMP	1019	2%	633	0%	1900	0.92
3	R-4 WB RAMP	0						
4	0	0						
5	0	0						

Arterial Traffic Performance & Signal Timing

			Field Survey		Signal Timing Data			
	Segment And Downstream Signal		Mean Speed	Average Stops	Cycle Length	Grn/Cycle for Thru	Ped Walk	Xing Ped Walk
	From	To	(mph)	(#/veh)	(secs)	(%)	(sec/cyc)	(sec/cyc)
1	RAILROAD AVI	HARBOR ST	31.5	0.8	130.0	15%	38.0	17.0
2	HARBOR ST	R-4 WB RAMP	36.0	0.7	80.0	38%	0.0	20.0
3	R-4 WB RAMP	0						
4	0	0						
5	0	0						

Notes: Median = 0 if None, 1 if one-way st., 2 if Painted or TWLTL, 3 if Raised
Heavy Vehicles = Buses plus trucks plus recreational vehicles
Thru Adusted Saturation Flow rates computed per Signalized Intersections Chapter, HC
Signal data is at the downstream signal

Urban Street Multimodal Level of Service
Data Collection Sheet - Transit

Direction: **EB**

Street: CALIFORNIA AVE Date: 0-Jan-00

Limits: FROM RAILROAD AVE TO SR-4 WB RAMPS Observer: 0

Field Survey

Segment			Bus Stop	Shelters	Benches	CBD
	From	To	(#)	(% stops)	(% stops)	(yes/no)
1	RAILROAD AVI	HARBOR ST	0	0	0	no
2	HARBOR ST	R-4 WB RAMP	0	0	0	no
3	R-4 WB RAMP	0				
4	0	0				
5	0	0				

Transit Performance Data

Segment			Route	Frequency	Load Factor	On-Time Perform.	Schedule Speed
	From	To	#'s	(bus/hr)	(pas/seat)	(%)	(mph)
1	RAILROAD AVI	HARBOR ST					
2	HARBOR ST	R-4 WB RAMP					
3	R-4 WB RAMP	0					
4	0	0					
5	0	0					

Bus is On-Time if arrives within: 5 minutes of scheduled time.
Average Passenger Trip Length: 6.4 miles

A. Compute Auto LOS and Performance

Street: **CALIFORNIA AVE**

Direction= **Down** **EB**

1. Compute Eastbound Hourly Demand (v)

Segment & Downstream Signal	AADT (vpd)	Peak Factor K (#)	Dir. Factor D (#)	Pk.Hr.Fac. PHF (#)	Thru Traffic (%)	Demand v (vph)	from:
1	309	1.000	1.00	0.92	100%	309	traffic
2	1019	1.000	1.00	0.92	100%	1019	traffic
3	0	1.000	1.00	0	100%	#DIV/0!	traffic
4	0	1.000	1.00	0	100%	#DIV/0!	traffic
5	0	1.000	1.00	0	100%	#DIV/0!	traffic

2. Compute Eastbound Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1900	2	0.15	570	0.54	OK	xsec 1-3, traffic
2	1900	3	0.38	2166	0.47	OK	xsec 1-3, traffic
3	0	0	0.00	1	#DIV/0!	--	xsec 1-3, traffic
4	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic
5	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	35	1982	31.5	traffic, layout
2	40	4188	36.0	traffic, layout
3	0	0	0	traffic, layout
4	0	0	0	traffic, layout
5	0	0	0	traffic, layout
Total/Ave.	38.4	6170	34.4	

4. Compute Stops & % Left Lane

Segment & Downstream Signal	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	2.21	y	0	traffic
2	0.91	y	0	traffic
3	#DIV/0!	0	0	traffic
4	#DIV/0!	0	0	traffic
5	#DIV/0!	0	0	traffic
Total/Ave	1.33	1.00	0.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weight. Ave.	Auto LOS
1	15.2%	36.4%	24.9%	13.0%	6.7%	3.8%	2.71	B
2	19.9%	39.8%	22.2%	10.3%	5.0%	2.7%	2.49	B
3	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average	24.0%	41.3%	19.9%	8.6%	4.1%	2.2%	2.34	B

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Pedestrian LOS

Street: **CALIFORNIA AVE**

1. Compute Pedestrian Density LOS

Seg.	Sidewalk Width (ft)	Ped Flow (pph)	Ped. Density LOS #	Ped. Density LOS	
1	5	0	0.00	A	from xsec1-3
2	5	0	0.00	A	from xsec1-3
3	0	0	N/A	N/A	from xsec1-3
4	0	0	N/A	N/A	from xsec4-5
5	0	0	N/A	N/A	from xsec4-5

Density LOS Lookup	
Ped/hr/ft	LOS
0	A
300	B
420	C
600	D
900	E
1380	F

2. Compute Pedestrian Segment LOS

Seg.	Outside Lane (ft)	Bike Ln + Park/Shldr (ft)	On-Street Parking Occ (%)	Barrier (ft/Tree)	Buffer Width (ft)	Dir. Traffic Volume (vph)	Traf. Lanes One-Dir (lanes)	Midblock Veh. Speed (mph)	Ped. Seg. LOS #	from
1	0	6	0%	0	0	309	2	33.3	2.78	xsec1-3
2	12	6	0%	0	0	1,019	3	38.0	2.96	xsec1-3
3	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec1-3
4	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5
5	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with intersection delay.

3. Compute Pedestrian Intersection LOS

Downstream Signal	RTOR+ Perm LT (vph)	X-Street Volume (vph)	X-Street PHF (#)	X-Street Speed (mph)	X-Street Lanes (#)	Ave Ped. Wait At Signal (sec)	Right Turn Channel Islands (#)	Ped. Intersect LOS #	from
1	685	2070	0.92	35	7	32.6	0	5.72	layout, traffic
2	633	917	0.92	35	5	40.0	0	4.20	layout, traffic
3	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
4	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
5	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic

Pedestrian Delay computed per Chapter 18 method (eqn 18-5, HCM 2000).

4. Compute Roadway Crossing Difficulty Factor (RCDF)

Seg.	Signal Spacing (ft)	Cross St. Ped Wait (secs/cycle)	Divert Delay (sec)	Arterial X Distance (ft)	Midblock Veh Speed (mph)	Vehicle Vol 2-Dir (vph)	Wait To X (max=900) (sec)	Is J-Walking Allowed? (Yes/No)	from
1	1982	49.1	402	69	33.3	309	44	no	layout, traffic
2	4188	22.5	809	81	38.0	1,019	900	no	layout, traffic
3	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
4	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
5	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic

5. Compute Pedestrian Facility LOS

Segment & Downstream Signal	Min. Wait,Divert (sec)	Crossing LOS (#)	No Cross LOS (#)	RCDF (#)	Ped. NDLOS (#)	Ped. Density LOS #	Ped. Fac. LOS (#)	Ped. Facility LOS
1	44	5.00	3.75	1.00	3.75	0.00	3.75	E
2	809	6.00	3.47	1.00	3.47	0.00	3.47	D
3	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
4	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
5	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
Average							3.56	E

C. Compute Transit LOS

Street: **CALIFORNIA AVE**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	0	#DIV/0!	0%	0%	#DIV/0!	no	transit
2	0	#DIV/0!	0%	0%	#DIV/0!	no	transit
3	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
4	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
5	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus (mph)	from
1	1982	31.5	0	#DIV/0!	transit
2	4188	36.0	0	#DIV/0!	transit
3	0	0	0	#DIV/0!	transit
4	0	0	0	#DIV/0!	transit
5	0	0	0	#DIV/0!	transit
Total/Ave	6170	#DIV/0!		#DIV/0!	

3. Compute Transit Perceived Travel Time and Headway Factors

Segment	a1 factor	IVTTR min/mi	EWTTR min/mi	ATR min/mi	PTTR	Fptt	Fh
1	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
2	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
3	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
4	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
5	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00

IVTTR = In-Vehicle Travel Time Rate
EWTTR = Equivalent Wait Travel Time Rate
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor

4. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	#DIV/0!	3.75	#DIV/0!	F
2	#DIV/0!	3.47	#DIV/0!	F
3	#DIV/0!	#NUM!	#DIV/0!	F
4	#DIV/0!	#NUM!	#DIV/0!	F
5	#DIV/0!	#NUM!	#DIV/0!	F
Average			5.00	F

D. Compute Bicycle LOS

Street: **CALIFORNIA AVE**

1. Geometric Input Data

Segment & Downstream Signal	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Sig. Int Cross-Dist (ft)	Unsig.Conf Per Mile (conf/mi)	from
1	0	6	2	UD	84	0.0	xsec1-3, layout
2	12	6	3	UD	115	1.3	xsec1-3, layout
3	0	0	0	UD	0	#DIV/0!	xsec1-3, layout
4	0	0	0	UD	0	#DIV/0!	xsec4-5, layout
5	0	0	0	UD	0	#DIV/0!	xsec4-5, layout

2. Performance and Other Input Data

Segment & Downstream Signal	Traffic Volume (vph)	Heavy Vehicle (%)	Midblock Traffic Spd (mph)	On-Street Parking (%)	Pavement Rating (#)	from
1	309	2%	33.3	0%	5.0	traffic, xsec1-3
2	1019	2%	38.0	0%	5.0	traffic, xsec1-3
3	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec1-3
4	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5
5	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5

Pavement Rating: 1=Poor, 5=Excellent

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with inte

3. Compute Bicycle LOS

Segment & Downstream Signal	Prelim. Eff. Width (Wv)	Effective Width (We)	Speed Factor (#)	Segment LOS (#)	Intersect LOS (#)	Bicycle Score (#)	Bicycle LOS
1	6.0	12.0	3.70	3.32	4.42	4.30	F
2	18.0	24.0	4.05	1.66	2.67	3.32	D
3	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average						3.63	E

E. LOS Summary

Title: CALIFORNIA AVE

Direction =	Down	EB

Date: Analyst:

Segment & Downstream Signal	Auto Stops LOS #1	Auto Speed LOS #2	Auto HCM LOS #3	Auto NCHRP 379 LOS #4	Transit LOS	Bicycle LOS	Pedestrian LOS
1	B	B	A	A	F	F	E
2	B	B	A	A	F	D	D
3	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
4	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
5	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
Facility	B	#DIV/0!	B	A	F	E	E

Auto Performance Measures Summary EB

Seg+Sig	Stops	FFS	Speed	%FFS
1	2.21	35.0	31.5	90.0%
2	0.91	40.0	36.0	90.0%
3	#DIV/0!	0.0	0	#DIV/0!
4	#DIV/0!	0.0	0	#DIV/0!
5	#DIV/0!	0.0	0	#DIV/0!
Facility	1.33	38.4	34.4	89.7%

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Under contract to:
Transportation Research Board
NCHRP 3-70 Multimodal Level of Service For Urban Streets

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Created: 8-Jun-07 Updated: 25-Sep-08

Multimodal Level of Service for Urban Streets

Diagram of Uban Street

Street: CALIFORNIA AVE

Date:

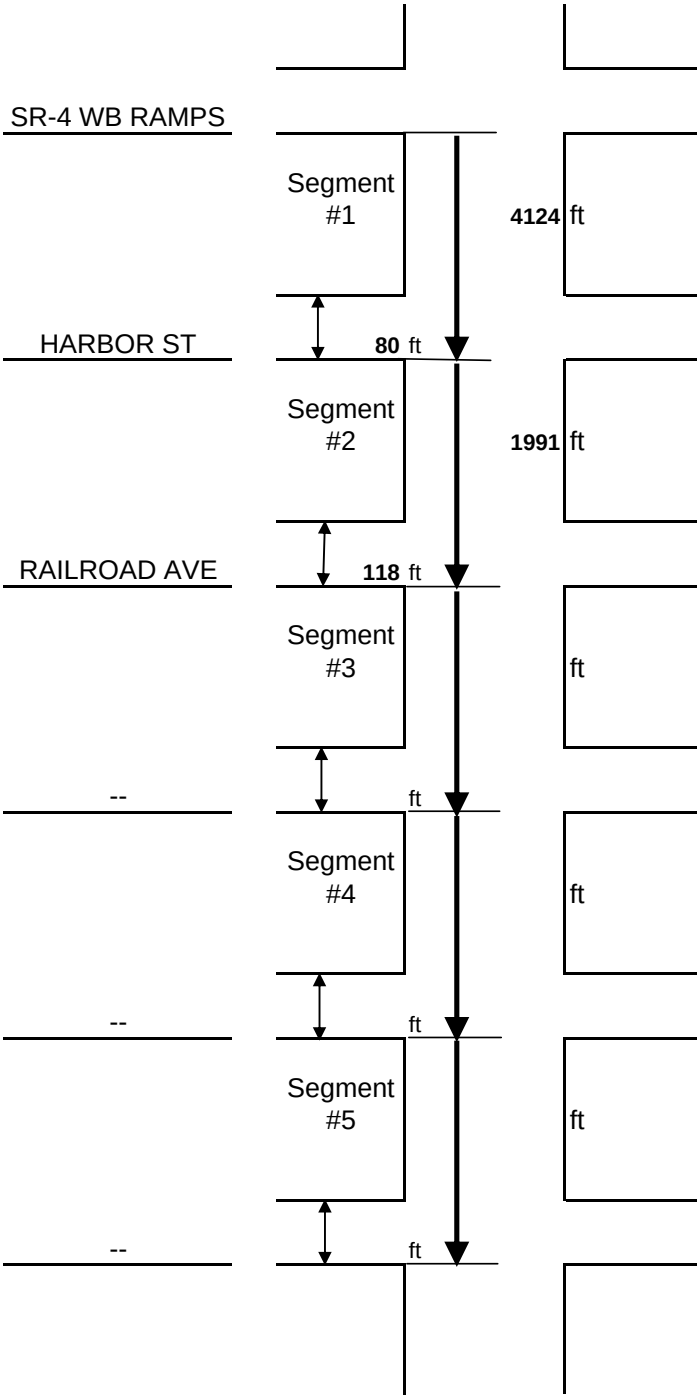
Limits: FROM SR-4 WB RAMPS TO RAILROAD AVE

Observer:

Analysis Direction:	WB

(NB, SB, EB, WB)
(NW, SE, NE, SW)

Data Entry Fields in Red



Intersect. Control	X-Street Lanes	X-Street Speed	X-Street 2-W vph	Right Turn Isl.
SIGNAL	6	35	2070	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	7	35	2847	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: CALIFORNIA AVE

Limits: FROM SR-4 WB RAMP

Observer: 0

Cross-Section #1
From: SR-4 WB RAMPS To: HARBOR ST

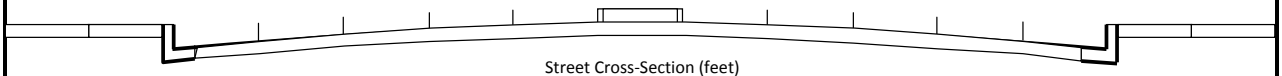
1

Ft/Trees	% Occ.
0	0%

WB

Pavement Cond:	5
Jay-Walking Legal:	no

EB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	3	0	12	12	12	0	12	12	12	0	6	0	5

Ped Vol: 0

Cross-Section #2
From: HARBOR ST To: RAILROAD AVE

2

Ft/Trees	% Occ.
20	0%

WB

Pavement Cond:	5
Jay-Walking Legal:	no

EB

Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	5	15	0	0	12	12	0	12	12	0	0	6	0	5

0

Cross-Section #3
From: RAILROAD AVE To: --

3

Ft/Trees	% Occ.

WB

Pavement Cond:	
Jay-Walking Legal:	

EB

Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Multimodal Level of Service for Urban Streets

Street Cross-Section Data | Street: CALIFORNIA AVE | Limits: FROM SR-4 WB RAMP

Cross-Section #4 | Observer: 0

From: -- To: --

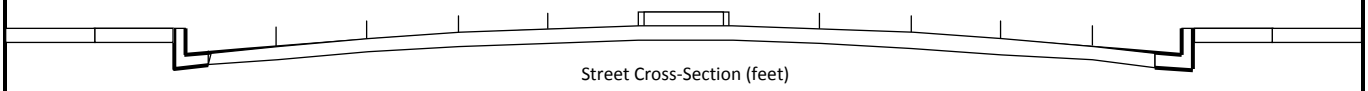
4

Ft/Trees	% Occ.

WB

Pavement Cond:	
Jay-Walking Legal:	

EB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Cross-Section #5

From: -- To: --

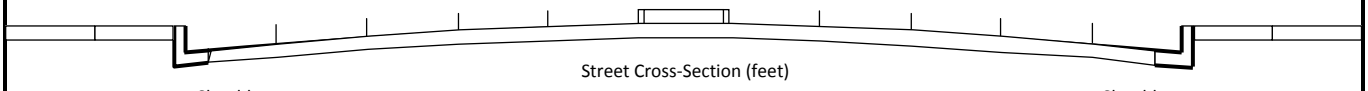
5

Ft/Trees	% Occ.

WB

Pavement Cond:	
Jay-Walking Legal:	

EB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Urban Street Multimodal Level of Service
Data Collection Sheet - Vehicle Traffic

Direction: **WB**

Street: CALIFORNIA AVE Date: 0-Jan-00

Limits: M SR-4 WB RAMPS TO RAILROAD Observer: 0

Field Survey

	Segment And Downstream Signal		Speed Limit	Median Type	Left Turn Pocket	Drivewys Rightside	Unsig. Intersects
	From	To	(mph)	(0-3)	(y/n)	(#)	(#)
1	R-4 WB RAMP	HARBOR ST	40	0	y	13	
2	HARBOR ST	RAILROAD AVI	35	0	n	26	
3	RAILROAD AVI	--					
4	--	--					
5	--	--					

Traffic Counts K: 100 D: 100

	Segment And Downstream Signal		Vol	Heavy Vehicle	RTOR+ PermLeft	Left/Right Turns	Thru Adj. Sat.	PHF
	From	To	(1-wy)	(%)	veh	%	(vphgl)	
1	R-4 WB RAMP	HARBOR ST	1619	2%	533	0%	1900	0.92
2	HARBOR ST	RAILROAD AVI	566	2%	306	0%	1900	0.88
3	RAILROAD AVI	--						
4	--	--						
5	--	--						

Arterial Traffic Performance & Signal Timing

	Segment And Downstream Signal		Field Survey		Signal Timing Data			
			Mean Speed	Average Stops	Cycle Length	Grn/Cycle for Thru	Ped Walk	Xing Ped Walk
	From	To	(mph)	(#/veh)	(secs)	(%)	(sec/cyc)	(sec/cyc)
1	R-4 WB RAMP	HARBOR ST	36.0	3.5	130.0	43%	28.0	14.0
2	HARBOR ST	RAILROAD AVI	31.5	0.7	80.0	26%	37.0	18.0
3	RAILROAD AVI	--						
4	--	--						
5	--	--						

Notes: Median = 0 if None, 1 if one-way st., 2 if Painted or TWLTL, 3 if Raised
Heavy Vehicles = Buses plus trucks plus recreational vehicles
Thru Adusted Saturation Flow rates computed per Signalized Intersections Chapter, HC
Signal data is at the downstream signal

Urban Street Multimodal Level of Service
Data Collection Sheet - Transit

Direction: **WB**

Street: CALIFORNIA AVE Date: 0-Jan-00

Limits: FROM SR-4 WB RAMPS TO RAILROAD AVE Observer: 0

Field Survey

Segment			Bus Stop	Shelters	Benches	CBD
	From	To	(#)	(% stops)	(% stops)	(yes/no)
1	R-4 WB RAMP	HARBOR ST	0	0	0	no
2	HARBOR ST	RAILROAD AVI	0	0	0	no
3	RAILROAD AVI	--				
4	--	--				
5	--	--				

Transit Performance Data

Segment			Route	Frequency	Load Factor	On-Time Perform.	Schedule Speed
	From	To	#'s	(bus/hr)	(pas/seat)	(%)	(mph)
1	R-4 WB RAMP	HARBOR ST					
2	HARBOR ST	RAILROAD AVI					
3	RAILROAD AVI	--					
4	--	--					
5	--	--					

Bus is On-Time if arrives within: 5 minutes of scheduled time.
Average Passenger Trip Length: 6.4 miles

A. Compute Auto LOS and Performance

Street: **CALIFORNIA AVE**

Direction=	Down	WB

1. Compute Eastbound Hourly Demand (v)

Segment & Downstream Signal	AADT (vpd)	Peak Factor K (#)	Dir. Factor D (#)	Pk.Hr.Fac. PHF (#)	Thru Traffic (%)	Demand v (vph)	from:
1	1619	1.000	1.00	0.92	100%	1619	traffic
2	566	1.000	1.00	0.88	100%	566	traffic
3	0	1.000	1.00	0	100%	#DIV/0!	traffic
4	0	1.000	1.00	0	100%	#DIV/0!	traffic
5	0	1.000	1.00	0	100%	#DIV/0!	traffic

2. Compute Eastbound Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1900	2	0.43	1634	0.99	OK	xsec 1-3, traffic
2	1900	3	0.26	1482	0.38	OK	xsec 1-3, traffic
3	0	0	0.00	1	#DIV/0!	--	xsec 1-3, traffic
4	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic
5	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	40	4124	36.0	traffic, layout
2	35	1991	31.5	traffic, layout
3	0	0	0	traffic, layout
4	0	0	0	traffic, layout
5	0	0	0	traffic, layout
Total/Ave.	38.4	6115	34.4	

4. Compute Stops & % Left Lane

Segment & Downstream Signal	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	4.52	y	0	traffic
2	1.91	n	0	traffic
3	#DIV/0!	0	0	traffic
4	#DIV/0!	0	0	traffic
5	#DIV/0!	0	0	traffic
Total/Ave	3.67	0.50	0.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weight. Ave.	Auto LOS
1	9.1%	28.2%	27.2%	18.2%	10.8%	6.5%	3.13	C
2	16.2%	37.3%	24.3%	12.4%	6.3%	3.5%	2.66	B
3	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average	12.8%	33.9%	26.1%	14.8%	7.9%	4.5%	2.85	C

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Pedestrian LOS

Street: **CALIFORNIA AVE**

1. Compute Pedestrian Density LOS

Seg.	Sidewalk Width (ft)	Ped Flow (pph)	Ped. Density LOS #	Ped. Density LOS	
1	5	0	0.00	A	from xsec1-3
2	5	0	0.00	A	from xsec1-3
3	0	0	N/A	N/A	from xsec1-3
4	0	0	N/A	N/A	from xsec4-5
5	0	0	N/A	N/A	from xsec4-5

Density LOS Lookup	
Ped/hr/ft	LOS
0	A
300	B
420	C
600	D
900	E
1380	F

2. Compute Pedestrian Segment LOS

Seg.	Outside Lane (ft)	Bike Ln + Park/Shldr (ft)	On-Street Parking Occ (%)	Barrier (ft/Tree)	Buffer Width (ft)	Dir. Traffic Volume (vph)	Traf. Lanes One-Dir (lanes)	Midblock Veh. Speed (mph)	Ped. Seg. LOS #	from
1	0	15	0%	0	5	1,619	2	38.0	4.28	xsec1-3
2	12	3	0%	20	0	566	3	33.3	2.55	xsec1-3
3	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec1-3
4	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5
5	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with intersection delay.

3. Compute Pedestrian Intersection LOS

Downstream Signal	RTOR+ Perm LT (vph)	X-Street Volume (vph)	X-Street PHF (#)	X-Street Speed (mph)	X-Street Lanes (#)	Ave Ped. Wait At Signal (sec)	Right Turn Channel Islands (#)	Ped. Intersect LOS #	from
1	533	2070	0.92	35	6	40.0	0	5.48	layout, traffic
2	306	2847	0.88	35	7	11.6	0	6.24	layout, traffic
3	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
4	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
5	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic

Pedestrian Delay computed per Chapter 18 method (eqn 18-5, HCM 2000).

4. Compute Roadway Crossing Difficulty Factor (RCDF)

Seg.	Signal Spacing (ft)	Cross St. Ped Wait (secs/cycle)	Divert Delay (sec)	Arterial X Distance (ft)	Midblock Veh Speed (mph)	Vehicle Vol 2-Dir (vph)	Wait To X (max=900) (sec)	Is J-Walking Allowed? (Yes/No)	from
1	4124	51.8	811	69	38.0	1,619	900	no	layout, traffic
2	1991	24.0	391	81	33.3	566	319	no	layout, traffic
3	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
4	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
5	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic

5. Compute Pedestrian Facility LOS

Segment & Downstream Signal	Min. Wait,Divert (sec)	Crossing LOS (#)	No Cross LOS (#)	RCDF (#)	Ped. NDLOS (#)	Ped. Density LOS #	Ped. Fac. LOS (#)	Ped. Facility LOS
1	811	6.00	4.17	1.00	4.17	0.00	4.17	E
2	319	6.00	3.79	1.00	3.79	0.00	3.79	E
3	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
4	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
5	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
Average							4.05	E

C. Compute Transit LOS

Street: **CALIFORNIA AVE**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	0	#DIV/0!	0%	0%	#DIV/0!	no	transit
2	0	#DIV/0!	0%	0%	#DIV/0!	no	transit
3	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
4	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
5	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus (mph)	from
1	4124	36.0	0	#DIV/0!	transit
2	1991	31.5	0	#DIV/0!	transit
3	0	0	0	#DIV/0!	transit
4	0	0	0	#DIV/0!	transit
5	0	0	0	#DIV/0!	transit
Total/Ave	6115	#DIV/0!		#DIV/0!	

3. Compute Transit Perceived Travel Time and Headway Factors

Segment	a1 factor	IVTTR min/mi	EWTTR min/mi	ATR min/mi	PTTR	Fptt	Fh
1	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
2	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
3	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
4	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
5	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00

IVTTR = In-Vehicle Travel Time Rate
EWTTR = Equivalent Wait Travel Time Rate
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor

4. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	#DIV/0!	4.17	#DIV/0!	F
2	#DIV/0!	3.79	#DIV/0!	F
3	#DIV/0!	#NUM!	#DIV/0!	F
4	#DIV/0!	#NUM!	#DIV/0!	F
5	#DIV/0!	#NUM!	#DIV/0!	F
Average			5.00	F

D. Compute Bicycle LOS

Street: **CALIFORNIA AVE**

1. Geometric Input Data

Segment & Downstream Signal	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Sig. Int Cross-Dist (ft)	Unsig.Conf Per Mile (conf/mi)	from
1	0	15	2	UD	80	16.6	xsec1-3, layout
2	12	3	3	UD	118	69.0	xsec1-3, layout
3	0	0	0	UD	0	#DIV/0!	xsec1-3, layout
4	0	0	0	UD	0	#DIV/0!	xsec4-5, layout
5	0	0	0	UD	0	#DIV/0!	xsec4-5, layout

2. Performance and Other Input Data

Segment & Downstream Signal	Traffic Volume (vph)	Heavy Vehicle (%)	Midblock Traffic Spd (mph)	On-Street Parking (%)	Pavement Rating (#)	from
1	1619	2%	38.0	0%	5.0	traffic, xsec1-3
2	566	2%	33.3	0%	5.0	traffic, xsec1-3
3	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec1-3
4	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5
5	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5

Pavement Rating: 1=Poor, 5=Excellent

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with inte

3. Compute Bicycle LOS

Segment & Downstream Signal	Prelim. Eff. Width (Wv)	Effective Width (We)	Speed Factor (#)	Segment LOS (#)	Intersect LOS (#)	Bicycle Score (#)	Bicycle LOS
1	15.0	30.0	4.05	0.48	3.66	3.94	E
2	15.0	18.0	3.70	2.54	3.09	5.91	F
3	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average						4.58	F

E. LOS Summary

Title: CALIFORNIA AVE

Direction =	Down	WB

Date: Analyst:

Segment & Downstream Signal	Auto Stops LOS #1	Auto Speed LOS #2	Auto HCM LOS #3	Auto NCHRP 379 LOS #4	Transit LOS	Bicycle LOS	Pedestrian LOS
1	C	F (v/c>1)	A	A	F	E	E
2	B	B	A	A	F	F	E
3	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
4	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
5	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
Facility	C	#DIV/0!	B	A	F	F	E

Auto Performance Measures Summary WB

Seg+Sig	Stops	FFS	Speed	%FFS
1	4.52	40.0	36.0	90.0%
2	1.91	35.0	31.5	90.0%
3	#DIV/0!	0.0	0	#DIV/0!
4	#DIV/0!	0.0	0	#DIV/0!
5	#DIV/0!	0.0	0	#DIV/0!
Facility	3.67	38.4	34.4	89.6%

Spreadsheet created by: R.Dowling of Dowling Associates, Inc.
Under contract to:
Transportation Research Board
NCHRP 3-70 Multimodal Level of Service For Urban Streets

Spreadsheet is made available "As-Is" for TRB internal review.
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Spreadsheet does not have data entry error checking.
Created: 8-Jun-07 Updated: 25-Sep-08

Multimodal Level of Service for Urban Streets

Diagram of Uban Street

Street: HARBOR ST

Date:

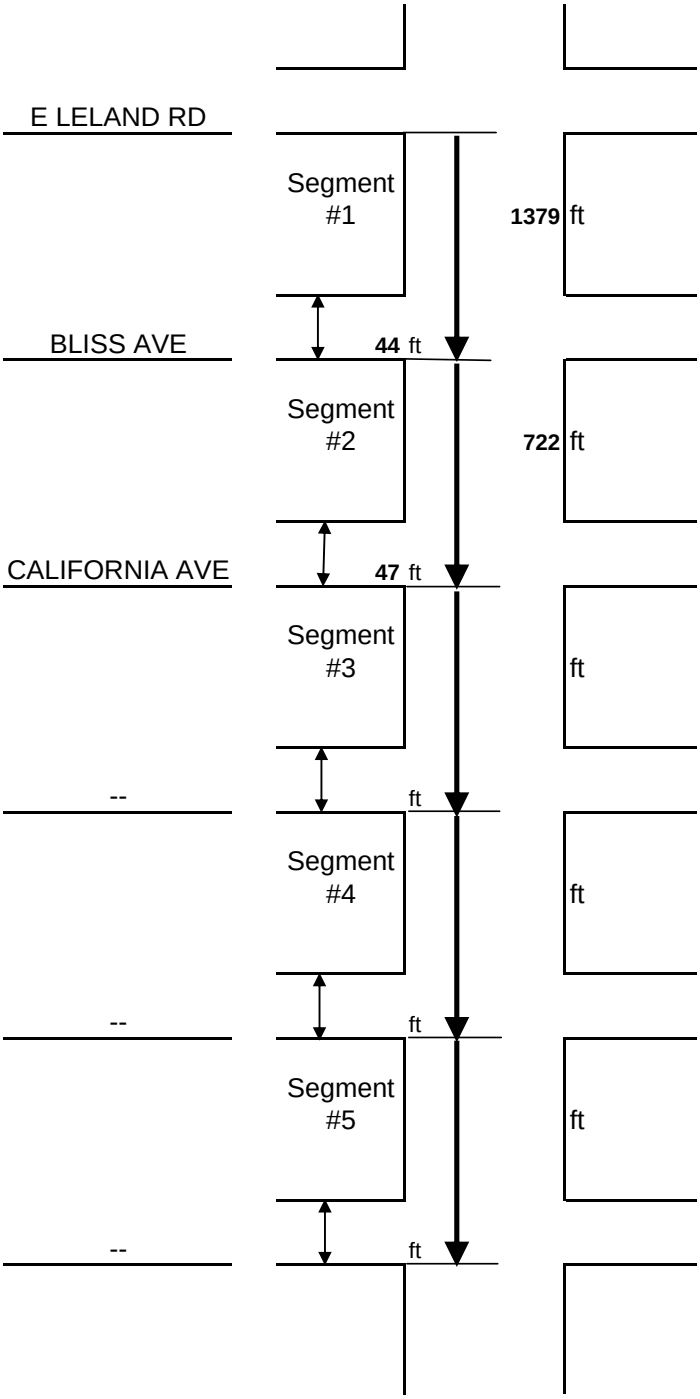
Limits: FROM E LELAND RD TO CALIFORNIA AVE

Observer:

Analysis Direction:	NB

(NB, SB, EB, WB)
(NW, SE, NE, SW)

Data Entry Fields in Red



Intersect. Control	X-Street Lanes	X-Street Speed	X-Street 2-W vph	Right Turn Isl.
SIGNAL	5	35	590	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	5	35	1269	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: HARBOR ST

Limits: FROM E LELAND RD

Observer: 0

Cross-Section #1
From: E LELAND RD To: BLISS AVE

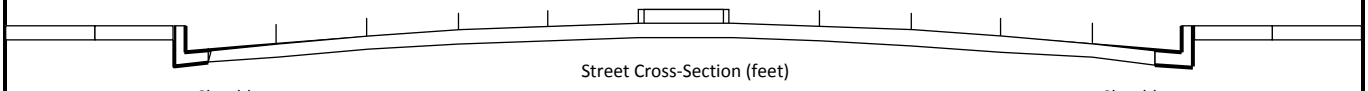
1

Ft/Trees	% Occ.
50	0%

NB

Pavement Cond:	5
Jay-Walking Legal:	no

SB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	5	5	0	0	12	12	15	12	12	0	0	5	3	5

Ped Vol: 0

Cross-Section #2
From: BLISS AVE To: CALIFORNIA AVE

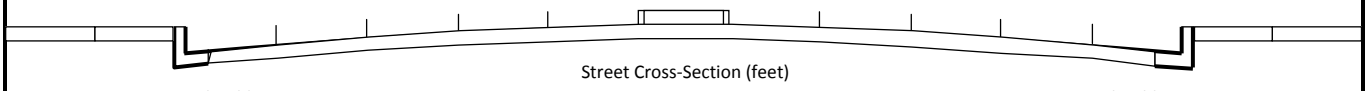
2

Ft/Trees	% Occ.
0	0%

NB

Pavement Cond:	5
Jay-Walking Legal:	no

SB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	5	0	0	12	12	15	12	12	0	0	5	0	5

0

Cross-Section #3
From: CALIFORNIA AVE To: --

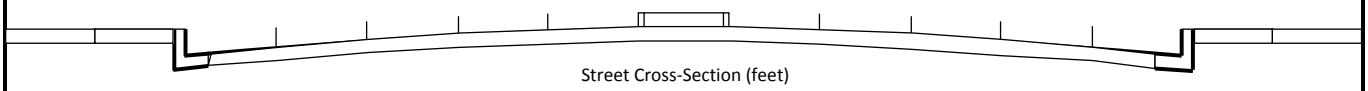
3

Ft/Trees	% Occ.

NB

Pavement Cond:	
Jay-Walking Legal:	

SB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: HARBOR ST

Limits: FROM E LELAND RD

Cross-Section #4

Observer: 0

From: -- To: --

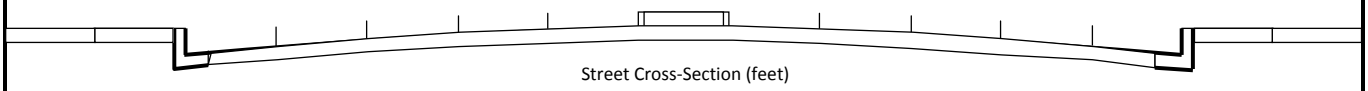
4

Ft/Trees	% Occ.

NB

Pavement Cond:	
Jay-Walking Legal:	

SB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Cross-Section #5

From: -- To: --

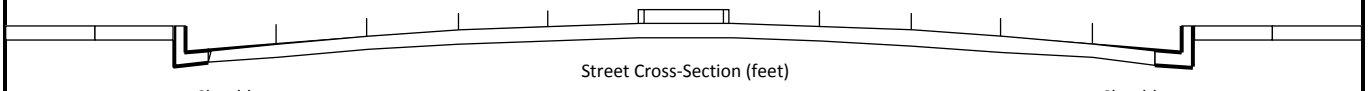
5

Ft/Trees	% Occ.

NB

Pavement Cond:	
Jay-Walking Legal:	

SB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Urban Street Multimodal Level of Service
Data Collection Sheet - Vehicle Traffic

Direction: **NB**

Street: HARBOR ST Date: 0-Jan-00

Limits: M E LELAND RD TO CALIFORNIA Observer: 0

Field Survey

	Segment And Downstream Signal		Speed Limit	Median Type	Left Turn Pocket	Drivewys Rightside	Unsig. Intersects
	From	To	(mph)	(0-3)	(y/n)	(#)	(#)
1	E LELAND RD	BLISS AVE	35	3	y	4	
2	BLISS AVE	ALIFORNIA AV	35	3	y	1	
3	ALIFORNIA AV	--					
4	--	--					
5	--	--					

Traffic Counts K: 100 D: 100

	Segment And Downstream Signal		Vol	Heavy Vehicle	RTOR+ PermLeft	Left/Right Turns	Thru Adj. Sat.	PHF
	From	To	(1-wy)	(%)	veh	%	(vphgl)	
1	E LELAND RD	BLISS AVE	922	2%	18	0%	1900	0.89
2	BLISS AVE	ALIFORNIA AV	829	2%	719	0%	1900	0.92
3	ALIFORNIA AV	--						
4	--	--						
5	--	--						

Arterial Traffic Performance & Signal Timing

	Segment And Downstream Signal		Field Survey		Signal Timing Data			
			Mean Speed	Average Stops	Cycle Length	Grn/Cycle for Thru	Ped Walk	Xing Ped Walk
	From	To	(mph)	(#/veh)	(secs)	(%)	(sec/cyc)	(sec/cyc)
1	E LELAND RD	BLISS AVE	31.5	0.3	90.0	62%	24.0	24.0
2	BLISS AVE	ALIFORNIA AV	31.5	0.9	90.0	20%	17.0	28.0
3	ALIFORNIA AV	--						
4	--	--						
5	--	--						

Notes: Median = 0 if None, 1 if one-way st., 2 if Painted or TWLTL, 3 if Raised
Heavy Vehicles = Buses plus trucks plus recreational vehicles
Thru Adusted Saturation Flow rates computed per Signalized Intersections Chapter, HC
Signal data is at the downstream signal

Urban Street Multimodal Level of Service
Data Collection Sheet - Transit

Direction: **NB**

Street: HARBOR ST Date: 0-Jan-00

Limits: FROM E LELAND RD TO CALIFORNIA AVE Observer: 0

Field Survey

Segment			Bus Stop	Shelters	Benches	CBD
	From	To	(#)	(% stops)	(% stops)	(yes/no)
1	E LELAND RD	BLISS AVE	1	0	1	no
2	BLISS AVE	ALIFORNIA AV	0	0	0	no
3	ALIFORNIA AV	--				
4	--	--				
5	--	--				

Transit Performance Data

Segment			Route	Frequency	Load Factor	On-Time Perform.	Schedule Speed
	From	To	#'s	(bus/hr)	(pas/seat)	(%)	(mph)
1	E LELAND RD	BLISS AVE					
			388-E	2	0.64	0.962	21
			391-W	2	0.34	0.962	20
2	BLISS AVE	ALIFORNIA AV					
3	ALIFORNIA AV	--					
4	--	--					
5	--	--					

Bus is On-Time if arrives within: 5 minutes of scheduled time.
Average Passenger Trip Length: 6.4 miles

A. Compute Auto LOS and Performance

Street: **HARBOR ST**

Direction= **Down** **NB**

1. Compute Eastbound Hourly Demand (v)

Segment & Downstream Signal	AADT (vpd)	Peak Factor K (#)	Dir. Factor D (#)	Pk.Hr.Fac. PHF (#)	Thru Traffic (%)	Demand v (vph)	from:
1	922	1.000	1.00	0.89	100%	922	traffic
2	829	1.000	1.00	0.92	100%	829	traffic
3	0	1.000	1.00	0	100%	#DIV/0!	traffic
4	0	1.000	1.00	0	100%	#DIV/0!	traffic
5	0	1.000	1.00	0	100%	#DIV/0!	traffic

2. Compute Eastbound Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1900	2	0.62	2356	0.39	OK	xsec 1-3, traffic
2	1900	2	0.20	760	1.09	Over Cap.	xsec 1-3, traffic
3	0	0	0.00	1	#DIV/0!	--	xsec 1-3, traffic
4	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic
5	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	35	1379	31.5	traffic, layout
2	35	722	31.5	traffic, layout
3	0	0	0	traffic, layout
4	0	0	0	traffic, layout
5	0	0	0	traffic, layout
Total/Ave.	35.0	2101	31.5	

4. Compute Stops & % Left Lane

Segment & Downstream Signal	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	0.96	y	3	traffic
2	6.80	y	3	traffic
3	#DIV/0!	0	0	traffic
4	#DIV/0!	0	0	traffic
5	#DIV/0!	0	0	traffic
Total/Ave	2.97	1.00	3.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weight. Ave.	Auto LOS
1	19.7%	39.7%	22.3%	10.4%	5.1%	2.8%	2.50	B
2	5.3%	19.7%	25.4%	22.3%	16.1%	11.1%	3.57	F (v/c>1)
3	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average	17.2%	38.1%	23.7%	11.8%	5.9%	3.2%	2.61	F (v/c>1)

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Pedestrian LOS

Street: **HARBOR ST**

1. Compute Pedestrian Density LOS

Seg.	Sidewalk Width (ft)	Ped Flow (pph)	Ped. Density LOS #	Ped. Density LOS	from
1	5	0	0.00	A	xsec1-3
2	5	0	0.00	A	xsec1-3
3	0	0	N/A	N/A	xsec1-3
4	0	0	N/A	N/A	xsec4-5
5	0	0	N/A	N/A	xsec4-5

Density LOS Lookup	
Ped/hr/ft	LOS
0	A
300	B
420	C
600	D
900	E
1380	F

2. Compute Pedestrian Segment LOS

Seg.	Outside Lane (ft)	Bike Ln + Park/Shldr (ft)	On-Street Parking Occ (%)	Barrier (ft/Tree)	Buffer Width (ft)	Dir. Traffic Volume (vph)	Traf. Lanes One-Dir (lanes)	Midblock Veh. Speed (mph)	Ped. Seg. LOS #	from
1	0	5	0%	50	5	922	2	33.3	3.14	xsec1-3
2	0	5	0%	0	0	829	2	33.3	3.50	xsec1-3
3	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec1-3
4	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5
5	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with intersection delay.

3. Compute Pedestrian Intersection LOS

Downstream Signal	RTOR+ Perm LT (vph)	X-Street Volume (vph)	X-Street PHF (#)	X-Street Speed (mph)	X-Street Lanes (#)	Ave Ped. Wait At Signal (sec)	Right Turn Channel Islands (#)	Ped. Intersect LOS #	from
1	18	590	0.89	35	5	24.2	0	2.85	layout, traffic
2	719	1269	0.92	35	5	29.6	0	4.75	layout, traffic
3	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
4	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
5	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic

Pedestrian Delay computed per Chapter 18 method (eqn 18-5, HCM 2000).

4. Compute Roadway Crossing Difficulty Factor (RCDF)

Seg.	Signal Spacing (ft)	Cross St. Ped Wait (secs/cycle)	Divert Delay (sec)	Arterial X Distance (ft)	Midblock Veh Speed (mph)	Vehicle Vol 2-Dir (vph)	Wait To X (max=900) (sec)	Is J-Walking Allowed? (Yes/No)	from
1	1379	24.2	275	73	33.3	922	900	no	layout, traffic
2	722	21.4	148	73	33.3	829	886	no	layout, traffic
3	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
4	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
5	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic

5. Compute Pedestrian Facility LOS

Segment & Downstream Signal	Min. Wait,Divert (sec)	Crossing LOS (#)	No Cross LOS (#)	RCDF (#)	Ped. NDLOS (#)	Ped. Density LOS #	Ped. Fac. LOS (#)	Ped. Facility LOS
1	275	6.00	3.23	1.00	3.23	0.00	3.23	D
2	148	6.00	3.76	1.00	3.76	0.00	3.76	E
3	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
4	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
5	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
Average							3.41	D

C. Compute Transit LOS

Street: **HARBOR ST**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	4	96%	0%	100%	0.49	no	transit
2	0	#DIV/0!	0%	0%	#DIV/0!	no	transit
3	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
4	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
5	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus (mph)	from
1	1379	31.5	1	20.5	transit
2	722	31.5	0	#DIV/0!	transit
3	0	0	0	#DIV/0!	transit
4	0	0	0	#DIV/0!	transit
5	0	0	0	#DIV/0!	transit
Total/Ave	2101	#DIV/0!		#DIV/0!	

3. Compute Transit Perceived Travel Time and Headway Factors

Segment	a1 factor	IVTTR min/mi	EWTTR min/mi	ATR min/mi	PTTR	Fptt	Fh
1	1.00	2.93	0.01	0.03	2.91	1.32	2.83
2	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
3	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
4	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
5	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00

IVTTR = In-Vehicle Travel Time Rate
EWTTR = Equivalent Wait Travel Time Rate
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor

4. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	3.74	3.23	0.87	A
2	#DIV/0!	3.76	#DIV/0!	F
3	#DIV/0!	#NUM!	#DIV/0!	F
4	#DIV/0!	#NUM!	#DIV/0!	F
5	#DIV/0!	#NUM!	#DIV/0!	F
Average			2.29	B

D. Compute Bicycle LOS

Street: **HARBOR ST**

1. Geometric Input Data

Segment & Downstream Signal	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Sig. Int Cross-Dist (ft)	Unsig.Conf Per Mile (conf/mi)	from
1	0	5	2	D	44	15.3	xsec1-3, layout
2	0	5	2	D	47	7.3	xsec1-3, layout
3	0	0	0	UD	0	#DIV/0!	xsec1-3, layout
4	0	0	0	UD	0	#DIV/0!	xsec4-5, layout
5	0	0	0	UD	0	#DIV/0!	xsec4-5, layout

2. Performance and Other Input Data

Segment & Downstream Signal	Traffic Volume (vph)	Heavy Vehicle (%)	Midblock Traffic Spd (mph)	On-Street Parking (%)	Pavement Rating (#)	from
1	922	2%	33.3	0%	5.0	traffic, xsec1-3
2	829	2%	33.3	0%	5.0	traffic, xsec1-3
3	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec1-3
4	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5
5	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5

Pavement Rating: 1=Poor, 5=Excellent

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with inte

3. Compute Bicycle LOS

Segment & Downstream Signal	Prelim. Eff. Width (Wv)	Effective Width (We)	Speed Factor (#)	Segment LOS (#)	Intersect LOS (#)	Bicycle Score (#)	Bicycle LOS
1	5.0	10.0	3.70	4.11	4.63	5.17	F
2	5.0	10.0	3.70	4.04	4.56	4.80	F
3	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average						5.05	F

E. LOS Summary

Title: HARBOR ST

Direction =	Down	NB

Date: Analyst:

Segment & Downstream Signal	Auto Stops LOS #1	Auto Speed LOS #2	Auto HCM LOS #3	Auto NCHRP 379 LOS #4	Transit LOS	Bicycle LOS	Pedestrian LOS
1	B	A	A	A	A	F	D
2	F (v/c>1)	F (v/c>1)	A	A	F	F	E
3	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
4	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
5	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
Facility	F (v/c>1)	#DIV/0!	A	A	B	F	D

Auto Performance Measures Summary NB

Seg+Sig	Stops	FFS	Speed	%FFS
1	0.96	35.0	31.5	90.0%
2	6.80	35.0	31.5	90.0%
3	#DIV/0!	0.0	0	#DIV/0!
4	#DIV/0!	0.0	0	#DIV/0!
5	#DIV/0!	0.0	0	#DIV/0!
Facility	2.97	35.0	31.5	90.0%

Spreadsheet created by: R.Dowling of Dowling Associates, Inc.
Under contract to:
Transportation Research Board
NCHRP 3-70 Multimodal Level of Service For Urban Streets

Spreadsheet is made available "As-Is" for TRB internal review.
No warranty as to accuracy or suitability for use.
Spreadsheet is unsupported.
Spreadsheet does not have data entry error checking.
Created: 8-Jun-07 Updated: 25-Sep-08

Multimodal Level of Service for Urban Streets

Diagram of Uban Street

Street: HARBOR ST

Date:

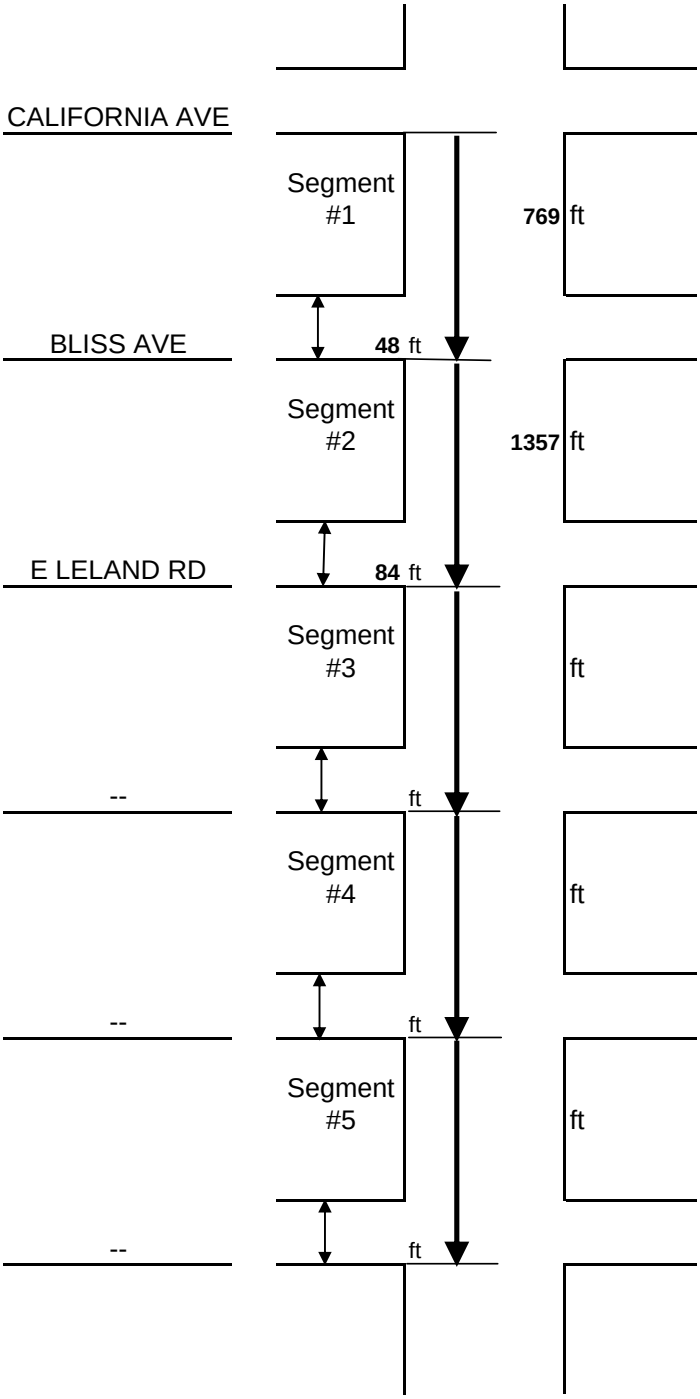
Limits: FROM CALIFORNIA AVE TO E LELAND RD

Observer:

Analysis Direction:	SB

(NB, SB, EB, WB)
(NW, SE, NE, SW)

Data Entry Fields in Red



Intersect. Control	X-Street Lanes	X-Street Speed	X-Street 2-W vph	Right Turn Isl.
SIGNAL	3	35	590	1

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL	6	35	1918	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: HARBOR ST

Limits: FROM CALIFORNIA A

Observer: 0

Cross-Section #1
From: CALIFORNIA AVE To: BLISS AVE

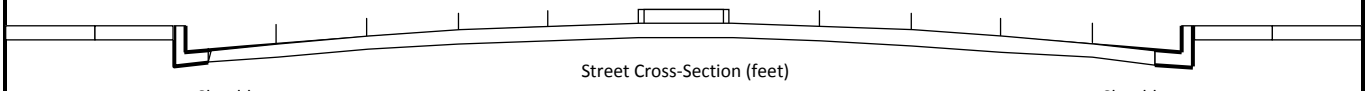
1

Ft/Trees	% Occ.
0	0%

SB

Pavement Cond:	5
Jay-Walking Legal:	no

NB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	5	0	0	12	12	15	12	12	0	0	5	0	5

Ped Vol: 0

Cross-Section #2
From: BLISS AVE To: E LELAND RD

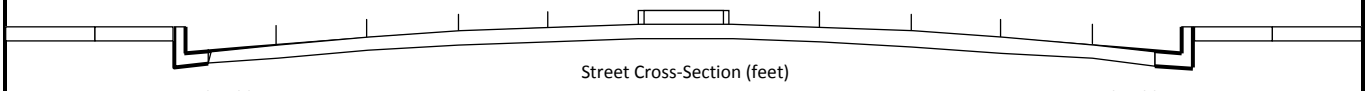
2

Ft/Trees	% Occ.
40	0%

SB

Pavement Cond:	5
Jay-Walking Legal:	no

NB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	3	5	0	0	12	12	15	12	12	0	0	5	5	5

0

Cross-Section #3
From: E LELAND RD To: --

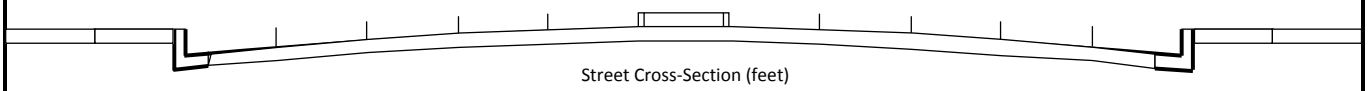
3

Ft/Trees	% Occ.

SB

Pavement Cond:	
Jay-Walking Legal:	

NB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: HARBOR ST

Limits: FROM CALIFORNIA A

Cross-Section #4

Observer: 0

From: -- To: --

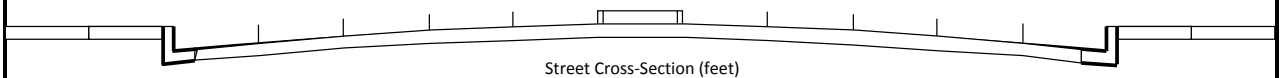
4

Ft/Trees	% Occ.

SB

Pavement Cond:	
Jay-Walking Legal:	

NB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Cross-Section #5

From: -- To: --

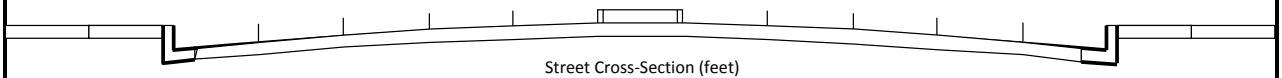
5

Ft/Trees	% Occ.

SB

Pavement Cond:	
Jay-Walking Legal:	

NB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Urban Street Multimodal Level of Service
Data Collection Sheet - Vehicle Traffic

Direction: **SB**

Street: HARBOR ST Date: 0-Jan-00

Limits: M CALIFORNIA AVE TO E LELAN Observer: 0

Field Survey

	Segment And Downstream Signal		Speed Limit	Median Type	Left Turn Pocket	Drivewys Rightside	Unsig. Intersects
	From	To	(mph)	(0-3)	(y/n)	(#)	(#)
1	ALIFORNIA AV	BLISS AVE	35	3	y	0	
2	BLISS AVE	E LELAND RD	35	3	y	5	
3	E LELAND RD	--					
4	--	--					
5	--	--					

Traffic Counts K: 100 D: 100

	Segment And Downstream Signal		Vol	Heavy Vehicle	RTOR+ PermLeft	Left/Right Turns	Thru Adj. Sat.	PHF
	From	To	(1-wy)	(%)	veh	%	(vphgl)	
1	ALIFORNIA AV	BLISS AVE	1317	2%	217	0%	1900	0.90
2	BLISS AVE	E LELAND RD	1445	2%	891	0%	1900	0.92
3	E LELAND RD	--						
4	--	--						
5	--	--						

Arterial Traffic Performance & Signal Timing

	Segment And Downstream Signal		Field Survey		Signal Timing Data			
			Mean Speed	Average Stops	Cycle Length	Grn/Cycle for Thru	Ped Walk	Xing Ped Walk
	From	To	(mph)	(#/veh)	(secs)	(%)	(sec/cyc)	(sec/cyc)
1	ALIFORNIA AV	BLISS AVE	31.5	0.2	90.0	62%	29.0	0.0
2	BLISS AVE	E LELAND RD	31.5	1.1	90.0	24%	24.0	28.0
3	E LELAND RD	--						
4	--	--						
5	--	--						

Notes: Median = 0 if None, 1 if one-way st., 2 if Painted or TWLTL, 3 if Raised
Heavy Vehicles = Buses plus trucks plus recreational vehicles
Thru Adusted Saturation Flow rates computed per Signalized Intersections Chapter, HC
Signal data is at the downstream signal

Urban Street Multimodal Level of Service
Data Collection Sheet - Transit

Direction: **SB**

Street: HARBOR ST Date: 0-Jan-00

Limits: FROM CALIFORNIA AVE TO E LELAND RD Observer: 0

Field Survey

Segment			Bus Stop	Shelters	Benches	CBD
	From	To	(#)	(% stops)	(% stops)	(yes/no)
1	ALIFORNIA AV	BLISS AVE	0	0	0	no
2	BLISS AVE	E LELAND RD	1	0	0	no
3	E LELAND RD	--				
4	--	--				
5	--	--				

Transit Performance Data

Segment			Route	Frequency	Load Factor	On-Time Perform.	Schedule Speed
	From	To	#'s	(bus/hr)	(pas/seat)	(%)	(mph)
1	ALIFORNIA AV	BLISS AVE					
2	BLISS AVE	E LELAND RD					
			388-W	2	0.77	0.962	13
			391-E	2	0.55	0.962	23
3	E LELAND RD	--					
4	--	--					
5	--	--					

Bus is On-Time if arrives within: 5 minutes of scheduled time.
Average Passenger Trip Length: 6.4 miles

A. Compute Auto LOS and Performance

Street: **HARBOR ST**

Direction=	Down	SB

1. Compute Eastbound Hourly Demand (v)

Segment & Downstream Signal	AADT (vpd)	Peak Factor K (#)	Dir. Factor D (#)	Pk.Hr.Fac. PHF (#)	Thru Traffic (%)	Demand v (vph)	from:
1	1317	1.000	1.00	0.9	100%	1317	traffic
2	1445	1.000	1.00	0.92	100%	1445	traffic
3	0	1.000	1.00	0	100%	#DIV/0!	traffic
4	0	1.000	1.00	0	100%	#DIV/0!	traffic
5	0	1.000	1.00	0	100%	#DIV/0!	traffic

2. Compute Eastbound Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1900	2	0.62	2356	0.56	OK	xsec 1-3, traffic
2	1900	2	0.24	912	1.58	Over Cap.	xsec 1-3, traffic
3	0	0	0.00	1	#DIV/0!	--	xsec 1-3, traffic
4	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic
5	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	35	769	31.5	traffic, layout
2	35	1357	31.5	traffic, layout
3	0	0	0	traffic, layout
4	0	0	0	traffic, layout
5	0	0	0	traffic, layout
Total/Ave.	35.0	2126	31.5	

4. Compute Stops & % Left Lane

Segment & Downstream Signal	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	1.65	y	3	traffic
2	4.36	y	3	traffic
3	#DIV/0!	0	0	traffic
4	#DIV/0!	0	0	traffic
5	#DIV/0!	0	0	traffic
Total/Ave	3.38	1.00	3.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weight. Ave.	Auto LOS
1	17.1%	38.0%	23.8%	11.8%	5.9%	3.3%	2.61	B
2	9.4%	28.8%	27.1%	17.8%	10.5%	6.3%	3.10	F (v/c>1)
3	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average	15.8%	37.0%	24.5%	12.6%	6.5%	3.6%	2.68	F (v/c>1)

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Pedestrian LOS

Street: **HARBOR ST**

1. Compute Pedestrian Density LOS

Seg.	Sidewalk Width (ft)	Ped Flow (pph)	Ped. Density LOS #	Ped. Density LOS	from
1	5	0	0.00	A	xsec1-3
2	5	0	0.00	A	xsec1-3
3	0	0	N/A	N/A	xsec1-3
4	0	0	N/A	N/A	xsec4-5
5	0	0	N/A	N/A	xsec4-5

Density LOS Lookup	
Ped/hr/ft	LOS
0	A
300	B
420	C
600	D
900	E
1380	F

2. Compute Pedestrian Segment LOS

Seg.	Outside Lane (ft)	Bike Ln + Park/Shldr (ft)	On-Street Parking Occ (%)	Barrier (ft/Tree)	Buffer Width (ft)	Dir. Traffic Volume (vph)	Traf. Lanes One-Dir (lanes)	Midblock Veh. Speed (mph)	Ped. Seg. LOS #	from
1	0	5	0%	0	0	1,317	2	33.3	4.17	xsec1-3
2	0	5	0%	40	3	1,445	2	33.3	3.91	xsec1-3
3	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec1-3
4	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5
5	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with intersection delay.

3. Compute Pedestrian Intersection LOS

Downstream Signal	RTOR+ Perm LT (vph)	X-Street Volume (vph)	X-Street PHF (#)	X-Street Speed (mph)	X-Street Lanes (#)	Ave Ped. Wait At Signal (sec)	Right Turn Channel Islands (#)	Ped. Intersect LOS #	from
1	217	590	0.90	35	3	20.7	1	3.14	layout, traffic
2	891	1918	0.92	35	6	24.2	0	5.83	layout, traffic
3	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
4	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
5	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic

Pedestrian Delay computed per Chapter 18 method (eqn 18-5, HCM 2000).

4. Compute Roadway Crossing Difficulty Factor (RCDF)

Seg.	Signal Spacing (ft)	Cross St. Ped Wait (secs/cycle)	Divert Delay (sec)	Arterial X Distance (ft)	Midblock Veh Speed (mph)	Vehicle Vol 2-Dir (vph)	Wait To X (max=900) (sec)	Is J-Walking Allowed? (Yes/No)	from
1	769	45.0	169	73	33.3	1,317	900	no	layout, traffic
2	1357	21.4	269	73	33.3	1,445	900	no	layout, traffic
3	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
4	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
5	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic

5. Compute Pedestrian Facility LOS

Segment & Downstream Signal	Min. Wait,Divert (sec)	Crossing LOS (#)	No Cross LOS (#)	RCDF (#)	Ped. NDLOS (#)	Ped. Density LOS #	Ped. Fac. LOS (#)	Ped. Facility LOS
1	169	6.00	3.62	1.00	3.62	0.00	3.62	E
2	269	6.00	4.13	1.00	4.13	0.00	4.13	E
3	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
4	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
5	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
Average							3.95	E

C. Compute Transit LOS

Street: **HARBOR ST**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	0	#DIV/0!	0%	0%	#DIV/0!	no	transit
2	4	96%	0%	0%	0.66	no	transit
3	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
4	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
5	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus (mph)	from
1	769	31.5	0	#DIV/0!	transit
2	1357	31.5	1	18.0	transit
3	0	0	0	#DIV/0!	transit
4	0	0	0	#DIV/0!	transit
5	0	0	0	#DIV/0!	transit
Total/Ave	2126	#DIV/0!		#DIV/0!	

3. Compute Transit Perceived Travel Time and Headway Factors

Segment	a1 factor	IVTTR min/mi	EWTTR min/mi	ATR min/mi	PTTR	Fptt	Fh
1	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
2	1.00	3.33	0.01	0.00	3.34	1.26	2.83
3	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
4	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
5	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00

IVTTR = In-Vehicle Travel Time Rate
EWTTR = Equivalent Wait Travel Time Rate
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor

4. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	#DIV/0!	3.62	#DIV/0!	F
2	3.56	4.13	1.28	A
3	#DIV/0!	#NUM!	#DIV/0!	F
4	#DIV/0!	#NUM!	#DIV/0!	F
5	#DIV/0!	#NUM!	#DIV/0!	F
Average			2.63	B

D. Compute Bicycle LOS

Street: **HARBOR ST**

1. Geometric Input Data

Segment & Downstream Signal	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Sig. Int Cross-Dist (ft)	Unsig.Conf Per Mile (conf/mi)	from
1	0	5	2	D	48	0.0	xsec1-3, layout
2	0	5	2	D	84	19.5	xsec1-3, layout
3	0	0	0	UD	0	#DIV/0!	xsec1-3, layout
4	0	0	0	UD	0	#DIV/0!	xsec4-5, layout
5	0	0	0	UD	0	#DIV/0!	xsec4-5, layout

2. Performance and Other Input Data

Segment & Downstream Signal	Traffic Volume (vph)	Heavy Vehicle (%)	Midblock Traffic Spd (mph)	On-Street Parking (%)	Pavement Rating (#)	from
1	1317	2%	33.3	0%	5.0	traffic, xsec1-3
2	1445	2%	33.3	0%	5.0	traffic, xsec1-3
3	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec1-3
4	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5
5	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5

Pavement Rating: 1=Poor, 5=Excellent

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with inte

3. Compute Bicycle LOS

Segment & Downstream Signal	Prelim. Eff. Width (Wv)	Effective Width (We)	Speed Factor (#)	Segment LOS (#)	Intersect LOS (#)	Bicycle Score (#)	Bicycle LOS
1	5.0	10.0	3.70	4.28	5.06	5.27	F
2	5.0	10.0	3.70	4.32	5.71	7.53	F
3	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average						6.71	F

E. LOS Summary

Title: HARBOR ST

Direction =	Down	SB

Date: Analyst:

Segment & Downstream Signal	Auto Stops LOS #1	Auto Speed LOS #2	Auto HCM LOS #3	Auto NCHRP 379 LOS #4	Transit LOS	Bicycle LOS	Pedestrian LOS
1	B	A	A	A	F	F	E
2	F (v/c>1)	F (v/c>1)	A	A	A	F	E
3	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
4	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
5	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
Facility	F (v/c>1)	#DIV/0!	A	A	B	F	E

Auto Performance Measures Summary SB

Seg+Sig	Stops	FFS	Speed	%FFS
1	1.65	35.0	31.5	90.0%
2	4.36	35.0	31.5	90.0%
3	#DIV/0!	0.0	0	#DIV/0!
4	#DIV/0!	0.0	0	#DIV/0!
5	#DIV/0!	0.0	0	#DIV/0!
Facility	3.38	35.0	31.5	90.0%

Spreadsheet created by: R.Dowling of Dowling Associates, Inc.
Under contract to:
Transportation Research Board
NCHRP 3-70 Multimodal Level of Service For Urban Streets

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Spreadsheet does not have data entry error checking.
Created: 8-Jun-07 Updated: 25-Sep-08

Multimodal Level of Service for Urban Streets

Diagram of Uban Street

Street: BLISS AVE

Date:

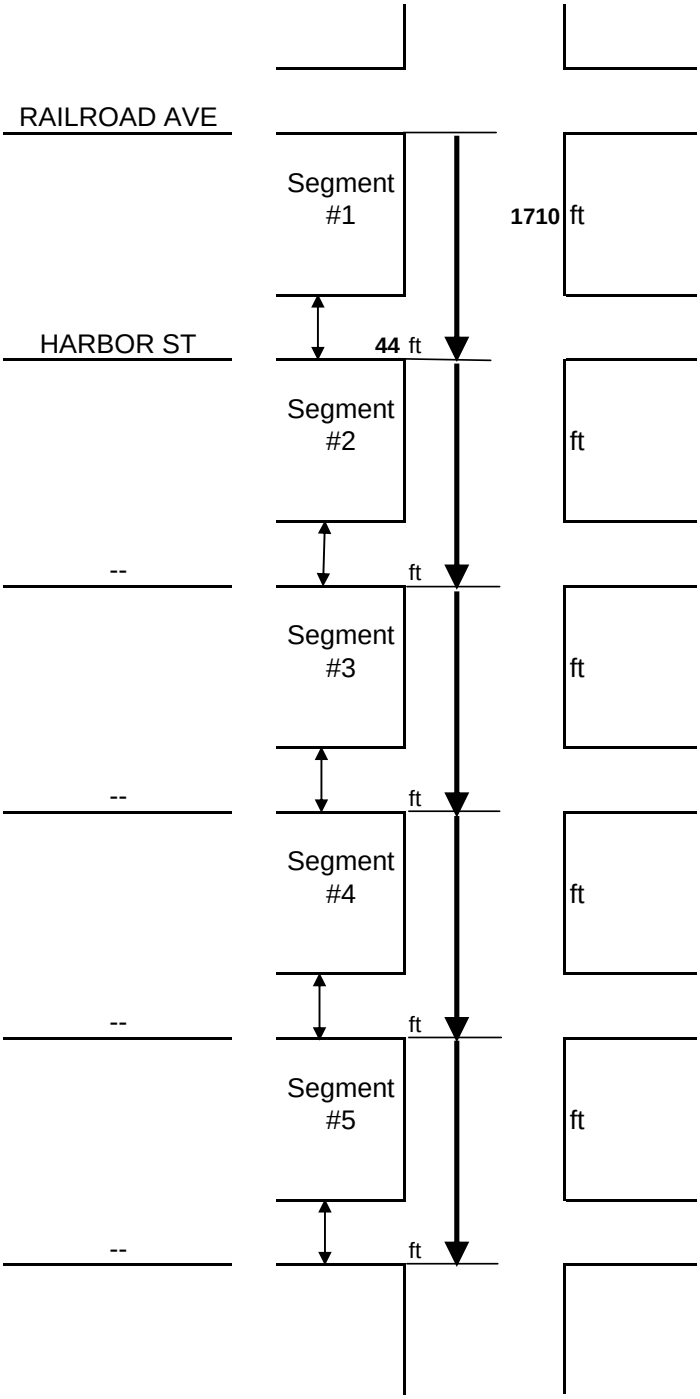
Limits: FROM RAILROAD AVE TO HARBOR ST

Observer:

Analysis Direction:	EB

(NB, SB, EB, WB)
(NW, SE, NE, SW)

Data Entry Fields in Red



Intersect. Control	X-Street Lanes	X-Street Speed	X-Street 2-W vph	Right Turn Isl.
SIGNAL	3	35	2239	1

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Multimodal Level of Service for Urban Streets

Street Cross-Section Data Street: BLISS AVE Limits: FROM RAILROAD A

Cross-Section #1 Observer: 0

From: RAILROAD AVE To: HARBOR ST

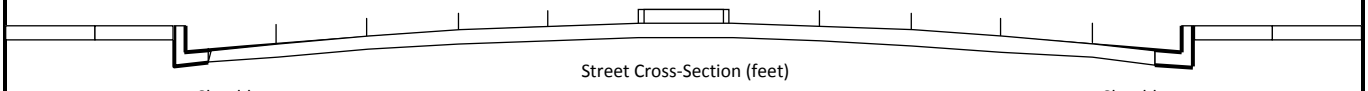
1

Ft/Trees	% Occ.
0	0%

EB

Pavement Cond:	2
Jay-Walking Legal:	no

WB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
5	0	2	0	0	0	12	0	12	0	0	0	2	0	10

Ped Vol: 0

Cross-Section #2

From: HARBOR ST To: --

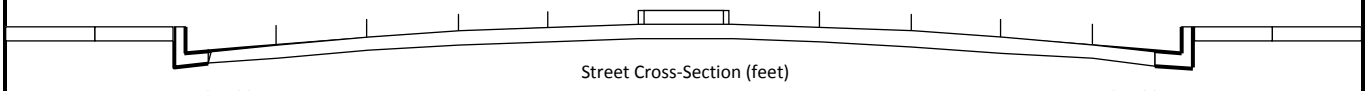
2

Ft/Trees	% Occ.

EB

Pavement Cond:	
Jay-Walking Legal:	

WB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Cross-Section #3

From: -- To: --

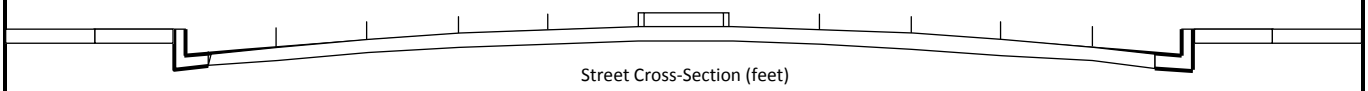
3

Ft/Trees	% Occ.

EB

Pavement Cond:	
Jay-Walking Legal:	

WB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: BLISS AVE

Limits: FROM RAILROAD A

Cross-Section #4

Observer: 0

From: -- To: --

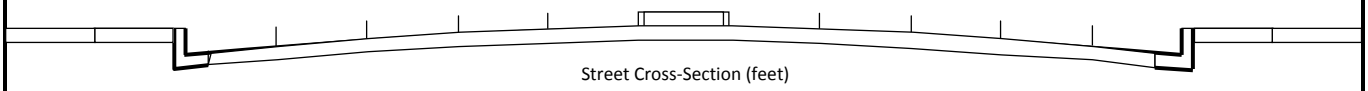
4

Ft/Trees	% Occ.

EB

Pavement Cond:	
Jay-Walking Legal:	

WB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Cross-Section #5

From: -- To: --

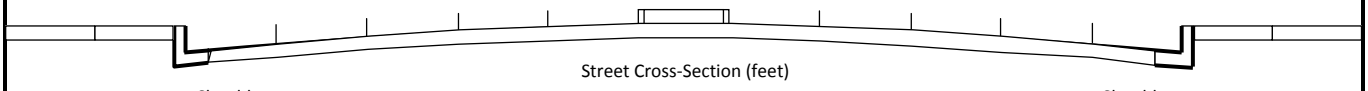
5

Ft/Trees	% Occ.
?	?

EB

Pavement Cond:	
Jay-Walking Legal:	

WB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Urban Street Multimodal Level of Service
Data Collection Sheet - Vehicle Traffic

Direction: **EB**

Street: BLISS AVE Date: 0-Jan-00

Limits: ƆM RAILROAD AVE TO HARBOR Observer: 0

Field Survey

	Segment And Downstream Signal		Speed Limit	Median Type	Left Turn Pocket	Drivewys Rightside	Unsig. Intersects
	From	To	(mph)	(0-3)	(y/n)	(#)	(#)
1	RAILROAD AVI	HARBOR ST	35	0	n	3	
2	HARBOR ST	--					
3	--	--					
4	--	--					
5	--	--					

Traffic Counts K: 100 D: 100

	Segment And Downstream Signal		Vol	Heavy Vehicle	RTOR+ PermLeft	Left/Right Turns	Thru Adj. Sat.	PHF
	From	To	(1-wy)	(%)	veh	%	(vphgl)	
1	RAILROAD AVI	HARBOR ST	355	2%	314	0%	1900	0.86
2	HARBOR ST	--						
3	--	--						
4	--	--						
5	--	--						

Arterial Traffic Performance & Signal Timing

	Segment And Downstream Signal		Field Survey		Signal Timing Data			
			Mean Speed	Average Stops	Cycle Length	Grn/Cycle for Thru	Ped Walk	Xing Ped Walk
	From	To	(mph)	(#/veh)	(secs)	(%)	(sec/cyc)	(sec/cyc)
1	RAILROAD AVI	HARBOR ST	31.5	0.7	80.0	25%	0.0	24.0
2	HARBOR ST	--						
3	--	--						
4	--	--						
5	--	--						

Notes: Median = 0 if None, 1 if one-way st., 2 if Painted or TWLTL, 3 if Raised
Heavy Vehicles = Buses plus trucks plus recreational vehicles
Thru Adusted Saturation Flow rates computed per Signalized Intersections Chapter, HC
Signal data is at the downstream signal

Urban Street Multimodal Level of Service
Data Collection Sheet - Transit

Direction: **EB**

Street: BLISS AVE Date: 0-Jan-00

Limits: FROM RAILROAD AVE TO HARBOR ST Observer: 0

Field Survey

Segment			Bus Stop	Shelters	Benches	CBD
	From	To	(#)	(% stops)	(% stops)	(yes/no)
1	RAILROAD AVE	HARBOR ST	0	0	0	no
2	HARBOR ST	--				
3	--	--				
4	--	--				
5	--	--				

Transit Performance Data

Segment			Route	Frequency	Load Factor	On-Time Perform.	Schedule Speed
	From	To	#'s	(bus/hr)	(pas/seat)	(%)	(mph)
1	RAILROAD AVE	HARBOR ST					
2	HARBOR ST	--					
3	--	--					
4	--	--					
5	--	--					

Bus is On-Time if arrives within: 5 minutes of scheduled time.
Average Passenger Trip Length: 6.4 miles

A. Compute Auto LOS and Performance

Street: **BLISS AVE**

Direction= **Down** **EB**

1. Compute Eastbound Hourly Demand (v)

Segment & Downstream Signal	AADT (vpd)	Peak Factor K (#)	Dir. Factor D (#)	Pk.Hr.Fac. PHF (#)	Thru Traffic (%)	Demand v (vph)	from:
1	355	1.000	1.00	0.86	100%	355	traffic
2	0	1.000	1.00	0	100%	#DIV/0!	traffic
3	0	1.000	1.00	0	100%	#DIV/0!	traffic
4	0	1.000	1.00	0	100%	#DIV/0!	traffic
5	0	1.000	1.00	0	100%	#DIV/0!	traffic

2. Compute Eastbound Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1900	1	0.25	475	0.75	OK	xsec 1-3, traffic
2	0	0	0.00	1	#DIV/0!	--	xsec 1-3, traffic
3	0	0	0.00	1	#DIV/0!	--	xsec 1-3, traffic
4	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic
5	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	35	1710	31.5	traffic, layout
2	0	0	0	traffic, layout
3	0	0	0	traffic, layout
4	0	0	0	traffic, layout
5	0	0	0	traffic, layout
Total/Ave.	35.0	1710	31.5	

4. Compute Stops & % Left Lane

Segment & Downstream Signal	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	2.01	n	0	traffic
2	#DIV/0!	0	0	traffic
3	#DIV/0!	0	0	traffic
4	#DIV/0!	0	0	traffic
5	#DIV/0!	0	0	traffic
Total/Ave	2.01	0.00	0.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weight. Ave.	Auto LOS
1	15.9%	37.0%	24.5%	12.6%	6.4%	3.6%	2.67	B
2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
3	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average	15.9%	37.0%	24.5%	12.6%	6.4%	3.6%	2.67	B

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Pedestrian LOS

Street: **BLISS AVE**

1. Compute Pedestrian Density LOS

Seg.	Sidewalk Width (ft)	Ped Flow (pph)	Ped. Density LOS #	Ped. Density LOS	
1	5	0	0.00	A	from
2	0	0	N/A	N/A	xsec1-3
3	0	0	N/A	N/A	xsec1-3
4	0	0	N/A	N/A	xsec1-3
5	0	0	N/A	N/A	xsec4-5
					xsec4-5

Density LOS Lookup	
Ped/hr/ft	LOS
0	A
300	B
420	C
600	D
900	E
1380	F

2. Compute Pedestrian Segment LOS

Seg.	Outside Lane (ft)	Bike Ln + Park/Shldr (ft)	On-Street Parking Occ (%)	Barrier (ft/Tree)	Buffer Width (ft)	Dir. Traffic Volume (vph)	Traf. Lanes One-Dir (lanes)	Midblock Veh. Speed (mph)	Ped. Seg. LOS #	from
1	0	2	0%	0	0	355	1	33.3	3.50	xsec1-3
2	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec1-3
3	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec1-3
4	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5
5	0	0	?	?	0	#DIV/0!	0	0.0	#VALUE!	xsec4-5

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with intersection delay.

3. Compute Pedestrian Intersection LOS

Downstream Signal	RTOR+ Perm LT (vph)	X-Street Volume (vph)	X-Street PHF (#)	X-Street Speed (mph)	X-Street Lanes (#)	Ave Ped. Wait At Signal (sec)	Right Turn Channel Islands (#)	Ped. Intersect LOS #	from
1	314	2239	0.86	35	3	40.0	1	5.48	layout, traffic
2	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
3	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
4	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
5	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic

Pedestrian Delay computed per Chapter 18 method (eqn 18-5, HCM 2000).

4. Compute Roadway Crossing Difficulty Factor (RCDF)

Seg.	Signal Spacing (ft)	Cross St. Ped Wait (secs/cycle)	Divert Delay (sec)	Arterial X Distance (ft)	Midblock Veh Speed (mph)	Vehicle Vol 2-Dir (vph)	Wait To X (max=900) (sec)	Is J-Walking Allowed? (Yes/No)	from
1	1710	19.6	336	28	33.3	355	8	no	layout, traffic
2	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
3	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
4	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
5	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic

5. Compute Pedestrian Facility LOS

Segment & Downstream Signal	Min. Wait,Divert (sec)	Crossing LOS (#)	No Cross LOS (#)	RCDF (#)	Ped. NDLOS (#)	Ped. Density LOS #	Ped. Fac. LOS (#)	Ped. Facility LOS
1	8	1.00	3.92	1.00	3.92	0.00	3.92	E
2	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
3	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
4	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
5	#DIV/0!	#DIV/0!	#VALUE!	1.00	#VALUE!	N/A	#VALUE!	#VALUE!
Average							3.92	E

C. Compute Transit LOS

Street: **BLISS AVE**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	0	#DIV/0!	0%	0%	#DIV/0!	no	transit
2	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
3	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
4	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
5	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus (mph)	from
1	1710	31.5	0	#DIV/0!	transit
2	0	0	0	#DIV/0!	transit
3	0	0	0	#DIV/0!	transit
4	0	0	0	#DIV/0!	transit
5	0	0	0	#DIV/0!	transit
Total/Ave	1710	#DIV/0!		#DIV/0!	

3. Compute Transit Perceived Travel Time and Headway Factors

Segment	a1 factor	IVTTR min/mi	EWTTR min/mi	ATR min/mi	PTTR	Fptt	Fh
1	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
2	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
3	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
4	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
5	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00

IVTTR = In-Vehicle Travel Time Rate
EWTTR = Equivalent Wait Travel Time Rate
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor

4. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	#DIV/0!	3.92	#DIV/0!	F
2	#DIV/0!	#NUM!	#DIV/0!	F
3	#DIV/0!	#NUM!	#DIV/0!	F
4	#DIV/0!	#NUM!	#DIV/0!	F
5	#DIV/0!	#VALUE!	#DIV/0!	F
Average			5.00	F

D. Compute Bicycle LOS

Street: **BLISS AVE**

1. Geometric Input Data

Segment & Downstream Signal	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Sig. Int Cross-Dist (ft)	Unsig.Conf Per Mile (conf/mi)	from
1	0	2	1	UD	44	9.3	xsec1-3, layout
2	0	0	0	UD	0	#DIV/0!	xsec1-3, layout
3	0	0	0	UD	0	#DIV/0!	xsec1-3, layout
4	0	0	0	UD	0	#DIV/0!	xsec4-5, layout
5	0	0	0	UD	0	#DIV/0!	xsec4-5, layout

2. Performance and Other Input Data

Segment & Downstream Signal	Traffic Volume (vph)	Heavy Vehicle (%)	Midblock Traffic Spd (mph)	On-Street Parking (%)	Pavement Rating (#)	from
1	355	2%	33.3	0%	2.0	traffic, xsec1-3
2	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec1-3
3	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec1-3
4	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5
5	#DIV/0!	0%	0.0	?	0.0	traffic, xsec4-5

Pavement Rating: 1=Poor, 5=Excellent

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with inte

3. Compute Bicycle LOS

Segment & Downstream Signal	Prelim. Eff. Width (Wv)	Effective Width (We)	Speed Factor (#)	Segment LOS (#)	Intersect LOS (#)	Bicycle Score (#)	Bicycle LOS
1	2.0	4.0	3.70	5.90	5.09	5.91	F
2	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
3	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average						5.91	F

E. LOS Summary

Title: BLISS AVE

Direction =	Down	EB

Date: Analyst:

Segment & Downstream Signal	Auto Stops LOS #1	Auto Speed LOS #2	Auto HCM LOS #3	Auto NCHRP 379 LOS #4	Transit LOS	Bicycle LOS	Pedestrian LOS
1	B	B	A	A	F	F	E
2	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
3	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
4	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
5	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#VALUE!
Facility	B	#DIV/0!	A	A	F	F	E

Auto Performance Measures Summary EB

Seg+Sig	Stops	FFS	Speed	%FFS
1	2.01	35.0	31.5	90.0%
2	#DIV/0!	0.0	0	#DIV/0!
3	#DIV/0!	0.0	0	#DIV/0!
4	#DIV/0!	0.0	0	#DIV/0!
5	#DIV/0!	0.0	0	#DIV/0!
Facility	2.01	35.0	31.5	90.0%

Spreadsheet created by: R.Dowling of Dowling Associates, Inc.
Under contract to:
Transportation Research Board
NCHRP 3-70 Multimodal Level of Service For Urban Streets

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Spreadsheet does not have data entry error checking.
Created: 8-Jun-07 Updated: 25-Sep-08

Multimodal Level of Service for Urban Streets

Diagram of Uban Street

Street: BLISS AVE

Date:

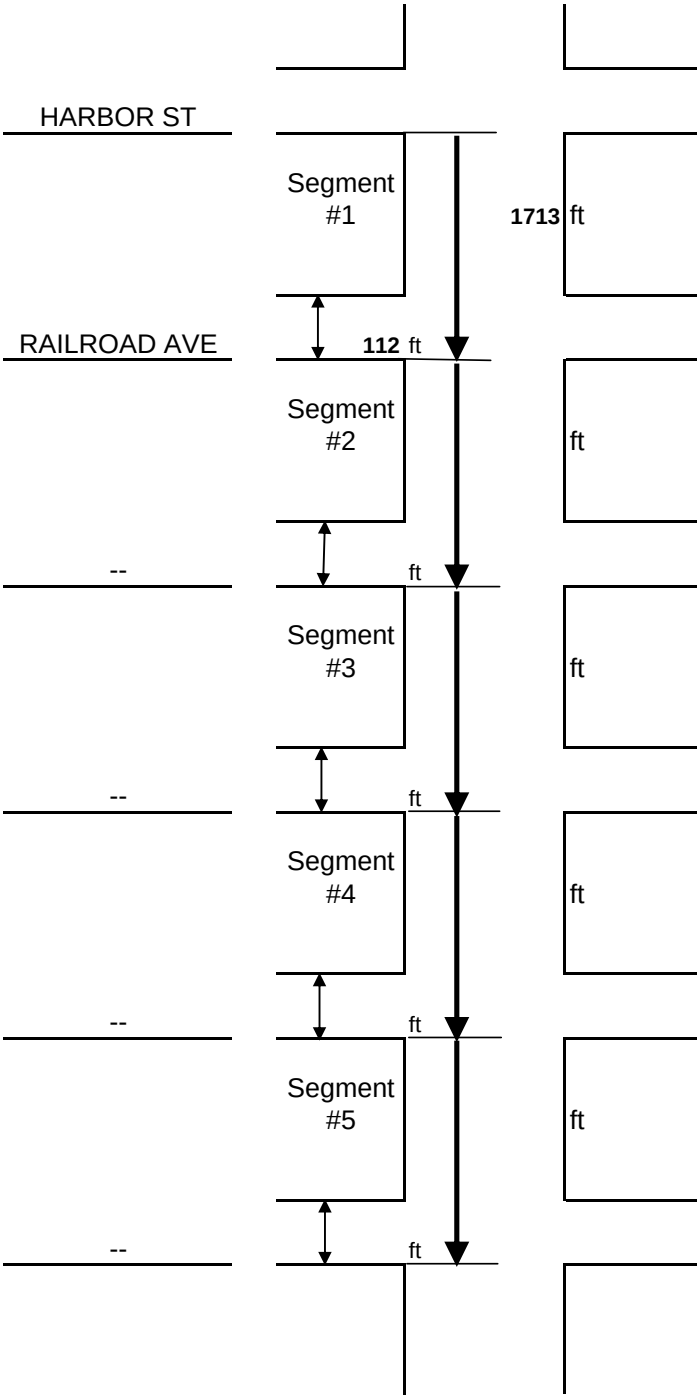
Limits: FROM HARBOR ST TO RAILROAD AVE

Observer:

Analysis Direction:	WB

(NB, SB, EB, WB)
(NW, SE, NE, SW)

Data Entry Fields in Red



Intersect. Control	X-Street Lanes	X-Street Speed	X-Street 2-W vph	Right Turn Isl.
SIGNAL	5	35	2239	0

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Intersect. Control	X-Street Lanes	X-Street Speed	X-Street Vph	Right Turn Isl.
SIGNAL				

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: BLISS AVE

Limits: FROM HARBOR ST

Cross-Section #1

Observer: 0

From: HARBOR ST To: RAILROAD AVE

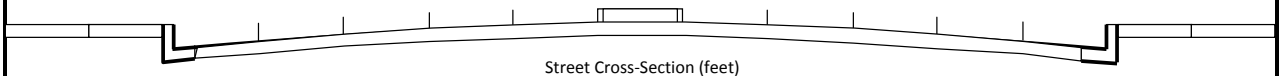
1

Ft/Trees	% Occ.
0	0%

WB

Pavement Cond:	2
Jay-Walking Legal:	no

EB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk
10	0	2	0	0	0	12	0	12	0	0	0	2	0	5

Ped Vol: 0

Cross-Section #2

From: RAILROAD AVE To: --

2

Ft/Trees	% Occ.

WB

Pavement Cond:	
Jay-Walking Legal:	

EB

Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Cross-Section #3

From: -- To: --

3

Ft/Trees	% Occ.

WB

Pavement Cond:	
Jay-Walking Legal:	

EB

Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Multimodal Level of Service for Urban Streets
Street Cross-Section Data

Street: BLISS AVE

Limits: FROM HARBOR ST

Cross-Section #4

Observer: 0

From: -- To: --

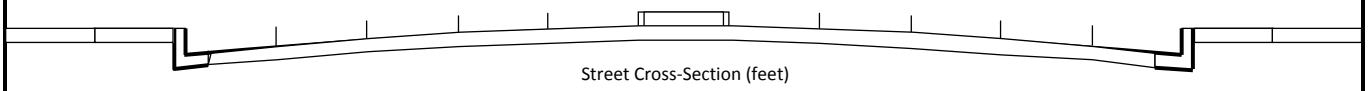
4

Ft/Trees	% Occ.

WB

Pavement Cond:	
Jay-Walking Legal:	

EB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Cross-Section #5

From: -- To: --

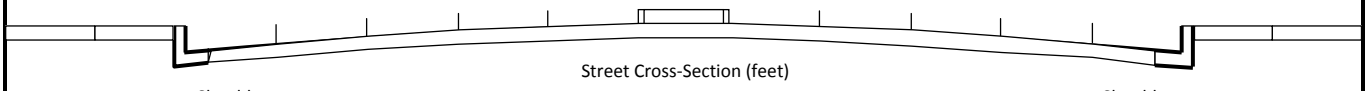
5

Ft/Trees	% Occ.

WB

Pavement Cond:	
Jay-Walking Legal:	

EB



Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Bike Ln	Shoulder Parking	Buffer	Sidewalk

Ped Vol:

Urban Street Multimodal Level of Service
Data Collection Sheet - Vehicle Traffic

Direction: **WB**

Street: BLISS AVE Date: 0-Jan-00

Limits: OM HARBOR ST TO RAILROAD A Observer: 0

Field Survey

	Segment And Downstream Signal		Speed Limit	Median Type	Left Turn Pocket	Drivewys Rightside	Unsig. Intersects
	From	To	(mph)	(0-3)	(y/n)	(#)	(#)
1	HARBOR ST	RAILROAD AVI	35	0	n	9	
2	RAILROAD AVI	--					
3	--	--					
4	--	--					
5	--	--					

Traffic Counts K: 100 D: 100

	Segment And Downstream Signal		Vol	Heavy Vehicle	RTOR+ PermLeft	Left/Right Turns	Thru Adj. Sat.	PHF
	From	To	(1-wy)	(%)	veh	%	(vphgl)	
1	HARBOR ST	RAILROAD AVI	263	2%	377	0%	1900	0.78
2	RAILROAD AVI	--						
3	--	--						
4	--	--						
5	--	--						

Arterial Traffic Performance & Signal Timing

	Segment And Downstream Signal		Field Survey		Signal Timing Data			
			Mean Speed	Average Stops	Cycle Length	Grn/Cycle for Thru	Ped Walk	Xing Ped Walk
	From	To	(mph)	(#/veh)	(secs)	(%)	(sec/cyc)	(sec/cyc)
1	HARBOR ST	RAILROAD AVI	31.5	0.8	80.0	25%	30.0	15.0
2	RAILROAD AVI	--						
3	--	--						
4	--	--						
5	--	--						

Notes: Median = 0 if None, 1 if one-way st., 2 if Painted or TWLTL, 3 if Raised
Heavy Vehicles = Buses plus trucks plus recreational vehicles
Thru Adusted Saturation Flow rates computed per Signalized Intersections Chapter, HC
Signal data is at the downstream signal

Urban Street Multimodal Level of Service
Data Collection Sheet - Transit

Direction: **WB**

Street: BLISS AVE Date: 0-Jan-00

Limits: FROM HARBOR ST TO RAILROAD AVE Observer: 0

Field Survey

Segment			Bus Stop	Shelters	Benches	CBD
	From	To	(#)	(% stops)	(% stops)	(yes/no)
1	HARBOR ST	RAILROAD AVE	0	0	0	no
2	RAILROAD AVE	--				
3	--	--				
4	--	--				
5	--	--				

Transit Performance Data

Segment			Route	Frequency	Load Factor	On-Time Perform.	Schedule Speed
	From	To	#'s	(bus/hr)	(pas/seat)	(%)	(mph)
1	HARBOR ST	RAILROAD AVE					
2	RAILROAD AVE	--					
3	--	--					
4	--	--					
5	--	--					

Bus is On-Time if arrives within: 5 minutes of scheduled time.
Average Passenger Trip Length: 6.4 miles

A. Compute Auto LOS and Performance

Street: **BLISS AVE**

Direction=	**Down**	**WB**

1. Compute Eastbound Hourly Demand (v)

Segment & Downstream Signal	AADT (vpd)	Peak Factor K (#)	Dir. Factor D (#)	Pk.Hr.Fac. PHF (#)	Thru Traffic (%)	Demand v (vph)	from:
1	263	1.000	1.00	0.78	100%	263	traffic
2	0	1.000	1.00	0	100%	#DIV/0!	traffic
3	0	1.000	1.00	0	100%	#DIV/0!	traffic
4	0	1.000	1.00	0	100%	#DIV/0!	traffic
5	0	1.000	1.00	0	100%	#DIV/0!	traffic

2. Compute Eastbound Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1900	1	0.25	475	0.55	OK	xsec 1-3, traffic
2	0	0	0.00	1	#DIV/0!	--	xsec 1-3, traffic
3	0	0	0.00	1	#DIV/0!	--	xsec 1-3, traffic
4	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic
5	0	0	0.00	1	#DIV/0!	--	xsec 4-5, traffic

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	35	1713	31.5	traffic, layout
2	0	0	0	traffic, layout
3	0	0	0	traffic, layout
4	0	0	0	traffic, layout
5	0	0	0	traffic, layout
Total/Ave.	35.0	1713	31.5	

4. Compute Stops & % Left Lane

Segment & Downstream Signal	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	2.56	n	0	traffic
2	#DIV/0!	0	0	traffic
3	#DIV/0!	0	0	traffic
4	#DIV/0!	0	0	traffic
5	#DIV/0!	0	0	traffic
Total/Ave	2.56	0.00	0.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weight. Ave.	Auto LOS
1	14.1%	35.3%	25.5%	13.8%	7.2%	4.1%	2.77	C
2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
3	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average	14.1%	35.3%	25.5%	13.8%	7.2%	4.1%	2.77	C

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Pedestrian LOS

Street: **BLISS AVE**

1. Compute Pedestrian Density LOS

Seg.	Sidewalk Width (ft)	Ped Flow (pph)	Ped. Density LOS #	Ped. Density LOS	from
1	10	0	0.00	A	xsec1-3
2	0	0	N/A	N/A	xsec1-3
3	0	0	N/A	N/A	xsec1-3
4	0	0	N/A	N/A	xsec4-5
5	0	0	N/A	N/A	xsec4-5

Density LOS Lookup	
Ped/hr/ft	LOS
0	A
300	B
420	C
600	D
900	E
1380	F

2. Compute Pedestrian Segment LOS

Seg.	Outside Lane (ft)	Bike Ln + Park/Shldr (ft)	On-Street Parking Occ (%)	Barrier (ft/Tree)	Buffer Width (ft)	Dir. Traffic Volume (vph)	Traf. Lanes One-Dir (lanes)	Midblock Veh. Speed (mph)	Ped. Seg. LOS #	from
1	0	2	0%	0	0	263	1	33.3	3.00	xsec1-3
2	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec1-3
3	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec1-3
4	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5
5	0	0	0%	0	0	#DIV/0!	0	0.0	#NUM!	xsec4-5

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with intersection delay.

3. Compute Pedestrian Intersection LOS

Downstream Signal	RTOR+ Perm LT (vph)	X-Street Volume (vph)	X-Street PHF (#)	X-Street Speed (mph)	X-Street Lanes (#)	Ave Ped. Wait At Signal (sec)	Right Turn Channel Islands (#)	Ped. Intersect LOS #	from
1	377	2239	0.78	35	5	15.6	0	6.00	layout, traffic
2	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
3	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
4	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic
5	0	0	0.00	0	0	#DIV/0!	0	#DIV/0!	layout, traffic

Pedestrian Delay computed per Chapter 18 method (eqn 18-5, HCM 2000).

4. Compute Roadway Crossing Difficulty Factor (RCDF)

Seg.	Signal Spacing (ft)	Cross St. Ped Wait (secs/cycle)	Divert Delay (sec)	Arterial X Distance (ft)	Midblock Veh Speed (mph)	Vehicle Vol 2-Dir (vph)	Wait To X (max=900) (sec)	Is J-Walking Allowed? (Yes/No)	from
1	1713	26.4	339	28	33.3	263	5	no	layout, traffic
2	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
3	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
4	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic
5	0	#DIV/0!	#DIV/0!	0	0.0	0	0	0	layout, traffic

5. Compute Pedestrian Facility LOS

Segment & Downstream Signal	Min. Wait,Divert (sec)	Crossing LOS (#)	No Cross LOS (#)	RCDF (#)	Ped. NDLOS (#)	Ped. Density LOS #	Ped. Fac. LOS (#)	Ped. Facility LOS
1	5	1.00	3.88	1.00	3.88	0.00	3.88	E
2	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
3	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
4	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
5	#DIV/0!	#DIV/0!	#NUM!	1.00	#NUM!	N/A	#NUM!	#NUM!
Average							3.88	E

C. Compute Transit LOS

Street: **BLISS AVE**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	0	#DIV/0!	0%	0%	#DIV/0!	no	transit
2	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
3	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
4	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit
5	0	#DIV/0!	0%	0%	#DIV/0!	0%	transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus (mph)	from
1	1713	31.5	0	#DIV/0!	transit
2	0	0	0	#DIV/0!	transit
3	0	0	0	#DIV/0!	transit
4	0	0	0	#DIV/0!	transit
5	0	0	0	#DIV/0!	transit
Total/Ave	1713	#DIV/0!		#DIV/0!	

3. Compute Transit Perceived Travel Time and Headway Factors

Segment	a1 factor	IVTTR min/mi	EWTTR min/mi	ATR min/mi	PTTR	Fptt	Fh
1	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
2	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
3	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
4	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00
5	#DIV/0!	#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!	0.00

IVTTR = In-Vehicle Travel Time Rate
EWTTR = Equivalent Wait Travel Time Rate
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor

4. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	#DIV/0!	3.88	#DIV/0!	F
2	#DIV/0!	#NUM!	#DIV/0!	F
3	#DIV/0!	#NUM!	#DIV/0!	F
4	#DIV/0!	#NUM!	#DIV/0!	F
5	#DIV/0!	#NUM!	#DIV/0!	F
Average			5.00	F

D. Compute Bicycle LOS

Street: **BLISS AVE**

1. Geometric Input Data

Segment & Downstream Signal	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Sig. Int Cross-Dist (ft)	Unsig.Conf Per Mile (conf/mi)	from
1	0	2	1	UD	112	27.7	xsec1-3, layout
2	0	0	0	UD	0	#DIV/0!	xsec1-3, layout
3	0	0	0	UD	0	#DIV/0!	xsec1-3, layout
4	0	0	0	UD	0	#DIV/0!	xsec4-5, layout
5	0	0	0	UD	0	#DIV/0!	xsec4-5, layout

2. Performance and Other Input Data

Segment & Downstream Signal	Traffic Volume (vph)	Heavy Vehicle (%)	Midblock Traffic Spd (mph)	On-Street Parking (%)	Pavement Rating (#)	from
1	263	2%	33.3	0%	2.0	traffic, xsec1-3
2	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec1-3
3	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec1-3
4	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5
5	#DIV/0!	0%	0.0	0%	0.0	traffic, xsec4-5

Pavement Rating: 1=Poor, 5=Excellent

Midblock traffic speed = average of auto free-flow speed, and mean auto speed with inte

3. Compute Bicycle LOS

Segment & Downstream Signal	Prelim. Eff. Width (Wv)	Effective Width (We)	Speed Factor (#)	Segment LOS (#)	Intersect LOS (#)	Bicycle Score (#)	Bicycle LOS
1	2.0	4.0	3.70	5.79	6.00	9.19	F
2	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
3	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!	0.81	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average						9.19	F

E. LOS Summary

Title: BLISS AVE

Direction =	Down	WB

Date: Analyst:

Segment & Downstream Signal	Auto Stops LOS #1	Auto Speed LOS #2	Auto HCM LOS #3	Auto NCHRP 379 LOS #4	Transit LOS	Bicycle LOS	Pedestrian LOS
1	C	B	A	A	F	F	E
2	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
3	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
4	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
5	#DIV/0!	#DIV/0!	#N/A	#DIV/0!	F	#DIV/0!	#NUM!
Facility	C	#DIV/0!	A	A	F	F	E

Auto Performance Measures Summary WB

Seg+Sig	Stops	FFS	Speed	%FFS
1	2.56	35.0	31.5	90.0%
2	#DIV/0!	0.0	0	#DIV/0!
3	#DIV/0!	0.0	0	#DIV/0!
4	#DIV/0!	0.0	0	#DIV/0!
5	#DIV/0!	0.0	0	#DIV/0!
Facility	2.56	35.0	31.5	90.0%

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Created: 8-Jun-07 Updated: 25-Sep-08

Appendix D

URBEMIS Air Quality and Noise Modeling Output Data

SIMPLIFIED CALINE4 CARBON MONOXIDE ANALYSIS

Project Number: 0
Project Title: Railroad Avenue Specific Plan

Background Information

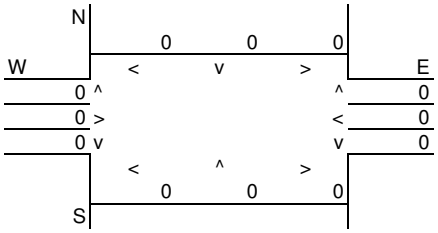
Nearest Air Monitoring Station measuring CO:	Pittsburg
Background 1-hour CO Concentration (ppm):	2.8
Background 8-hour CO Concentration (ppm):	1.5
Persistence Factor:	0.7
Analysis Year:	2030

Roadway Data

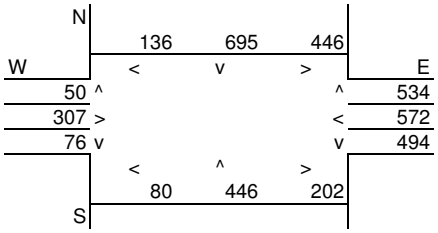
Intersection: California Harbor
Analysis Condition: No Project

		Roadway Type	No. of Lanes	Average Speed A.M.	Average Speed P.M.
North-South Roadway:	California	At Grade	4	25	25
East-West Roadway:	Harbor	At Grade	4	25	25

A.M. Peak Hour Traffic Volumes



P.M. Peak Hour Traffic Volumes



Highest Traffic Volumes (Vehicles per Hour)

N-S Road:	0	N-S Road:	2,307
E-W Road:	0	E-W Road:	2,555

Roadway CO Contributions and Concentrations

Emissions = (A x B x C) / 100,000[1]

Roadway	A_1 Reference CO Concentrations 25 Feet	A_2 Reference CO Concentrations 50 Feet	A_3 Reference CO Concentrations 100 Feet	B Traffic Volume	C Emission Factors[2]	Estimated CO Concentrations 25 Feet	Estimated CO Concentrations 50 Feet	Estimated CO Concentrations 100 Feet
A.M. Peak Traffic Hour								
North-South Road	7.0	5.4	3.8	0	0.99	0.00	0.00	0.00
East-West Road	2.6	2.2	1.7	0	0.99	0.00	0.00	0.00
P.M. Peak Traffic Hour								
North-South Road	2.6	2.2	1.7	2,307	0.99	0.06	0.05	0.04
East-West Road	7.0	5.4	3.8	2,555	0.99	0.18	0.14	0.10

SIMPLIFIED CALINE4 CARBON MONOXIDE ANALYSIS

Project Number: 0
Project Title: Railroad Avenue Specific Plan

Background Information

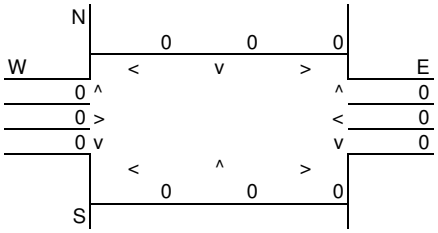
Nearest Air Monitoring Station measuring CO:	Pittsburg
Background 1-hour CO Concentration (ppm):	2.8
Background 8-hour CO Concentration (ppm):	1.5
Persistence Factor:	0.7
Analysis Year:	2030

Roadway Data

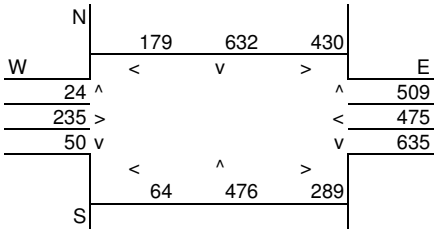
Intersection: California Harbor
Analysis Condition: With Project

		Roadway Type	No. of Lanes	Average Speed A.M.	Average Speed P.M.
North-South Roadway:	California	At Grade	4	25	25
East-West Roadway:	Harbor	At Grade	4	25	25

A.M. Peak Hour Traffic Volumes



P.M. Peak Hour Traffic Volumes



Highest Traffic Volumes (Vehicles per Hour)

N-S Road:	0	N-S Road:	2,250
E-W Road:	0	E-W Road:	2,573

Roadway CO Contributions and Concentrations

Emissions = (A x B x C) / 100,000[1]

Roadway	A_1 Reference CO Concentrations 25 Feet	A_2 Reference CO Concentrations 50 Feet	A_3 Reference CO Concentrations 100 Feet	B Traffic Volume	C Emission Factors[2]	Estimated CO Concentrations 25 Feet	Estimated CO Concentrations 50 Feet	Estimated CO Concentrations 100 Feet
A.M. Peak Traffic Hour								
North-South Road	7.0	5.4	3.8	0	0.99	0.00	0.00	0.00
East-West Road	2.6	2.2	1.7	0	0.99	0.00	0.00	0.00
P.M. Peak Traffic Hour								
North-South Road	2.6	2.2	1.7	2,250	0.99	0.06	0.05	0.04
East-West Road	7.0	5.4	3.8	2,573	0.99	0.18	0.14	0.10

SIMPLIFIED CALINE4 CARBON MONOXIDE ANALYSIS

Project Number: 0
Project Title: Railroad Avenue Specific Plan

Background Information

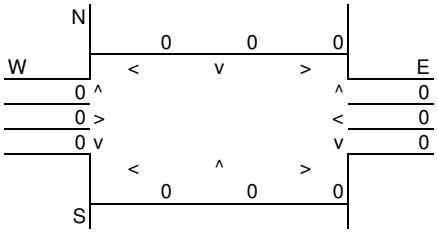
Nearest Air Monitoring Station measuring CO:	Pittsburg
Background 1-hour CO Concentration (ppm):	2.8
Background 8-hour CO Concentration (ppm):	1.5
Persistence Factor:	0.7
Analysis Year:	2030

Roadway Data

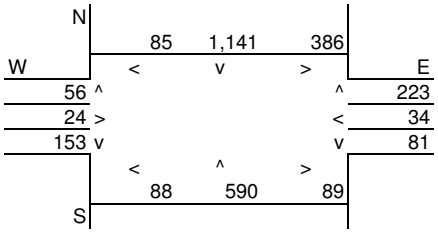
Intersection: Garcia Harbor
Analysis Condition: No Project

		Roadway Type	No. of Lanes	Average Speed A.M.	Average Speed P.M.
North-South Roadway:	Garcia	At Grade	4	25	25
East-West Roadway:	Harbor	At Grade	4	25	25

A.M. Peak Hour Traffic Volumes



P.M. Peak Hour Traffic Volumes



Highest Traffic Volumes (Vehicles per Hour)

N-S Road:	0	N-S Road:	2,481
E-W Road:	0	E-W Road:	837

Roadway CO Contributions and Concentrations

Emissions = (A x B x C) / 100,000[1]

Roadway	A_1 Reference CO Concentrations 25 Feet	A_2 Reference CO Concentrations 50 Feet	A_3 Reference CO Concentrations 100 Feet	B Traffic Volume	C Emission Factors[2]	Estimated CO Concentrations 25 Feet	Estimated CO Concentrations 50 Feet	Estimated CO Concentrations 100 Feet
A.M. Peak Traffic Hour								
North-South Road	7.0	5.4	3.8	0	0.99	0.00	0.00	0.00
East-West Road	2.6	2.2	1.7	0	0.99	0.00	0.00	0.00
P.M. Peak Traffic Hour								
North-South Road	7.0	5.4	3.8	2,481	0.99	0.17	0.13	0.09
East-West Road	2.6	2.2	1.7	837	0.99	0.02	0.02	0.01

SIMPLIFIED CALINE4 CARBON MONOXIDE ANALYSIS

Project Number: 0
Project Title: Railroad Avenue Specific Plan

Background Information

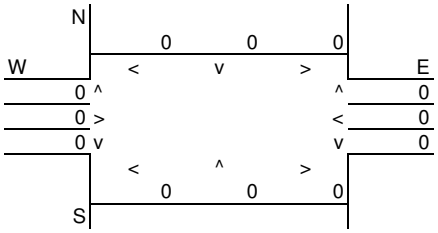
Nearest Air Monitoring Station measuring CO:	Pittsburg
Background 1-hour CO Concentration (ppm):	2.8
Background 8-hour CO Concentration (ppm):	1.5
Persistence Factor:	0.7
Analysis Year:	2030

Roadway Data

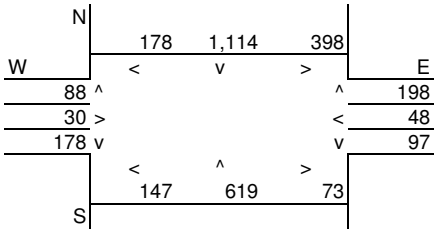
Intersection: Garcia Harbor
Analysis Condition: with Project

		Roadway Type	No. of Lanes	Average Speed A.M.	Average Speed P.M.
North-South Roadway:	Garcia	At Grade	4	25	25
East-West Roadway:	Harbor	At Grade	4	25	25

A.M. Peak Hour Traffic Volumes



P.M. Peak Hour Traffic Volumes



Highest Traffic Volumes (Vehicles per Hour)

N-S Road:	0	N-S Road:	2,595
E-W Road:	0	E-W Road:	844

Roadway CO Contributions and Concentrations

Emissions = (A x B x C) / 100,000[1]

Roadway	A_1 Reference CO Concentrations 25 Feet	A_2 Reference CO Concentrations 50 Feet	A_3 Reference CO Concentrations 100 Feet	B Traffic Volume	C Emission Factors[2]	Estimated CO Concentrations 25 Feet	Estimated CO Concentrations 50 Feet	Estimated CO Concentrations 100 Feet
A.M. Peak Traffic Hour								
North-South Road	7.0	5.4	3.8	0	0.99	0.00	0.00	0.00
East-West Road	2.6	2.2	1.7	0	0.99	0.00	0.00	0.00
P.M. Peak Traffic Hour								
North-South Road	7.0	5.4	3.8	2,595	0.99	0.18	0.14	0.10
East-West Road	2.6	2.2	1.7	844	0.99	0.02	0.02	0.01

SIMPLIFIED CALINE4 CARBON MONOXIDE ANALYSIS

Project Number: 0
Project Title: Railroad Avenue Specific Plan

Background Information

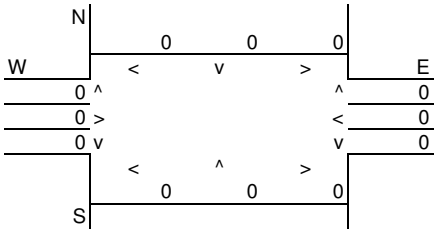
Nearest Air Monitoring Station measuring CO:	Pittsburg
Background 1-hour CO Concentration (ppm):	2.8
Background 8-hour CO Concentration (ppm):	1.5
Persistence Factor:	0.7
Analysis Year:	2030

Roadway Data

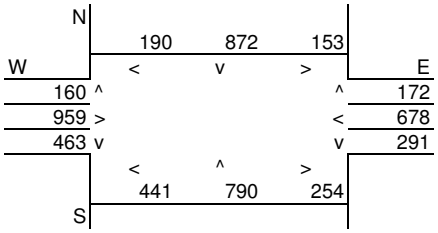
Intersection: Railroad Leland
Analysis Condition: No Project

		Roadway Type	No. of Lanes	Average Speed A.M.	Average Speed P.M.
North-South Roadway:	Railroad	At Grade	4	25	25
East-West Roadway:	Leland	At Grade	4	25	25

A.M. Peak Hour Traffic Volumes



P.M. Peak Hour Traffic Volumes



Highest Traffic Volumes (Vehicles per Hour)

N-S Road:	0	N-S Road:	3,111
E-W Road:	0	E-W Road:	2,891

Roadway CO Contributions and Concentrations

Emissions = (A x B x C) / 100,000[1]

Roadway	A_1 Reference CO Concentrations 25 Feet	A_2 Reference CO Concentrations 50 Feet	A_3 Reference CO Concentrations 100 Feet	B Traffic Volume	C Emission Factors[2]	Estimated CO Concentrations 25 Feet	Estimated CO Concentrations 50 Feet	Estimated CO Concentrations 100 Feet
A.M. Peak Traffic Hour								
North-South Road	7.0	5.4	3.8	0	0.99	0.00	0.00	0.00
East-West Road	2.6	2.2	1.7	0	0.99	0.00	0.00	0.00
P.M. Peak Traffic Hour								
North-South Road	7.0	5.4	3.8	3,111	0.99	0.22	0.17	0.12
East-West Road	2.6	2.2	1.7	2,891	0.99	0.07	0.06	0.05

SIMPLIFIED CALINE4 CARBON MONOXIDE ANALYSIS

Project Number: 0
Project Title: Railroad Avenue Specific Plan

Background Information

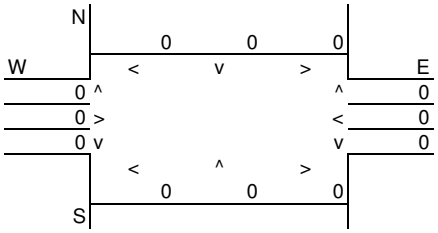
Nearest Air Monitoring Station measuring CO:	Pittsburg
Background 1-hour CO Concentration (ppm):	2.8
Background 8-hour CO Concentration (ppm):	1.5
Persistence Factor:	0.7
Analysis Year:	2030

Roadway Data

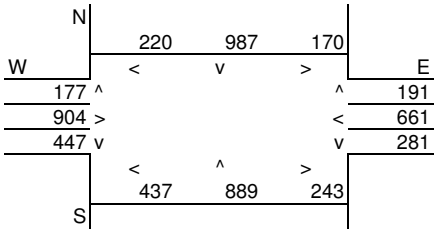
Intersection: Railroad Leland
Analysis Condition: With Project

		Roadway Type	No. of Lanes	Average Speed A.M.	Average Speed P.M.
North-South Roadway:	Railroad	At Grade	4	25	25
East-West Roadway:	Leland	At Grade	4	25	25

A.M. Peak Hour Traffic Volumes



P.M. Peak Hour Traffic Volumes



Highest Traffic Volumes (Vehicles per Hour)

N-S Road:	0	N-S Road:	3,284
E-W Road:	0	E-W Road:	2,846

Roadway CO Contributions and Concentrations

Emissions = (A x B x C) / 100,000[1]

Roadway	A_1 Reference CO Concentrations 25 Feet	A_2 Reference CO Concentrations 50 Feet	A_3 Reference CO Concentrations 100 Feet	B Traffic Volume	C Emission Factors[2]	Estimated CO Concentrations 25 Feet	Estimated CO Concentrations 50 Feet	Estimated CO Concentrations 100 Feet
A.M. Peak Traffic Hour								
North-South Road	7.0	5.4	3.8	0	0.99	0.00	0.00	0.00
East-West Road	2.6	2.2	1.7	0	0.99	0.00	0.00	0.00
P.M. Peak Traffic Hour								
North-South Road	7.0	5.4	3.8	3,284	0.99	0.23	0.18	0.12
East-West Road	2.6	2.2	1.7	2,846	0.99	0.07	0.06	0.05

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Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: C:\Documents and Settings\21479\Application Data\Urbemis\Version9a\Projects\Railroad Avenue Operation 2030.urb924

Project Name: Railroad Avenue Specific Plan Operation

Project Location: Contra Costa County

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	74.83	10.24	7.52	0.00	0.03	0.03	13,014.14

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	33.59	26.01	332.91	0.81	144.57	27.49	82,077.11

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	108.42	36.25	340.43	0.81	144.60	27.52	95,091.25

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Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

Source	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
Natural Gas	0.79	10.20	4.43	0.00	0.02	0.02	13,008.52
Hearth - No Summer Emissions							
Landscape	0.25	0.04	3.09	0.00	0.01	0.01	5.62
Consumer Products	64.77						
Architectural Coatings	9.02						
TOTALS (lbs/day, unmitigated)	74.83	10.24	7.52	0.00	0.03	0.03	13,014.14

Area Source Changes to Defaults

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Apartments low rise	31.51	24.11	309.61	0.75	134.07	25.50	76,172.09
Strip mall	2.08	1.90	23.30	0.06	10.50	1.99	5,905.02
TOTALS (lbs/day, unmitigated)	33.59	26.01	332.91	0.81	144.57	27.49	82,077.11

Operational Settings:

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2030 Temperature (F): 85 Season: Summer

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Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Apartments low rise	82.75	6.90	dwelling units	1,324.00	9,135.60	78,106.64
Strip mall		36.70	1000 sq ft	22.55	827.58	6,118.34
					9,963.18	84,224.98

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	51.3	0.0	100.0	0.0
Light Truck < 3750 lbs	12.9	0.0	99.2	0.8
Light Truck 3751-5750 lbs	20.4	0.0	100.0	0.0
Med Truck 5751-8500 lbs	7.8	0.0	100.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.1	0.0	81.8	18.2
Lite-Heavy Truck 10,001-14,000 lbs	0.6	0.0	66.7	33.3
Med-Heavy Truck 14,001-33,000 lbs	0.7	0.0	14.3	85.7
Heavy-Heavy Truck 33,001-60,000 lbs	0.3	0.0	0.0	100.0
Other Bus	0.0	0.0	0.0	0.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	3.7	35.1	64.9	0.0
School Bus	0.3	0.0	0.0	100.0
Motor Home	0.8	0.0	87.5	12.5

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Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	10.8	7.3	7.5	9.5	7.4	7.4
Rural Trip Length (miles)	16.8	7.1	7.9	14.7	6.6	6.6
Trip speeds (mph)	35.0	35.0	35.0	35.0	35.0	35.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
Strip mall				2.0	1.0	97.0

Appendix E

Native American Correspondence

STATE OF CALIFORNIA
Arnold Schwarzenegger, Governor

NATIVE AMERICAN HERITAGE COMMISSION
915 CAPITOL MALL, ROOM 364
SACRAMENTO, CA 95814
(916) 653-4082
Fax (916) 657-5390

February 14, 2008

Leigha Schmidt
CITY OF PITTSBURG PLANNING DEPARTMENT
65 Civic Avenue
Pittsburg, CA 94565

Sent Via Fax: 925-252-4814
# of Pages: 2

RE: SB 18 Tribal Consultation: Railroad Avenue eBART Specific Plan, City of Pittsburg, Contra Costa County.

Dear Ms. Schmidt:

Government Code §65352.3 requires local governments to consult with California Native American tribes identified by the Native American Heritage Commission (NAHC) for the purpose of protecting, and/or mitigating impacts to cultural places. Attached is a consultation list of tribes with traditional lands or cultural places located within the requested General Plan boundaries.

As a part of consultation, the NAHC recommends that local governments conduct record searches through the NAHC and California Historic Resources Information System (CHRIS) to determine if any cultural places are located within the area(s) affected by the proposed action. NAHC Sacred Lands File requests must be made in writing. All requests must include: county, USGS quad map name, township, range and section. Local governments should be aware, however, that records maintained by the NAHC and CHRIS are not exhaustive, and a negative response to these searches does not preclude the existence of a cultural place. A tribe may be the only source of information regarding the existence of a cultural place.

If you receive notification of change of addresses and phone numbers from Tribes, please notify me. With your assistance we are able to assure that our consultation list contains current information.

If you have any questions, please contact me at (916) 653-4038.

Sincerely,

Debbie Pilas-Treadway
Environmental Specialist III

Native American Tribal Consultation List
City of Pittsburg
February 14, 2008

Amah/MutsunTribal Band
Irene Zwierlein, Chairperson
789 Canada Road
Woodside , CA 94062
amah_mutsun@yahoo.com
(650) 851-7747 - Home

Ohlone/Costanoan

Indian Canyon Mutsun Band of Costanoan
Ann Marie Sayers, Chairperson
P.O. Box 28
Hollister , CA 95024
ams@garlic.com
831-637-4238

Ohlone/Costanoan

The Ohlone Indian Tribe
Andrew Galvan
PO Box 3152
Mission San Jose , CA 94539
chochenyo@AOL.com
(510) 656-0787 - Voice
(510) 882-0527 - Cell

Ohlone/Costanoan
Bay Miwok
Plains Miwok
Patwin

This list is current only as of the date of this document.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is applicable only for consultation with Native American tribes under Government Code Section 65352.3.

City of Pittsburg

Planning Department
Civic Center - 65 Civic Avenue, Pittsburg, CA 94565

Telephone (925) 252-4920 • FAX: (925) 252-4814

January 29, 2008

Native American Heritage Commission
915 Capitol Mall, Room 364
Sacramento, CA 95814

RE: LOCAL GOVERNMENT TRIBAL CONSULTATION REQUEST

Project Title: Railroad Avenue eBART Specific Plan

Local Government/Lead Agency: City of Pittsburg

Contact Person: Leigha Schmidt
City of Pittsburg Planning Department
65 Civic Avenue
Pittsburg, CA 94565
ph. 925-252-4015
fx. 925-252-4814
e. lschmidt@ci.pittsburg.ca.us

Project Location: Pittsburg, Contra Costa County, California

Local Action Type: Specific Plan

Project Description:

The City of Pittsburg entered into a Memorandum of Understanding with Bay Area Rapid Transit District (BART), Contra Costa Transportation Authority (CCTA) and Eastern Contra Costa Transit Authority in connection with the development of a high quality rapid transit service to east Contra Costa County. The MOU requires that all of the participating cities create a Ridership Development Plan, which focuses on increasing ridership near the station areas through development intensity and increased pedestrian and transportation linkages in the area within a ½-mile radius around the proposed eBART station. According to the Agreement, the City of Pittsburg must implement the Ridership plan through the preparation and adoption of a new specific plan. The proposed eBART station is in the middle of State Route 4 at Railroad Avenue.

The Specific Plan area encompasses approximately 1,075 acres. The rough boundaries are the Burlington Northern and Santa Fe Railroad and the Union Pacific Railroad lines

on the north, Andrew Avenue on the west, the Contra Costa Canal on the south, and Diaz Circle on the east. Please see the attached map for the detailed boundaries.

To date, the City has retained the services of MIG consultants to develop a Specific Plan for the area roughly encompassing the ½-mile area around the proposed eBART station. The plan is intended to facilitate transit-oriented development through an increase in the intensity and density of residential and commercial development in the specific plan area, to improve the pedestrian, bus, bicycle, train and other linkages between the area and the surrounding community, and to develop design and development standards that will facilitate a vibrant, pedestrian friendly, mixed-use neighborhood.

March 12, 2008

Native American Heritage Commission
915 Capitol Mall, Room #364
Sacramento, CA 95814

SUBJECT: Request for Sacred Lands Database Search for the proposed Railroad Avenue Specific Plan Project in Pittsburg, California

Dear NAHC:

PBS&J is preparing an environmental impact report for the proposed Railroad Avenue eBART Specific Plan Project in the City of Pittsburg (see attached map). The proposed East Contra Costa BART Extension (eBART) project would extend from the Pittsburg/Bay Point station eastward via the median of SR4 for a distance of 8.5 miles to its terminus at Hillcrest Avenue. Once adopted, the Specific Plan would guide all new development in the Specific Plan area. Existing developments would not be directly affected unless the occupants or owners choose to expand or change their structures, grounds, or uses. The township, range, and section for the project site are unavailable as the site is located within the Los Medanos Landgrant and is unsectioned. We are requesting a search of the sacred lands database to determine if any Native American cultural resources are present on or in the immediate vicinity of the proposed project site. We have also requested a cultural resources records search from the Northwest Information Center.

Should you have any questions or need additional information, please do not hesitate to call me at (916) 325-4800.

Please FAX the results of the database search and any other input on the project to Steve Smith at (916) 325-4810.

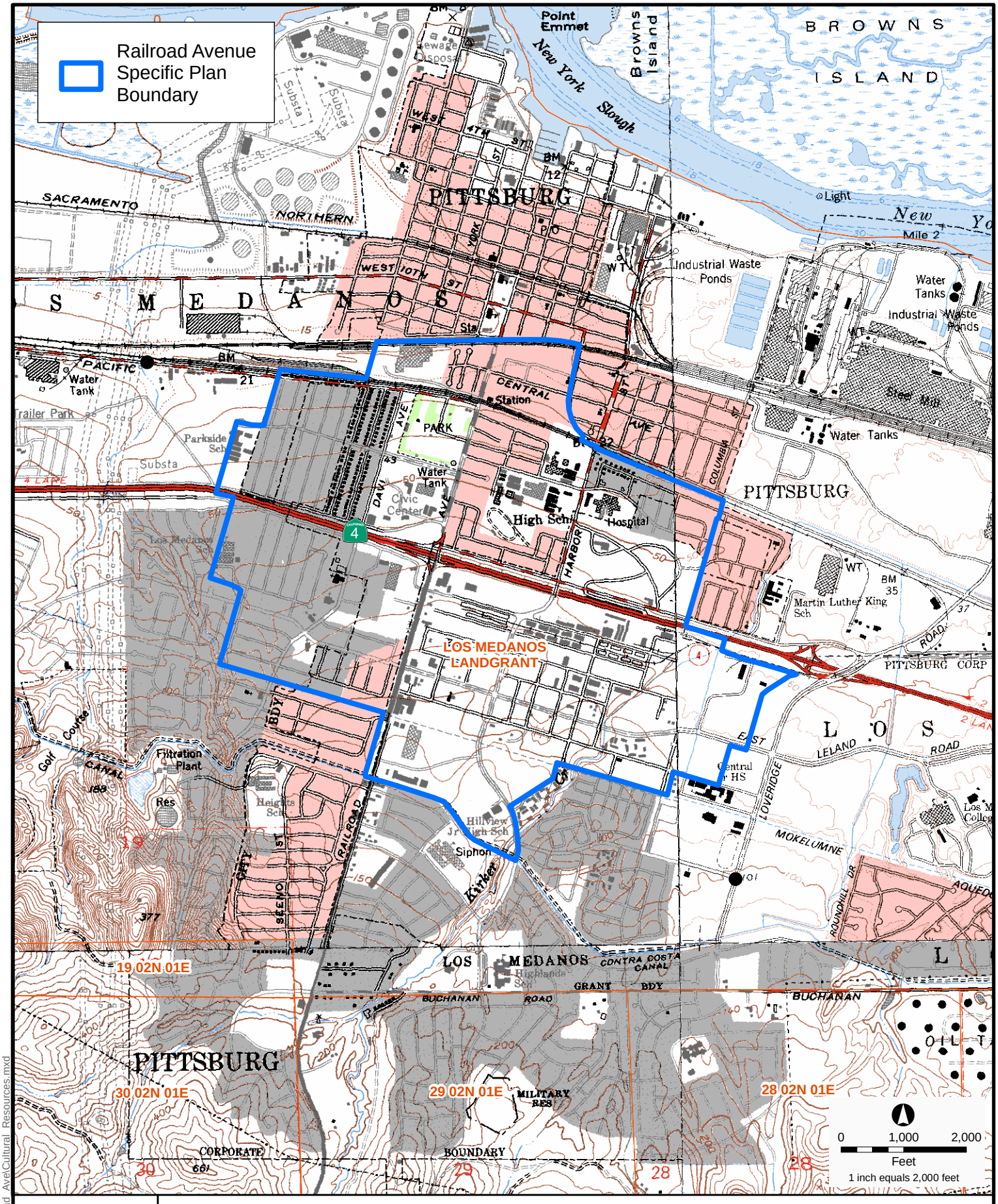
Sincerely,

Steve Smith

Steve Smith
Historian

Enclosure: project area map

1200 2nd Street • Sacramento, California 95814 • Telephone 916.325.4800
Fax 916.325.4810 • www.pbsj.com



C:\GIS Temp\Railroad Ave\Cultural Resources.mxd

PBS&J

Cultural Resources

D41193.00

E-BART Railroad Ave Station

STATE OF CALIFORNIA Arnold Schwarzenegger, Governor

NATIVE AMERICAN HERITAGE COMMISSION
915 CAPITOL MALL, ROOM 364
SACRAMENTO, CA 95814
(916) 653-6251
Fax (916) 657-5390
Web Site www.nahc.ca.gov
e-mail: ds_nahc@pacbell.net

March 19, 2008

Steve Smith
PBS&J
1200 2nd Street
Sacramento, CA 95814

Sent by Fax: 916-325-4812
Number of Pages: 3

Re: Railroad Avenue Bart Specific Plan project, Contra Costa County

Dear Mr. Smith:

A record search of the sacred land file has failed to indicate the presence of Native American cultural resources in the immediate project area. The absence of specific site information in the sacred lands file does not indicate the absence of cultural resources in any project area. Other sources of cultural resources should also be contacted for information regarding known and recorded sites.

Enclosed is a list of Native Americans individuals/organizations who may have knowledge of cultural resources in the project area. The Commission makes no recommendation or preference of a single individual, or group over another. This list should provide a starting place in locating areas of potential adverse impact within the proposed project area. I suggest you contact all of those indicated, if they cannot supply information, they might recommend others with specific knowledge. By contacting all those listed, your organization will be better able to respond to claims of failure to consult with the appropriate tribe or group. If a response has not been received within two weeks of notification, the Commission requests that you follow-up with a telephone call to ensure that the project information has been received.

If you receive notification of change of addresses and phone numbers from any of these individuals or groups, please notify me. With your assistance we are able to assure that our lists contain current information. If you have any questions or need additional information, please contact me at (916) 653-4038.

Sincerely,

Debbie Pilas-Treadway
Environmental Specialist III

Native American Contacts
Contra Costa County
March 19, 2008

Katherine Erolinda Perez
PO Box 717
Linden , CA 95236
(209) 887-3415

Ohlone/Costanoan
Northern Valley Yokuts
Bay Miwok

The Ohlone Indian Tribe
Andrew Galvan
PO Box 3152
Mission San Jose , CA 94539
chochenyo@AOL.com
(510) 656-0787 - Voice
(510) 882-0527 - Cell
(510) 687-9393 - Fax

Ohlone/Costanoan
Bay Miwok
Plains Miwok
Patwin

Trina Marine Ruano Family
Ramona Garibay, Representative
16010 Halmar Lane
Lathrop , CA 95330
510-300-5971 - cell

Ohlone/Costanoan
Bay Miwok
Plains Miwok
Patwin

This list is current only as of the date of this document.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources for the proposed Railroad Ave eBart Specfic Plan project, Contra Costa County.

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An employee-owned company

October 28, 2008

Trina Marine Ruano Family
Ramona Garibay, Representative
16010 Halmar Lane
Lathrop, CA 95330

SUBJECT: Railroad Avenue Bart Specific Plan project

Dear Ms. Ramona Garibay:

PBS&J, is preparing an environmental impact report for the proposed East Contra Costa BART Extension (eBART) project would extend from the Pittsburg/Bay Point station eastward via the median of SR4 for a distance of 8.5 miles to its terminus at Hillcrest Avenue. Once adopted, the Specific Plan would guide all new development in the Specific Plan area. Existing developments would not be directly affected unless the occupants or owners choose to expand or change their structures, grounds, or uses. The township, range, and section for the project site are unavailable as the site is located within the Los Medanos Landgrant and is unsectioned. The Native American Heritage Commission has identified you as someone who may have knowledge of cultural resources within the immediate project area. If you are aware of any such properties, please contact Amber Grady at (916) 325-4800 or by mail or email to the address below. We invite your views and comments about the proposed project as they relate to cultural resources.

Sincerely,

Amber Grady

Amber Grady
Senior Scientist – Historic Resources
algrady@pbsj.com

Enclosure: project area map

PBS&J®

An employee-owned company

October 28, 2008

Ms. Katherine Erolinda Perez
P.O. Box 717
Linden, CA 95236

SUBJECT: Railroad Avenue Bart Specific Plan project

Dear Ms. Perez:

PBS&J, is preparing an environmental impact report for the proposed East Contra Costa BART Extension (eBART) project would extend from the Pittsburg/Bay Point station eastward via the median of SR4 for a distance of 8.5 miles to its terminus at Hillcrest Avenue. Once adopted, the Specific Plan would guide all new development in the Specific Plan area. Existing developments would not be directly affected unless the occupants or owners choose to expand or change their structures, grounds, or uses. The township, range, and section for the project site are unavailable as the site is located within the Los Medanos Landgrant and is unsectioned. The Native American Heritage Commission has identified you as someone who may have knowledge of cultural resources within the immediate project area. If you are aware of any such properties, please contact Amber Grady at (916) 325-4800 or by mail or email to the address below. We invite your views and comments about the proposed project as they relate to cultural resources.

Sincerely,

Amber Grady

Amber Grady
Senior Scientist – Historic Resources
algrady@pbsj.com

Enclosure: project area map

PBS&J®

An employee-owned company

October 28, 2008

The Ohlone Indian Tribe
Andrew Galvan
P.O. Box 3152
Mission San Jose, CA 94539

SUBJECT: Railroad Avenue Bart Specific Plan project

Dear Mr. Galvan:

PBS&J, is preparing an environmental impact report for the proposed East Contra Costa BART Extension (eBART) project would extend from the Pittsburg/Bay Point station eastward via the median of SR4 for a distance of 8.5 miles to its terminus at Hillcrest Avenue. Once adopted, the Specific Plan would guide all new development in the Specific Plan area. Existing developments would not be directly affected unless the occupants or owners choose to expand or change their structures, grounds, or uses. The township, range, and section for the project site are unavailable as the site is located within the Los Medanos Landgrant and is unsectioned. The Native American Heritage Commission has identified you as someone who may have knowledge of cultural resources within the immediate project area. If you are aware of any such properties, please contact Amber Grady at (916) 325-4800 or by mail or email to the address below. We invite your views and comments about the proposed project as they relate to cultural resources.

Sincerely,

Amber Grady

Amber Grady
Senior Scientist – Historic Resources
algrady@pbsj.com

Enclosure: project area map

PBS&J
An employee-owned company

Leigha Schmidt
Planning Department
City of Pittsburg
65 Civic Avenue
Pittsburg, CA 94565

Subject: Cultural Resources Records Search Results for the Railroad Avenue Specific Plan EIR

Dear Leigha:

Please find enclosed a DVD that includes the complete and confidential results of the cultural resources records search for the Railroad Avenue Specific Plan EIR. In the Cultural Resources section of the Draft EIR, I have included a footnote reference to the enclosed information as on file with the City of Pittsburg Planning Department. Please note that the locations of cultural resource sites are subject to strict confidentiality and this information is not to be publically disclosed, including as an appendix to the Draft EIR. The confidentiality agreement PBS&J has entered with the Northwest Information Center is included on the enclosed PDF file labeled "07-1312 Agreement." Please do not hesitate to call me at (916) 325-4800 should you have any questions regarding the results of the records search.

Sincerely,

Steve Smith

Steve Smith
Associate Project Manager – Historian
(916) 325-4800
sdsmith@pbsj.com

Appendix F

General and Specific Plan Goals and Policies

Appendix F-1
Railroad Avenue Specific Plan Goals and Policies

Number	Description	Inconsistency/Discussion
	LAND USE	
Goals		
3-G-1	Maximize the benefit of the proposed eBART Station and other transit options and increase ridership by creating a high density, mixed-use community around the potential station site and by integrating the area with the surrounding neighborhoods.	None.
3-G-2	Preserve the character of existing residential neighborhoods, and enhance their connections to each other and the transit hub area.	None.
3-G-3	Preserve industrial uses and jobs by allowing similar and compatible uses in the designated light industrial areas within the Transit Village, Industrial/Mixed Use Center and Los Medanos Industrial Center sub-areas.	None.
Policies		
3-P-1	Create a vibrant, mixed-use, transit-oriented development district nearest the proposed eBART Station.	None.
3-P-2	Foster an engaging and active street environment.	None.
3-P-3	Provide additional housing opportunities, including multifamily and affordable housing, within one-half mile of the proposed eBART Station.	None.
3-P-4	Provide services and amenities that meet the needs of transit riders, local residents, employees, students and visitors such as childcare, education and job skills services, community centers, healthcare services, and neighborhood serving retail in close proximity to the eBART Station.	None.
3-P-5	Provide land uses that accommodate both City-wide and locally-oriented retail opportunities for different consumers to patronize within the Specific Plan Area.	None.
3-P-6	Designate land as public space to provide opportunities for gathering, social interaction, and recreation.	None.
3-P-7	Create an integrated network of open spaces and trails that connect different neighborhoods and sub-areas to each other and to transit facilities.	None.
3-P-8	Incorporate visual and physical connections between City Park and the public uses on the southern portion of the Civic Center block through the inclusion of view corridors, public pathways and greenways in the residential development at the northern part of the Civic Center block.	None.
3-P-9	Retain and expand a variety of employment opportunities in the Specific Plan Area by providing a range of land uses in close proximity to the eBART station.	None.
3-P-10	Allow residential uses above ground floor commercial uses in all commercial land use designations subject to the design review approval by the Planning Commission.	None.
3-P-11	Allow density increases up to 25% for all properties within one-quarter mile of the eBART Station subject to design review by the Planning Commission.	None.

Appendix F-1
Railroad Avenue Specific Plan Goals and Policies

Number	Description	Inconsistency/Discussion
3-P-12	Allow minor deviations from the designated land uses provided that the intent of the predominant land use designation is maintained. Where uncertainty exists regarding the interpretation of a provision of this document to a specific site, the Zoning Administrator shall determine the intent of the provision.	None.
	DESIGN AND DEVELOPMENT	
Goals		
4-G-1	Provide a safe and inviting pedestrian environment to draw people to and from the eBART Station.	None.
4-G-2	Celebrate the station area as a major gateway to the City.	None.
4-G-3	Promote high quality development that is socially and environmentally sustainable.	None.
Policies		
4-P-1	Require high quality, pedestrian-friendly design and a high level of transparency along street fronts and pathways to activate the street environment, promote social interaction and support crime prevention.	None.
4-P-2	Incorporate public pathways and greenways throughout private development located within the Civic Center and Transit Village sub-areas to facilitate pedestrian and bicycle movement throughout the Specific Plan Area.	None.
4-P-3	Provide high quality wayfinding signage throughout the Specific Plan Area.	None.
4-P-4	Develop incentives to support environmentally sustainable practices in site and building design such as improved insulation, operable windows, energy efficient lighting and appliances, solar access, natural ventilation, and permeable paving materials.	None.
4-P-5	Allow reductions in on-site parking requirements at the discretion of the Planning Commission or City Council as part of project approval for affordable and senior housing developments located within the Transit Village, Civic Center and High School Village sub-areas.	None.
4-P-6	Provide a combination of long term, secure and short term bicycle parking facilities and encourage decorative, yet functional, bicycle parking facilities.	None.
	COMMUNITY AND NATURAL RESOURCES	
Goals		
5-G-1	Provide a range of parks, open spaces and public facilities in the Specific Plan Area to meet the diverse needs of residents, employees, students and visitors.	None.
5-G-2	Design and install facilities specifically oriented towards meeting the needs of area youth.	None.
5-G-3	Provide direct access and convenient bus service to the Transit Village and eBART station.	None.

Appendix F-1
Railroad Avenue Specific Plan Goals and Policies

Number	Description	Inconsistency/Discussion
5-G-4	Ensure that natural resources are identified and enhanced by the new development to provide for additional community amenities within the Specific Plan Area.	None.
Policies		
5-P-1	Integrate high quality public facilities including public meeting places, a teen center and an upgraded library into the area to support the needs of visitors, workers, students and residents.	None.
5-P-2	Require new development in the Transit Village and Civic Center sub-areas to dedicate land or to build the proposed public pathways and trails into new development to create a strong network of parks, plazas and pathways that are consistent with those shown on the Land Use Plan.	None.
5-P-3	Encourage the development of day care and early childhood education centers as part of new developments nearest to the eBART station.	None.
5-P-4	Work with the Pittsburg Unified School District, the Contra Costa County Courts and other institutional partners to identify opportunities for joint facility use and cooperative facility planning.	None.
5-P-5	Create a dedicated bus-only street and lanes with access in both directions in the Transit Village sub-area.	None.
5-P-6	Allow installation of public art to fulfill a portion of the landscaping and parkland dedication requirements for commercial and mixed use developments at the discretion of the City Planner, Planning Commission or City Council, as appropriate.	None.
5-P-7	Install street furniture that improves the transit rider's experience, including bus shelters with seating, interactive bus shelters with GPS tracking to show bus times, and other informational signage.	None.
5-P-8	Provide uniform pedestrian-scale lighting along all streets in the Transit Village and Civic Center sub-areas.	None.
5-P-9	Develop sign standards for all uses in the Transit Village sub-area. Until new standards are developed, follow the signage standards set forth in the Old Town Design Guidelines.	None.
5-P-10	All residential development located within 500 feet of Highway 4 shall incorporate site and building specific measures such as triple paned windows and internal ventilation systems to reduce the exposure of residents to noise and air quality impacts from vehicle emissions.	None.
5-P-11	Encourage all development along Kirker Creek and the Delta De Anza trail to protect, restore and retain natural characteristics of the environment to enhance local resources and provide additional community amenities.	None.
5-P-12	Ensure that all development is compliant and consistent with the East Contra Costa Habitat Conservation Plan.	None.

Appendix F-1
Railroad Avenue Specific Plan Goals and Policies

Number	Description	Inconsistency/Discussion
	TRANSPORTATION AND CIRCULATION	
Goals		
6-G-1	Make the Specific Plan Area a walkable center at the crossroads of the Pittsburg community.	None.
6-G-2	Reduce vehicle miles traveled by strengthening multi-modal connections in and around the Specific Plan Area.	None.
6-G-3	Improve all transit connections from the Specific Plan Area outward to the City, the Pittsburg/Bay Point BART station and the region.	None.
Policies		
6-P-1	Encourage walking, bicycling and other non-motorized modes of transportation by providing clearly defined, generous, safe and enjoyable routes for pedestrians and cyclists.	None.
6-P-2	Create a program of wayfinding signage for common destinations throughout the City and Specific Plan Area.	None.
6-P-3	Provide wide sidewalks (a minimum of six-feet wide in residential areas and ten feet in commercial areas) to enhance the pedestrian experience.	None.
6-P-4	Discourage local automobile traffic from performing short trips.	None.
6-P-5	Minimize walking distances between key destinations by mixing uses and providing streetscape amenities.	None.
6-P-6	Create dedicated mid-block greenway connections throughout the Transit Village and into the Civic Center sub-areas.	None.
6-P-7	Design the public realm and rights-of-way for universal design and Americans with Disabilities Act (ADA) compliance to meet or exceed guidelines set by the Division of the State Architect.	None.
6-P-8	Include accessible design improvements, such as appropriately placed curb cuts, audible pedestrian-crossing signals, minimum pathway grades, generous walkway width and areas for rest.	None.
6-P-9	Incorporate traffic calming techniques such as wide sidewalks, narrow streets, bulb outs, on-street parking, and other strategies throughout the Transit Village, Civic Center and High School Village sub-areas.	None.
6-P-10	Enforce truck routes along Railroad Avenue, Leland Road and Harbor Street.	None.
6-P-11	Provide multiple public parking structures in strategic locations that may be shared by commercial and residential uses as well as eBART transit riders.	None.
6-P-12	Allow public use of BART parking lots and parking spaces after 6 p.m. on weekdays and on weekends.	None.

Appendix F-1
Railroad Avenue Specific Plan Goals and Policies

Number	Description	Inconsistency/Discussion
6-P-13	When traffic and parking demand volumes increase as the Specific Plan Area develops, implement Transportation Demand Management (TDM) strategies including unbundling parking from residential development, lowering minimum parking requirements, and instituting parking pricing strategies to discourage single occupancy vehicle travel to and from the Specific Plan Area.	None.
6-P-14	Encourage conversion of surface parking lots to structured parking facilities that can be funded through the formation of a Community Facilities District, Assessment District and/or in lieu fees and revenues generated from public parking facilities.	None.
6-P-15	Create an "easy-to-use" public transit system that is well-delineated with identifying and orienting signage, high quality shelters, benches, lighting and real-time LED signs showing bus arrival times.	None.
6-P-16	Include efficient links between Tri-Delta buses, shuttles, public parking areas and the potential eBART Station. Work with transit providers to ensure matching service spans between buses, shuttles and BART trains.	None.
6-P-17	Achieve a minimum of 10 to 15 minute headways between BART and bus connections during peak hours.	None.
6-P-18	Use shuttles to strengthen transit connections between the Specific Plan Area, the Pittsburg/Bay Point BART station and Old Town Pittsburg.	None.
6-P-19	Develop a bus-only access street in the Transit Village.	None.
6-P-20	When traffic and parking demand volumes increase as the Specific Plan Area develops, consider amending the General Plan to define the intersections located within the Specific Plan Area as Transit Oriented Development and subject to specific multi-modal as well as vehicular LOS standards.	None.
UTILITIES AND INFRASTRUCTURE		
Goals		
7-G-1	Ensure efficient, effective and equitable provision of high quality utilities and infrastructure throughout the Specific Plan Area.	None.
7-G-2	Encourage new development within the Specific Plan Area to incorporate energy efficient and sustainable building principles.	None.
Policies		
7-P-1	Ensure that adequate infrastructure (water, wastewater, energy and communication services) is provided throughout the Specific Plan Area to support development and attract private investment.	None.

Appendix F-1
Railroad Avenue Specific Plan Goals and Policies

Number	Description	Inconsistency/Discussion
7-P-2	Promote building design that improves energy efficiency by incorporating natural cooling and passive solar heating where possible. This may include extended eaves, window overhangs, awnings and tree placement for natural cooling and building and window orientation to take advantage of passive solar heating.	None.
7-P-3	Where possible, integrate solar generating structures with varied functions into the urban fabric including, but not limited to, bus shelters, parking lots, street lights and other public infrastructure.	None.
7-P-4	Provide funding for infrastructure through permit fees as well as federal and state grants and the formation of Community Facilities Districts and other public/private funding mechanisms.	None.
7-P-5	Encourage developers to utilize low-impact development (LID). LID addresses stormwater treatment through small, cost-effective landscape features located at the site level. These landscape features, known as Integrated Management Practices (IMPs), are the building blocks of LID. IMPs include planter strips, rooftop gardens, planter boxes, and pervious concrete pavers.	None.
7-P-6	Encourage developments on adjacent and/or contiguous lots within the Specific Plan Area, and particularly within the Transit Village and Civic Center sub-areas, to jointly meet Provision C3 requirements through shared swales and other integrated management practices.	None.
7-P-7	New projects shall incorporate water conservation measures including but not limited to low flow showers and toilets, low flow and gray water irrigation systems and the use of drought tolerant landscaping.	None.
7-P-8	All commercial and residential development shall provide trash enclosures that can accommodate receptacles for garbage, recycling and green and food waste collection when it is available from Pittsburg Disposal on a city-wide basis.	None.
7-P-9	Trash enclosures shall be constructed of masonry material with self-enclosing doors and have a second access in accordance with Title 18 of the PMC. All enclosures shall be constructed of high quality materials, and the design and color shall be coordinated with the proposed development.	None.
7-P-10	Develop a comprehensive map showing all service corridor easements and routes to ensure the provision of public utilities to all new urban development and require utility corridor easements in development plans for projects within the Specific Plan.	None.
7-P-11	Ensure that all new and redevelopment projects underground utility lines on and adjacent to the site.	None.

Appendix F-2
Applicable General Plan Goals and Policies

Number	Description	Inconsistency/Discussion
	LAND USE ELEMENT	
Goals		
2-G-1	Maintain a compact urban form within the City's projected municipal boundary. Ensure that hillside lands not environmentally suitable for development are maintained as open space.	None.
2-G-2	Promote large-scale office/business development, and reserve sites for Business Commercial uses in designated locations accessible from regional transportation systems.	None.
2-G-3	Emphasize concentrated commercial development, rather than linear commercial strips.	None.
2-G-4	Provide a range of development intensities, with the highest intensities in Downtown and in areas accessible to transit and services, and lower intensities in hillsides and at the City's southern edge.	None.
2-G-5	Promote a diversity of housing types, including opportunities for hillside estate development, as well as smaller lot, infill, and high-density housing.	None.
2-G-6	Maintain programs and provide incentives for use of vacant infill land and reuse and revitalization of underutilized sites.	None.
2-G-7	Promote flexibility and diversity in land use arrangements, including mixed-use development in appropriate areas.	None.
2-G-18	Maintain Railroad Avenue as a destination point for community commercial activities, while continuing to allow other compatible uses.	None.
2-G-19	Encourage further economic development along the Railroad Avenue corridor.	None.
2-G-20	Support the extension of BART to Railroad Avenue, and develop a mixed use, pedestrian-oriented village surrounding the proposed Station area.	None.
Policies		
2-P-5	Undertake planned development as a means to achieve high community design standards, not to circumvent development intensity standards.	None.
2-P-6	Ensure provision of community amenities within planned development projects, including parks and recreation facilities, streetscaping and pedestrian paths, transit facilities, parking areas, and public safety facilities. Ensure construction of amenities at a time that is in balance with the needs of the development.	None.
2-P-7	During development review, consider project compatibility with existing surrounding land uses. Ensure that sensitive uses—such as residences, schools, and parks—are not subject to hazardous or unhealthy conditions.	None.
2-P-9	Allow development of residential uses in transition areas where real estate interest in Industrial land adjacent to existing or planned residential areas has diminished. However, ensure project design avoids potential activity conflicts.	None.

Appendix F-2
Applicable General Plan Goals and Policies

Number	Description	Inconsistency/Discussion
2-P-10	Reserve sites for Business Commercial uses, including but not limited to: • Along State Route 4, focused at the Willow Pass Road/San Marco Boulevard interchange and Loveridge Road interchange; • Adjacent to the Pittsburg/Bay Point BART Station; • Between Willow Pass Road and the BNSF Railroad tracks, west of Downtown; and • Along Harbor Street, between State Route 4 and East Leland Road (the proposed Railroad Avenue BART Station).	None.
2-P-11	Do not allow sites designated for Business Commercial uses to be changed to another land use designation unless it is determined that adequate sites are available elsewhere to meet the City's office and business development objectives.	None.
2-P-19	Revise the City's Subdivision Ordinance to encourage solar access and other energy-saving devices.	None.
2-P-20	Revise the City's Zoning Ordinance to require undergrounding of utility service/transformer boxes, and any other type of utility boxes, in new residential subdivisions.	None.
2-P-54	Allow redevelopment and/or expansion of Community Commercial uses along Railroad Avenue.	None.
2-P-55	Pursue the extension of the Railroad Avenue linear park along the north side of State Route 4, providing a pedestrian/bicycle connection from the City's major shopping corridor to the Civic Center and City Park.	None.
2-P-56	Work with Bay Area Rapid Transit (BART) to develop a specific plan for the Railroad Avenue BART Station area, featuring mixed-use Business Commercial activities with extensive pedestrian amenities. Provide pedestrian linkage from this mixed use village to the Civic Center, City Park, high school, and other institutional uses on the north side of State Route 4.	None.
2-P-57	Allow development at an intensity of up to 2.0 FAR along Railroad Avenue from State Route 4 to East Leland Road.	None.
2-P-58	Allow mixed-use development at an intensity of up to 1.0 FAR for non-residential uses, and additional residential development at a maximum density of 25 units per acre, on designated community commercial sites along Railroad Avenue, south of Bliss Avenue.	None.
2-P-59	Extend Garcia Avenue to Railroad Avenue if suitable opportunity arises during redevelopment of adjacent sites, and explore the feasibility of other linkages to improve accessibility.	None.
2-P-60	Ensure that the small business commercial center at the southern end of Railroad Avenue (at Buchanan Road) is compatible with the scale of surrounding uses.	None.

Appendix F-2
Applicable General Plan Goals and Policies

Number	Description	Inconsistency/Discussion
	GROWTH MANAGEMENT ELEMENT	
Goals		
3-G-1	Manage the City's growth to balance development of housing options and job opportunities, protection of open space and habitat areas, construction of transportation improvements, and preservation of high quality public facilities.	None.
Policies		
3-P-1	Allow urban development only in areas where public facilities and infrastructure (police, fire, parks, water, sewer, storm drainage, and community facilities) are available or can be provided.	None.
	PUBLIC FACILITIES ELEMENT	
Goals		
3-G-4	Maintain comprehensive police services and timely emergency response in all parts of Pittsburg.	None.
3-G-5	Maintain comprehensive and efficient fire and emergency medical response in all parts of Pittsburg.	None.
3-G-6	Provide and maintain active and passive parks and recreation facilities within a reasonable walking distance of residents in all parts of Pittsburg.	None.
3-G-7	Maintain an adequate water capacity and distribution system to serve current and future residents in all parts of Pittsburg.	None.
3-G-8	Maintain an adequate sewer collection and treatment system to serve current and future residents in all parts of Pittsburg.	None.
3-G-9	Maintain adequate flood control facilities to minimize storm hazards in all parts of Pittsburg.	None.
3-G-10	Maintain adequate public school facilities in locations accessible to residents in all parts of Pittsburg.	None.
Policies		
3-P-12	Review and update the City's development impact fee schedule to ensure that new development pays it's proportional share of the costs associated with the provision of facilities for police, fire, parks, water, sewer, storm drainage, and schools.	None.
3-P-13	Approve new development projects only if at least one of the following conditions is met: Adopted performance standards will be maintained following project occupancy; Project-specific mitigation measures are planned and implemented in order to ensure maintenance of adopted performance standards; or Capital projects planned by the City or special districts will result in maintenance of adopted performance standards.	None.

Appendix F-2
Applicable General Plan Goals and Policies

Number	Description	Inconsistency/Discussion
	URBAN DESIGN ELEMENT	
Goals		
4-G-6	Create an attractive, walkable corridor, featuring a variety of land uses, along the City's major north-south arterial.	None.
4-G-7	Support and encourage redevelopment of aging commercial properties along Railroad Avenue.	None.
4-G-13	Encourage development of pedestrian-oriented mixed-use areas as focal points of new neighborhoods, and adjacent to key transportation centers.	None.
4-G-14	Provide permitting and incentives (such as density increases) to encourage private (re)development of viable mixed-use structures.	None.
4-G-15	Ensure the provision of public transit and pedestrian amenities within the City's mixed-use areas.	None.
4-G-16	Establish the City's BART Stations as regional focal points, surrounded by a mix of urban activities and services.	None.
Policies		
4-P-32	Continue installation and maintenance of street trees, sidewalks, and historic streetlights along Railroad Avenue.	None.
4-P-33	Pursue the extension of the Railroad Avenue linear park north along the west side of the arterial to City Park.	None.
4-P-34	Provide incentives (available through Enterprise Zone programs and local programs) for demolition and/or reuse of blighted commercial properties near the Civic Center.	None.
4-P-35	Create a sense of identity along Railroad Avenue by installing street amenities fabricated from similar materials and styles as existing median trellises.	None.
4-P-36	Ensure that new development and redevelopment projects along Railroad Avenue position new retail and office structures along the sidewalk, with parking tucked behind. Consider developing architectural guidelines for new development or redevelopment along Railroad Avenue.	None.
4-P-37	Ensure that developers plant and maintain a minimum of one tree per six parking spaces within Community Commercial parking lots along Railroad Avenue.	None.
4-P-38	Develop an entry feature at the intersection of Railroad Avenue/Kirker Pass Road and Nortonville Road to welcome residents and visitors to the City of Pittsburg.	None.
4-P-39	Encourage rehabilitation and façade improvement of existing commercial centers along Railroad Avenue to ensure commercial vitality and pedestrian-oriented design.	None.
4-P-40	Continue participation with community partners in the Business Improvement District program to fund streetscape improvements, promotion programs, and special events.	None.
4-P-41	Provide incentives to redevelop blighted commercial properties along Railroad Avenue. Encourage developers to provide pedestrian amenities and focus on connections	None.

Number	Description	Inconsistency/Discussion
	between the street and surrounding properties.	
4-P-42	Work with Contra Costa Water District to clean up Contra Costa Canal, including the removal of litter, and reduction and beautification of fencing.	None.
4-P-43	Pursue private investment in the redevelopment of the Railroad Square shopping center. Consider development of a community or recreational facility on this property.	None.
4-P-44	Work with BART to develop a pedestrian-oriented mixed-use district in the proposed Railroad Avenue BART Station Area.	None.
4-P-70	Upon finalization of plans to extend BART to Railroad Avenue, develop a mixed-use, transit-oriented center surrounding the proposed station. Focus redevelopment on higher-end business/office uses, with support retail, restaurant, and residential activities.	None.
4-P-71	Upon finalization of plans to extend BART to Railroad Avenue, work with BART to develop a Railroad Avenue BART Station Area Specific Plan that addresses: • Mixed-use structures; • Building design that focuses on street-orientation; • Extensive landscaping and street trees; • Pedestrian furniture (for example, benches and trash cans); • Street lighting; and • Signage.	None.
4-P-72	Encourage reuse and redevelopment of the aging industrial/warehouse structures currently located within the proposed Railroad Avenue BART Station Area, between Garcia Avenue and State Route 4. Amend the City's Zoning Ordinance to allow commercial intensities of up to 2.5 FAR.	None.
4-P-73	Ensure that all new business commercial employers provide safe and convenient pedestrian and bicycle connections to adjacent neighborhoods, the proposed BART Station, Delta De Anza Trail, Railroad Avenue Linear Park, and employment and activity centers.	None.
4-P-83	Ensure that new developments provide an integrated pattern of streets and pedestrian paths that provide connections between neighborhoods. As part of the City's Subdivision Regulations, establish street connectivity requirements.	None.
4-P-84	Use traffic calming measures to reduce speeds in residential areas, rather than limiting through-street connections.	None.
4-P-85	Provide safe and comfortable pedestrian routes through local neighborhoods by requiring sidewalks on both sides of residential streets, except in hillside areas, by planting street trees adjacent to the curb, and by minimizing curb cuts.	None.
	DOWNTOWN ELEMENT	
Policies		
5-P-51	Develop a bikeway connecting the Downtown and waterfront areas to the Civic Center area along Railroad Avenue.	None.

Appendix F-2
Applicable General Plan Goals and Policies

Number	Description	Inconsistency/Discussion
TRANSPORTATION ELEMENT		
Goals		
7-G-12	Seek assistance from major employers and developers in implementing programs to encourage use of bikes for commute purposes.	None.
7-G-13	Continue to support programs to improve the mobility of the elderly and handicapped, and ensure that new development is accessible to those with physical impairments, as required by State law.	None.
7-G-14	Develop urban design and streetscape standards and guidelines to improve pedestrian environments and accessibility in new development projects and in Downtown.	None.
7-G-15	Encourage walking as a regular means of transportation for people who live within a half-mile walk of school, work, or routine shopping destinations.	None.
7-G-16	Ensure that current bicycle-friendly roadways, featuring wide shoulders or marked bicycle lanes, are not redesigned to improve traffic LOS, unless all other alternative roadways possible to alleviate congestion are exhausted.	None.
Policies		
7-P-27	Support the expansion of the existing transit service area and an increase in the service levels of existing transit. Support increased Tri-Delta and County Connection express bus service to the Pittsburg/Bay Point BART Station to reduce traffic demand on State Route 4.	None.
7-P-28	Encourage the extension of BART to Railroad Avenue within the median of State Route 4. Cooperate with BART and regional agencies to develop station area plans and transit-oriented development patterns.	None.
7-P-29	Preserve options for future transit use when designing improvements for roadways. Ensure that developers provide bus turnouts and/or shelters, where appropriate, as part of projects.	None.
7-P-30	Work with Tri-Delta and planning area residents to plan for local bus routes that more effectively serve potential riders within local neighborhoods.	None.
7-P-31	Work with Tri-Delta and County Connection to schedule signal timing for arterials with heavy bus traffic, where air quality benefits can be demonstrated.	None.
7-P-32	Support efforts by public agencies and/or private interests to promote regional heavy and light passenger rail transit as an alternative or adjunct to BART, with connections to BART and other multi-modal transit.	None.
7-P-34	As part of development approval, ensure that safe and contiguous routes for pedestrians and bicyclists are provided within new development projects.	None.
7-P-36	Ensure continued compliance with Title 24 of the Uniform Building Code, requiring removal of all barriers to disabled persons on arterial and collector streets.	None.

Appendix F-2
Applicable General Plan Goals and Policies

Number	Description	Inconsistency/Discussion
7-P-38	Develop a series of continuous pedestrian systems within Downtown and residential neighborhoods, connecting major activity centers and trails with City and County open space areas. Sidewalks should be creatively designed to invite safe use by pedestrians, and be free of obstacles, such as newspaper racks, bus benches, utility poles, and fire hydrants.	None.
7-P-39	Ensure that residential and commercial developments provide pedestrian pathways between lots for direct routes to commercial centers, schools, and transit facilities.	None.
7-P-40	Ensure provision of sufficiently wide sidewalks and pedestrian paths in all new residential development.	None.
7-P-42	Improve pedestrian crossing safety at heavily used intersections by installing crossing controls that provide adequate time for pedestrians to cross the street.	None.
7-P-45	During review of development projects, encourage secure bicycle facilities and other alternative transportation facilities at employment sites, public facilities, and multi-family residential complexes.	None.
7-P-50	Improve signage, notifying vehicles of bicyclists at dangerous intersections and underpasses, such as the Railroad Avenue/State Route 4 interchange.	None.
7-P-51	Consider redesigning the Railroad Avenue linear park to accommodate bicycles. Ensure that future greenways throughout the City contain multi-use paths.	None.
OPEN SPACE, YOUTH AND RECREATION ELEMENT		
Goals		
8-G-1	Develop a high-quality public park system for Pittsburg that provides varied recreational opportunities accessible to all City residents.	None.
8-G-2	Provide parks that reflect the diversity of Pittsburg's natural setting, including creeks and waterways, tree stands, rock outcroppings, and topography.	None.
8-G-3	Promote a local trail and linear park system to provide access to regional open space areas, as well as connections between neighborhoods.	None.
8-G-10	Ensure that school facilities maintain adequate capacity to provide for current and projected enrollment.	None.
Policies		
8-P-1	Maintain a neighborhood and community park standard of 5 acres of public parkland per 1,000 residents.	None.
8-P-2	Pursue the development of park and recreation facilities within reasonable walking distance of all homes.	None.
8-P-3	Develop public parks and recreational facilities that are equitably distributed throughout the urbanized area, and provide neighborhood recreation facilities in existing neighborhoods where such facilities are presently lacking.	None.
8-P-4	Consider park accessibility, use and character as more valuable than size in the acquisition and development of new	None.

Appendix F-2
Applicable General Plan Goals and Policies

Number	Description	Inconsistency/Discussion
	parks.	
8-P-5	Maintain park and recreation facility standards for new development to serve both residents and employees, attainable through dedication of parkland or payment of in-lieu fees.	None.
8-P-6	Revise the City's Park Dedication Ordinance to define useable area for parkland dedication requirements. Proposed park sites should be: Designed such that 80 percent of the site has slopes of less than 3 percent that are suitable for active recreational play; Sized according to the City's park standard of 5 acres per 1,000 residents (for example, a 200-unit subdivision would yield about 600 residents, and a dedication requirement of 3 acres); Available for year-round use, so that detention basins are not designated as parkland or shared park facilities; and A minimum of 2 contiguous acres in new residential neighborhoods.	None.
8-P-7	Encourage the development or provision of facilities that cater to diverse recreational interests.	None.
8-P-8	Preserve areas of riparian and other wildlife habitat, oak woodland, and other significant biotic resources within parks. Design park improvements to be compatible with the preservation of such resource areas.	None.
8-P-9	Design the layout of new park facilities in accordance with the natural features of the land. Where possible, preserve such natural features as creeks and drainage ponds, rock outcroppings, and significant topographic features.	None.
8-P-11	Encourage dedication of fully developed parks rather than in-lieu fees. When in-lieu fees are collected, ensure that they are spent acquiring and developing new park sites or enhancing existing park facilities.	None.
8-P-12	Ensure that all parks acquired through dedication are at least 2 acres in size within new residential developments (target 5 acres). Accept smaller visual open space areas in new commercial and industrial development for parkland dedications.	None.
8-P-13	Limit parkland dedications to flat, usable parcels within new residential neighborhoods (see Policy 8-P-6 above). Ensure that such park sites provide open, grassy areas for informal recreational play (such as football or soccer).	None.
8-P-14	Develop a maintenance-funding plan for all City parks. Consider participation in parkland maintenance districts as a condition of development approval for new residential subdivisions.	None.
8-P-16	Encourage dedication of public parks in new residential developments with more than 150 units.	None.
8-P-19	Cooperate with East Bay Municipal Utility District to ensure continued public access to the Delta De Anza Trail, along the Mokelumne Aqueduct right-of-way.	None.

Appendix F-2
Applicable General Plan Goals and Policies

Number	Description	Inconsistency/Discussion
8-P-20	Pursue the development and extension of local and regional trails throughout the Planning Area by utilizing available public utility rights-of-way including: Kirker Creek. The Kirker Creek easement could be developed as a creekside trail, connecting other trails and open spaces throughout the City with the hiking trails in the Black Diamond Mines Regional Preserve. Contra Costa Canal. The Contra Costa Canal provides a meandering right-of-way throughout the southern portion of Pittsburg. A trail along this right-of-way could link several neighborhoods with the Railroad Avenue commercial corridor. PG&E Utility ROW. PG&E holds a right-of-way for the power/utility lines that run north-south from the southern hills to the power plant on the waterfront, an ideal corridor for public access.	None.
8-P-27	Locate community facilities in and adjacent to public parks, where possible. Encourage community organizations to utilize these and other park facilities for recreational and cultural activities.	None.
8-P-28	Pursue the development of recreational facilities and programs specifically geared toward youth and teens, including: Teen Center. A teen center would provide a safe environment for local youth to meet and interact, or to participate in after-school, athletic, or cultural activities. Gymnasium. A large gymnasium would provide the City with more opportunity to get youth involved in local sports leagues and after-school drop-in games, such as basketball. Skateboard Park. Construction of a skateboard park would provide challenging topography in a controlled environment for local skateboarders. The City is currently working on the development of such a facility.	None.
8-P-29	Enable private and non-profit programs to use City recreational facilities, as needed.	None.
8-P-30	Continue to develop programs for the Senior Center, featuring cultural and recreational programs, classes and special events geared toward the community's seniors.	None.
8-P-31	Improve public cultural facilities, including community centers, theatres, and libraries. Cooperate with Los Medanos Community College to provide City residents with access to local cultural facilities.	None.
8-P-32	Participate in partnership and collaborative efforts with local art groups and service organizations to strengthen local, regional, and State art advocacy efforts.	None.
8-P-34	Explore and develop new funding options for maintenance of public art, in partnership with private developers.	None.
8-P-35	Encourage collaboration among artists, art organizations, and other community partners, including businesses, educational institutions, and individuals, for acquisition and maintenance of public art.	None.

Appendix F-2
Applicable General Plan Goals and Policies

Number	Description	Inconsistency/Discussion
8-P-36	Utilize art and cultural programs as a revitalizing force for renewal of the Downtown.	None.
8-P-37	Work in partnership with artists, art organizations, and educational institutions to educate youth in the arts.	None.
8-P-38	Support the preservation, maintenance, and development of community cultural facilities that provide gathering places for cultural exploration, expression, and inspiration.	None.
8-P-42	Cooperate with local school districts to develop joint school/park facilities, which provide an increased variety of recreational opportunities close to many residential areas. Additionally, work with school districts to develop public parks adjacent to school facilities.	None.
8-P-45	Promote use of the educational and cultural resources available at the Pittsburg Library.	None.
	RESOURCE CONSERVATION ELEMENT	
Goals		
9-G-1	Protect conservation areas, particularly habitats that support special status species, including species that are State or Federally listed as endangered, threatened, or rare (see Table 9-1).	None.
9-G-2	Guide development in such a way that preserves significant ecological resources.	None.
9-G-4	Minimize the runoff and erosion caused by earth movement by requiring development to use best construction management practices (BMPs).	None.
9-G-5	Preserve and enhance Pittsburg's creeks for their value in providing visual amenity, drainage capacity, and habitat value.	None.
9-G-7	Comply with Regional Water Quality Control Board regulations and standards to maintain and improve the quality of both surface water and groundwater resources.	None.
9-G-8	Ensure that soil and groundwater pollution is addressed during redevelopment and reuse projects.	None.
9-G-9	Work toward improving air quality and meeting all Federal and State ambient air quality standards by reducing the generation of air pollutants from stationary and mobile sources.	None.
9-G-10	Reduce the potential for human discomfort or illness due to local concentrations of toxic contaminants, odors and dust.	None.
9-G-11	Reduce the number of motor vehicle trips and emissions accounted to Pittsburg residents and encourage land use and transportation strategies that promote use of alternatives to the automobile for transportation, including bicycling, bus transit, and carpooling.	None.
9-G-12	Encourage the preservation, protection, enhancement and use of structures that: Represent past eras, events and persons important in history; Provide significant examples of architecture;	None.

Number	Description	Inconsistency/Discussion
	Embody unique and irreplaceable assets to the City and its neighborhoods; and Provide examples of the physical surroundings in which past generations lived.	
Policies		
9-P-1	Ensure that development does not substantially affect special status species, as required by State and federal agencies and listed in Table 9-1. Conduct assessments of biological resources as required by CEQA prior to approval of development within habitat areas of identified special status species, as depicted in Figure 9-1.	None.
9-P-2	Establish an on-going program to remove and prevent the re-establishment of invasive species and restore native species as part of development approvals on sites that include ecologically sensitive habitat.	None.
9-P-9	Establish creek setbacks along riparian corridors, extending a minimum of 50 to 150 feet laterally on each side of the creekbed. Setback buffers for habitat areas of identified special status species and wetlands may be expanded as needed to preserve ecological resources.	None.
9-P-10	Prohibit development within creek setback areas, except as part of greenway enhancement (for example, trails and bikeways). Encourage developers to reserve space outside of the creek setbacks where endangered species habitat makes trail development inappropriate.	None.
9-P-11	Ensure that riparian corridor characteristics are retained. Encourage the retention and/or reestablishment of creeks in the design of new development.	None.
9-P-12	Protect and restore threatened natural resources, such as estuaries, tidal zones, marine life, wetlands, and waterfowl habitat.	None.
9-P-15	As part of development plans, require evaluation and implementation of appropriate measures for creek bank stabilization, as well as necessary Best Management Practices (BMPs) to reduce erosion and sedimentation. Encourage preservation of natural creeks and riparian habitat as best as possible.	None.
9-P-16	Establish development standards for new construction adjacent to riparian zones to reduce sedimentation and flooding. Standards should include: • Requirements that low berms or other temporary structures such as protection fences be built between a construction site and riparian corridor to preclude sheet-flooding stormwater from entering the corridors during the construction period. • Requirements for installation of storm sewers before construction occurs to collect stormwater runoff during construction.	None.
9-P-17	To prevent flood hazards in the Kirker Creek watershed, ensure that new development minimizes paved areas, retaining large blocks of undisturbed, naturally vegetated habitat to	None.

Number	Description	Inconsistency/Discussion
	allow for water infiltration.	
9-P-21	As part of project review and CEQA documentation, require an assessment of downstream drainage (creeks and channels) and City storm-water facilities impacted by potential project runoff.	None.
9-P-23	Require new urban development to use Best Management Practices to minimize creek bank instability, runoff of construction sediment, and flooding.	None.
9-P-24	Reduce sedimentation and erosion of waterways by minimizing site disturbance and vegetation removal along creek corridors.	None.
9-P-25	Encourage rehabilitation and revegetation of riparian corridors and wetlands throughout the City to contribute to bioremediation and improved water quality.	None.
9-P-26	Monitor water quality in the local creek and reservoir system to ensure clean supplies for human consumption and ecosystem health.	None.
9-P-27	Protect water quality by reducing non-point sources of pollution and the dumping of debris in and near creeks, storm drains, and Contra Costa Canal. Continue use and implementation of the City's storm drain marking program in newly developed or redeveloped areas.	None.
9-P-29	Cooperate with the Bay Area Air Quality Management District to achieve emissions reductions for ozone and its precursor, PM-10.	None.
9-P-30	Cooperate with Bay Area Air Quality Management District to ensure compliance with dust abatement measures during construction. These measures would reduce particulate emissions from construction and grading activities.	None.
9-P-31	Encourage preparation of Transportation Demand Management plans for major employers in the City.	None.
9-P-32	Minimize emissions and air pollution from City operations by using alternative fuel vehicles, as feasible.	None.
9-P-33	Encourage new residential development and remodeled existing homes to install clean-burning fireplaces and wood stoves.	None.
9-P-34	Encourage the preservation of varied architectural styles that reflect the cultural, industrial, social, economic, political and architectural phases of the City's history.	None.
9-P-38	Explore mechanisms to incorporate Pittsburg's industrial heritage in historic and cultural preservation.	None.
9-P-39	Ensure the protection of known archeological resources in the City by acquiring a records review for any development proposed in areas of known resources. If such resources are found, limit urban development in the vicinity or account for the resources.	None.
9-P-40	In accordance with State law, ensure the preparation of a resource mitigation plan and monitoring program by a qualified archeologist in the event that archeological resources	None.

Appendix F-2
Applicable General Plan Goals and Policies

Number	Description	Inconsistency/Discussion
	are uncovered.	
9-P-41	If archeological resources are found during ground-breaking for new urban development, halt construction immediately and conduct an archeological investigation to collect all valuable remnants.	None.
9-P-42	Develop an identification and preservation system for cultural resources—those places or structures that qualify as "important" or "unique" to local community, ethnic, or social groups.	None.
9-P-43	During redevelopment and rehabilitation of older residential units, ensure that the development process complies with the lead testing requirements established by Bay Area Air Quality Management District, Contra Costa County Environmental Health District, and Housing and Urban Development.	None.
	HEALTH AND SAFETY ELEMENT	
Goals		
10-G-1	Minimize risk to life and property from geologic and seismic hazards.	None.
10-G-3	Minimize the potential for soil erosion by wind and stormwater runoff.	None.
10-G-7	Locate development outside of flood-prone areas unless mitigation of flood risk is assured.	None.
10-G-8	Ensure that new development mitigates impacts to the City's storm drainage capacity from storm water runoff in excess of runoff occurring from the property in its undeveloped state.	None.
10-G-9	Minimize the risk to life and property from the generation, storage, and transportation of hazardous materials and waste by complying with all applicable State regulations.	None.
10-G-10	Encourage redevelopment of areas with potential hazardous materials issues. Pursue a leadership role in the remediation of brownfield sites throughout Pittsburg.	None.
10-G-11	Ensure emergency response equipment and personnel training are adequate to follow the procedures contained within the Emergency Response Plan for a major earthquake, wildland fire, or hazardous substance event.	None.
Policies		
10-P-1	Ensure preparation of a soils report by a City-approved engineer or geologist in areas identified as having geological hazards in Figure 10-1, as part of development review.	None.
10-P-5	Ensure that Bay Area Air Quality Management District requirements are implemented around construction sites to reduce wind velocity and soil transport at the sites.	None.
10-P-6	Encourage the use of water-sprinkling trucks at large construction sites to keep the exposed soil moist during construction.	None.
10-P-7	As part of the development approval process, restrict grading to only those areas going into immediate construction as opposed to grading the entire site, unless necessary for slope repair or creek bed restoration. On large tracts of land, avoid	None.

Appendix F-2
Applicable General Plan Goals and Policies

Number	Description	Inconsistency/Discussion
	having large areas bare and unprotected; units of workable size shall be graded one at a time.	
10-P-14	Review and amend City ordinances, including the Building Code, that regulate development in potentially hazardous locations to ensure adequate protection from geologic hazards.	None.
10-P-18	Evaluate storm drainage needs for each development project in the context of demand and capacity when the drainage area is fully developed. Ensure drainage improvements or other mitigation of the project's impacts on the storm drainage system appropriate to the project's share of the cumulative effect.	None.
10-P-19	Assure through the Master Drainage Plan and development ordinances that proposed new development adequately provides for on-site and downstream mitigation of potential flood hazards.	None.
10-P-20	Develop and implement a Storm Flooding Mitigation Fee Program to fund required drainage improvements during construction of new development. Cooperate with the County Flood Control District in developing a Storm Flooding Mitigation Fee Program for incorporated and unincorporated lands within the City's watersheds.	None.
10-P-23	Ensure that all new development (residential, commercial, or industrial) contributes to the construction of drainage improvements in the Kirker Creek and other watersheds in the Planning Area, as required by the City's adopted ordinances.	None.
10-P-25	Ensure adequate minimum setbacks to reduce potential for property damage from storm flooding.	None.
10-P-26	Reduce the risk of localized and downstream flooding and runoff through the use of high infiltration measures, including the maximization of permeable landscape.	None.
10-P-27	Adopt practices for development and construction on sites where the erosion potential is moderate to severe.	None.
10-P-30	Encourage residential development that includes post-construction Best Management Practices to minimize runoff from the site to the storm drain system (for example, using permeable surfaces for parking lots, sidewalks, and bike paths, or using roof runoff as irrigation).	None.
10-P-36	Maintain, modernize, and designate new sites for emergency response facilities, including fire and police stations, as needed to accommodate population growth.	None.
10-P-39	Strive to maintain a ratio of 1.8 sworn police officers per 1,000 residents	None.
	PUBLIC FACILITIES ELEMENT	
Goals		
11-G-1	Available water supply and distribution capacity should grow proportionally with development patterns and water usage trends. Update City's Water Master Plan to implement General Plan growth projections.	None.
11-G-2	Continue to implement water conservation policies to ensure	None.

Number	Description	Inconsistency/Discussion
	adequate supplies of water in the future.	
11-G-3	Plan for expansion of the City's wastewater collection system, in order to provide necessary infrastructure for projected urban growth through 2020.	None.
11-G-4	Maintain environmentally appropriate wastewater management practices.	None.
11-G-5	Reduce rainfall-dependent infiltration and inflow, in order to maintain capacity of existing collection system, and prevent Sanitary Sewer Overflows (SSO).	None.
11-G-6	Continue reduction and recycling efforts within the City to divert increasingly larger portions of the waste stream from local landfills.	None.
11-G-7	Manage solid waste so that State diversion goals are met.	None.
11-G-9	Assess the adequacy of public utilities in existing developed areas, and program needed improvements to coordinate with developing portions of the Planning Area.	None.
11-G-10	Encourage buffer landscaping and multi-use of utility sites and rights-of-way to harmonize with adjoining uses.	None.
Policies		
11-P-1	Continue using the Urban Water Management Plan as the mechanism for detailed water supply planning, implementation, and conservation.	None.
11-P-2	Implement, as needed, replacements and/or expansions to the existing system of water mains through the City's Capital Improvement Program.	None.
11-P-15	Work with Delta Diablo Sanitation District to promote the use of recycled water for irrigation of large planted areas, such as business/industrial campus projects, City parks, and street medians.	None.
11-P-19	Support the implementation of program tasks within the Source Reduction and Recycling Element.	None.
11-P-20	Work with Pittsburg Disposal Services to increase participation in curbside recycling programs for residential neighborhoods.	None.
11-P-21	Promote the importance of recycling industrial and construction wastes.	None.
11-P-22	Prepare and distribute informational handouts to the public regarding opportunities to reduce waste at homes and businesses, as well as methods of safe disposal of hazardous materials.	None.
11-P-23	Encourage builders to incorporate interior and exterior storage areas for recyclables into new or remodeled residential, commercial, and industrial structures.	None.
11-P-26	Cooperate with Contra Costa County Fire Protection District to ensure that new or relocated fire stations are constructed on appropriate sites within the 1.5-mile response radii from new or existing development.	None.
11-P-29	Ensure adequate road widths in new development for fire	None.

Appendix F-2
Applicable General Plan Goals and Policies

Number	Description	Inconsistency/Discussion
	response trucks, per the subdivision regulations.	
11-P-30	Continue to rely on the five-year Capital Improvement Program to provide for needed utilities in relation to the City's financial resources.	None.
11-P-32	Ensure the designation of service corridor easements or routes when required for tentative map or specific plan approval. Ensure the provision of public utilities to all new urban development by requiring utility corridor easements in development plans.	None.
11-P-33	As a condition of approval, ensure that all new and redevelopment projects underground utility lines on and adjacent to the site.	None.
	NOISE ELEMENT	
Goals		
12-G-1	Protect public health and welfare by eliminating or minimizing the effects of existing noise problems, and by preventing increased noise levels in the future.	None.
12-G-2	Encourage criteria such as building design and orientation, wider setbacks, and intense landscaping in lieu of sound walls to mitigate traffic noise along all major corridors, except along State Route 4.	None.
12-G-3	Continue efforts to incorporate noise considerations into land use planning decisions, and guide the location and design of transportation facilities to minimize the effects of noise on adjacent land uses.	None.
Policies		
12-P-2	Work with Caltrans to provide sound walls designed to reduce noise by 10 dB in residential areas along State Route 4.	None.
12-P-3	Support implementation of State legislation that requires reduction of noise from motorcycles, automobiles, trucks, trains, and aircraft.	None.
12-P-4	Require noise attenuation programs for new development exposed to noise above normally acceptable levels. Encourage noise attenuation programs that avoid visible sound walls.	None.
12-P-5	Require that applicants for new noise-sensitive development, such as schools, residences, and hospitals, in areas subject to noise generators producing noise levels greater than 65 dB CNEL, obtain the services of a professional acoustical engineer to provide a technical analysis and design of mitigation measures.	None.
12-P-6	Ensure that new noise-sensitive uses, including schools, hospitals, churches, and homes, in areas near roadways identified as impacting sensitive receptors by producing noise levels greater than 65 dB CNEL, incorporate mitigation measures to ensure that interior noise levels do not exceed 45 dB CNEL.	None.
12-P-7	Require the control of noise at the source through site design, building design, landscaping, hours of operation, and other techniques, for new development deemed to be noise	None.

Number	Description	Inconsistency/Discussion
	generators.	
12-P-8	Develop noise attenuation programs for mitigation of noise adjacent to existing residential areas, including such measures as wider setbacks, intense landscaping, double-pane windows, and building orientation muffling the noise source.	None.
12-P-9	Limit generation of loud noises on construction sites adjacent to existing development to normal business hours between 8:00 AM and 5:00 PM.	None.
12-P-10	Reduce the impact of truck traffic noise on residential areas by limiting such traffic to appropriate truck routes. Consider methods to restrict truck travel times in sensitive areas.	None.
	HOUSING ELEMENT	
Goals		
13-G-1	Foster development of a variety of housing types, densities and prices to balance the City's housing stock and meet the City's regional fair share housing needs for people of all income levels.	None.
13-G-2	Promote the expansion of our affordable housing stock, including that which accommodates special needs households.	None.
13-G-3	Eliminate housing discrimination.	None.
13-G-4	Improve and preserve the existing affordable housing stock, where feasible and appropriate.	None.
13-G-5	Enhance the visual quality of Pittsburg's residential neighborhoods.	None.
Policies		
13-P-1.1	Ensure there is an adequate supply of mixed use and residentially zoned land of appropriate densities to accommodate existing and anticipated housing needs through 2020.	None.
13-P-1.2	Ensure the construction of larger, high end housing in the southern foothills to provide move-up housing opportunities within the community.	None.
13-P-1.3	Encourage the development of small-lot single-family in-fill developments suitable for first-time homebuyers, empty nesters, and single-parent households.	None.
13-P-1.4	Support the construction of multi-family housing in close proximity to transit, arterials, shopping, and public services.	None.
13-P-1.5	Encourage the construction of second family units.	None.
13-P-1.6	Continue to permit manufactured homes in single-family residential districts, subject to design review approval.	None.
13-P-1.7	Develop an adequate housing supply downtown to support ground floor neighborhood serving retail and service establishments along Railroad Avenue.	None.
13-P-1.8	Meet the City's fair share regional housing needs.	None.
13-P-2.1	Provide incentives to developers who assist the City in meeting affordable housing needs, including units to accommodate State-identified special needs households:	None.

Appendix F-2
Applicable General Plan Goals and Policies

Number	Description	Inconsistency/Discussion
	female-headed households, seniors, disabled, large families and the homeless.	
13-P-2.2	Accommodate the development of housing that is accessible to disabled persons and facilitates aging in place.	None.
13-P-2.3	Support efforts to provide temporary, transitional and permanent housing in the City and surrounding area for homeless people.	None.
13-P-2.4	Increase homeownership opportunities for Very Low, Low and Moderate income households.	None.
13-P-2.5	Increase the supply of rental housing available and affordable to Extremely Low, Very Low, Low and Moderate income households, and in particular large families.	None.
13-P-2.6	Encourage the incorporation of energy conservation design features in existing and future residential developments to conserve resources and reduce housing costs.	None.
13-P-3.1	Promote fair housing opportunities for all people.	None.
13-P-4.1	Support the conservation and rehabilitation of the existing housing stock (including mobile homes) through a balanced program of code enforcement and property improvements, when and where appropriate.	None.
13-P-4.2	Utilize public funds to preserve rent restricted units at risk of conversion to market rate, and conserve and rehabilitate the existing supply of housing affordable made available to Extremely Low, Very Low, Low and/or Moderate income households, when and where appropriate.	None.
13-P-4.3	Support the relocation of structurally sound housing units scheduled for demolition to compatible neighborhoods when appropriate land can be found. Waive City fees, where appropriate, when the unit maintains a long-term affordability component.	None.
13-P-5.1	Utilize smart growth principles in the site planning of new subdivisions to enhance the quality of life of Pittsburg residents.	None.
13-P-5.2	Enhance the quality and variety of new home designs and home additions to ensure an attractive living environment.	None.
13-P-5.3	Enhance the built environment through implementation of a street tree program.	None.