Appendix C:
Traffic Impact Assessment

H Cycle Pittsburg Renewable Hydrogen Project -Transportation Impact Assessment

Prepared for:
The City of Pittsburg
TRC Solutions, Inc.

October 2023

WC23-3980

FEHR PEERS

Table of Contents

Appendices

List of Figures

List of Tables

1. Introduction

This report presents the analysis and findings of the Transportation Impact Assessment (TIA) prepared for the H Cycle Pittsburg Renewable Hydrogen Project (Project) proposed in the City of Pittsburg, California. This chapter discusses the TIA purpose, study locations and analysis scenarios, analysis methods, criteria used to identify significant impacts, and report organization.

Study Purpose and Project Description

The study's purpose is to evaluate the potential transportation impacts of the Project, located in Pittsburg, California, approximately half a mile north of the Arcy Lane/Pittsburg-Antioch Highway intersection, as shown in **Figure 1**. The site is currently occupied by industrial storage space and parking. The proposed Project would develop a facility totaling about 113,200 square feet in size, with approximately 30 full-time daily employees. The Project site plan is shown on **Figure 2**.

Vehicular access to the proposed development would be provided by Arcy Lane with the proposed driveway located in the southeast corner of the site. Emergency vehicle access would be provided on the central west part of the project site, via an existing access road that leads to East Third Street and Pittsburg Waterfront Road, as illustrated on Figure 2. Regional access is available via full movement interchanges with State Route 4 at Loveridge Road, and Somersville Road.

Study Locations and Analysis Scenarios

Potential violations of the city's established level of service policies at study area roadway facilities were determined by measuring the effect project traffic would have on intersections in the vicinity of the project site during the weekday morning (7:00 to 9:00 AM) and afternoon (4:00 to 6:00 PM) peak periods. The following intersections were selected based on a review of the Project location, estimates of the added traffic from the Project, and locations of planned roadways in the area:

1. Loveridge Road/Pittsburg-Antioch Highway
2. Arcy Lane/Pittsburg-Antioch Highway

🟧 Project Site

● Study Intersection

Figure 1

Project Site Vicinity and Study Locations

\\fpainc.local\Dfs-ent-data\Walnut Creek N Drive\PROJECTS_WC23\WC23-3980.00_H_Cycle_Pittsburg\Graphics\Figures\WC23-3980_TIA_1_ProjectArea.ai

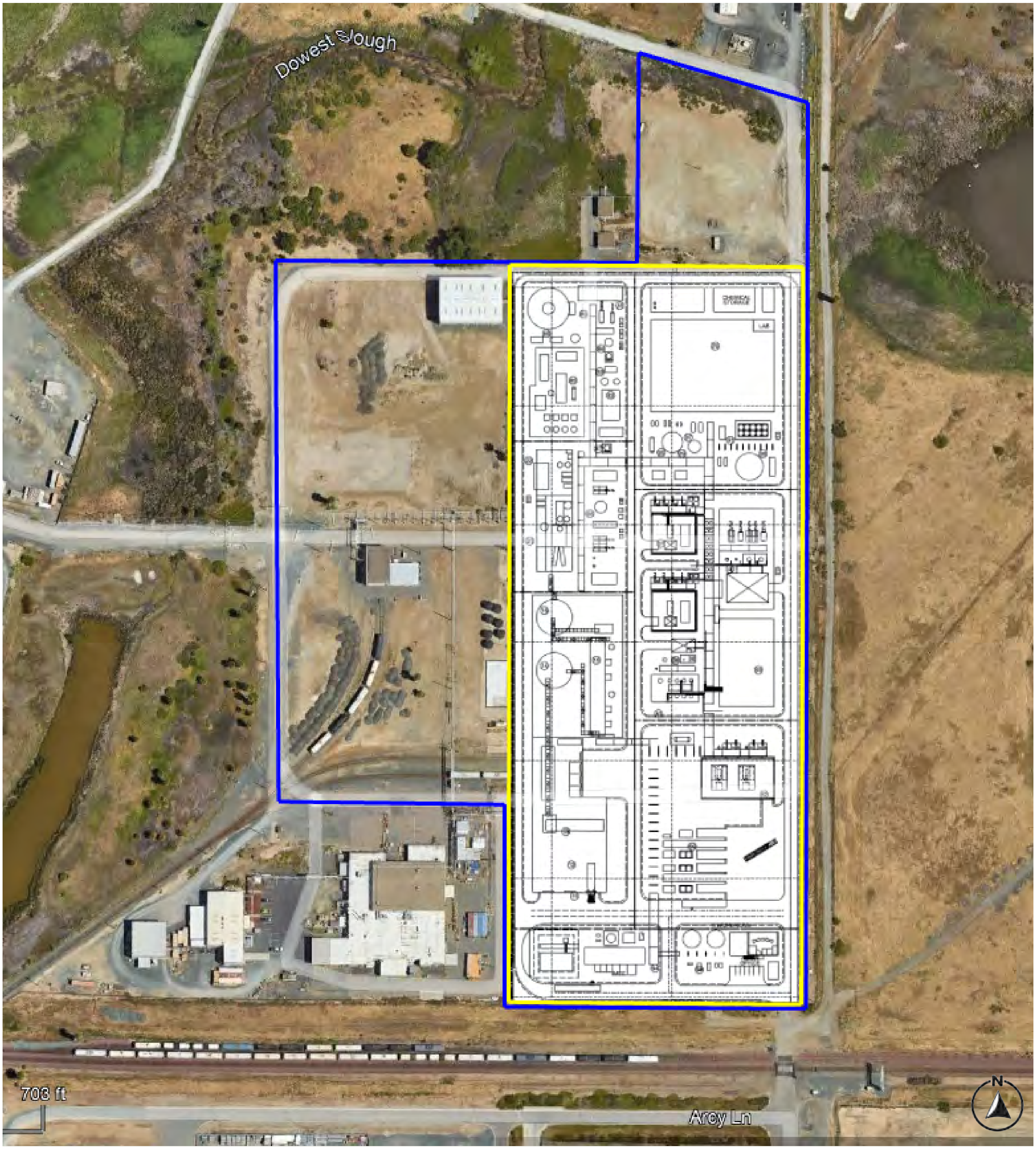


Figure 2

Site Plan

The following scenarios were evaluated:

- ***Existing*** – Existing (2023) conditions based on recent traffic counts.
- ***Existing with Project*** – Existing (2023) conditions with project-related traffic.
- ***Cumulative without Project*** – Based on traffic growth trends as described in the Pittsburg General Plan EIR and supplemented by a check of traffic forecasts for the study area in the 2040 Contra Costa Countywide travel demand model.
- ***Cumulative with Project*** – Future forecast conditions with project-related traffic.

Analysis Methods

Vehicle Miles Traveled

"VMT" or Vehicle Miles of Travel is a measure used to describe automobile use on a daily basis. VMT is the product of the total number of vehicles traveling and the number of miles traveled per vehicle.

On September 27, 2013, Senate Bill (SB) 743 was signed into law. The California state legislature found that with the adoption of the Sustainable Communities and Climate Protection Act of 2008 (SB 375), the State had signaled its commitment to encourage land use and transportation planning decisions and investments that reduce vehicle miles traveled and thereby contribute to the reduction of greenhouse gas emissions, as required by the California Global Warming Solutions Act of 2006 (Assembly Bill 32). In December 2018, the Governor's Office of Planning and Research (OPR) finalized new CEQA guidelines (CEQA Guidelines section 15064.3), that identify VMT as the most appropriate criteria to evaluate a project's transportation impacts.

The implementation of SB 743 eliminated the use of criteria such as auto delay, level of service, and similar measures of vehicle capacity of traffic congestion as the basis for determining significant impacts as part of CEQA compliance. The SB 743 VMT criteria promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses.

Project VMT was assessed using the guidelines and thresholds of the City of Pittsburg, which are consistent with CCTA and OPR guidelines. The guidelines require that VMT analysis be prepared using the Regional Travel Behavior Model (CCTA Model). For employment-generating projects, home-work VMT per worker is used as the analysis metric. VMT calculations were prepared for the following scenarios:

- **Baseline No Project:** VMT was calculated using the year 2023 CCTA Model.

- **Baseline Plus Project:** VMT was calculated using the year 2023 CCTA Model with the Project land use added into transportation analysis zone (TAZ) 30648.[1]

A Cumulative (2040) No Project and Cumulative (2040) Plus Project scenario is performed if the Project does not meet the Baseline thresholds, summarized in the *Thresholds of Significance for VMT* section below.

The CCTA Model was used to assess the home-work per worker VMT. The CCTA Model assigns all predicted trips within, across, or to or from the nine-county San Francisco Bay Area region onto the roadway network and the transit system by mode (single-driver and carpool vehicle, biking, walking, or transit) and transit carrier (bus, rail) for a particular scenario.

Level of Service

The operations of roadway facilities are described with the term "level of service" (LOS). LOS is a qualitative description of traffic flow from a vehicle driver's perspective based on factors such as speed, travel time, delay, and freedom to maneuver. Six levels of service are defined, ranging from LOS A (free-flow conditions) to LOS F (over capacity conditions). LOS E corresponds to operations "at capacity." When volumes exceed capacity, stop-and-go conditions result, and operations are designated LOS F.

Signalized Intersections

Traffic conditions at signalized intersections were evaluated using methods developed by the Transportation Research Board (TRB), as documented in the *Highway Capacity Manual, 6th Edition* (HCM 6th Edition) for vehicles using the analysis software Synchro 11.0. The HCM method calculates control delay at an intersection based on inputs such as traffic volumes, lane geometry, signal phasing and timing, pedestrian crossing times, and peak hour factors. Control delay is defined as the delay directly associated with the traffic control device (i.e., a stop sign or a traffic signal) and specifically includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The relationship between LOS and control delay is summarized in **Table 1**.

Unsignalized Intersections

For unsignalized (all-way stop controlled and side-street stop controlled) intersections, the HCM 6th Edition method for unsignalized intersections was used. With this method, operations are defined by the average control delay per vehicle (measured in seconds). The control delay incorporates delay associated with deceleration, acceleration, stopping, and moving up in queue. **Table 2** summarizes the relationship

---

[1] The CCTA Model area is divided into geographic sub-areas called TAZs. TAZs are used in the CCTA Model to connect the land uses to the roadway network. Each TAZ includes land use information for that geographic sub-area within the model. The Project is located in TAZ 30648.

between LOS and delay for unsignalized intersections. At side-street stop-controlled intersections, the delay is calculated for each stop-controlled movement, the left turn movement from the major street, as well as the intersection average. The intersection average delay and highest movement/approach delay are reported for side-street stop-controlled intersections.

Table 1: Signalized Intersection LOS Criteria

Level of Service	Description	Delay in Seconds
A	Progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.	≤ 10.0
B	Progression is good, cycle lengths are short, or both. More vehicles stop than with LOS A, causing higher levels of average delay.	> 10.1 to 20.0
C	Higher congestion may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level, though many still pass through the intersection without stopping.	> 20.1 to 35.0
D	The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high V/C ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.	> 35.1 to 55.0
E	This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences.	> 55.1 to 80.0
F	This level is considered unacceptable with oversaturation, which is when arrival flow rates exceed the capacity of the intersection. This level may also occur at high V/C ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be contributing factors to such delay levels.	> 80.0

Source: *Highway Capacity Manual, 6th Edition*, Transportation Research Board, 2017.

Table 2: Unsignalized Intersection LOS Criteria

Level of Service	Description	Delay in Seconds
A	Little or no delays	≤ 10.0
B	Short traffic delays	> 10.1 to 15.0
C	Average traffic delays	> 15.1 to 25.0
D	Long traffic delays	> 25.1 to 35.0
E	Very long traffic delays	> 35.1 to 50.0
F	Extreme traffic, delays where intersection capacity exceeded	> 50.0

Source: *Highway Capacity Manual, 6th Edition*, Transportation Research Board, 2017.

Regulatory Setting and Significance Criteria

Thresholds of Significance for VMT

In response to Senate Bill 743 (SB 743), the Office of Planning and Research updated the California Environmental Quality Act guidelines to include new transportation-related evaluation metrics. Draft guidelines were developed in August 2014, with final guidelines published in November 2017 incorporating public comments from the August 2014 and January 2016 guidelines. In December 2018, the California Natural Resources Agency certified and adopted the CEQA Guidelines update package along with an updated Technical Advisory related to Evaluating Transportation Impacts in CEQA (December 2018). Full compliance with the guidelines is now required, and vehicle-delay based level of service calculations cannot be used to evaluate the environmental impacts of projects on the transportation system.

The methods and thresholds used by the City follow the guidance and recommendations of OPR pertaining to the implementation of SB 743, as described below:

- For residential projects, a project would cause substantial additional VMT if it exceeds existing countywide household VMT per capita minus 15%.
- For office projects, a project would cause substantial additional VMT if it exceeds the existing countywide VMT per employee minus 15%.
- For regional retail projects, a project would cause substantial additional VMT if it exceeds the baseline Bay Area total VMT per service population minus 15%.
- For mixed-use projects, the project should be divided into individual constituent parts and evaluated against individual components' standards.

The City's guidelines define the following criteria that can screen projects out of conducting project-level VMT analysis:

- CEQA exemption – Any project exempt from CEQA is not required to conduct a VMT analysis.
- Small projects – Small projects generate or attract fewer than 110 trips per day. Based on research for small project triggers, this may equate to non-residential projects of 10,000 square feet or less and single-family residential projects of 10 units or less, or otherwise generating less than 836 VMT per day.
- Small scale, local-serving retail – Local-serving retail projects are defined as projects of less than 50,000 square feet in size on the basis that they attract trips that would otherwise travel longer

distances. Local-serving retail generally improves the convenience of shopping and other activities close to home and has the effect of reducing vehicle travel.

- Small and active transportation projects – Screened transportation projects are transit projects, bicycle and pedestrian projects, and roadway projects that do not result in an increase in vehicle capacity.
- Public services – Police stations, fire stations, public utilities, and parks do not generally generate VMT. Instead, these land uses are often built in response to development from other land uses (e.g., office and residential). Therefore, these land uses can be presumed to have less-than-significant impacts on VMT. However, this presumption would not apply if the project is sited in a location that would require employees or visitors to travel substantial distances and the project is not located within one half-mile of a major transit stop or does not meet the small project screening criterion.
- Projects located in transit priority areas (TPAs) – Projects located within a TPA can be presumed to have a less-than-significant impact absent substantial evidence to the contrary.
- Projects located in low VMT areas – Residential and employment-generating projects located within a low VMT-generating area can be presumed to have a less-than-significant impact absent substantial evidence to the contrary. A Low VMT area is defined as follows:
    - For housing projects: TAZs that have baseline home-based VMT per capita that is 85% or less of the existing countywide average.
    - For employment-generating projects: TAZs that have baseline home-work VMT per worker that is 85% or less of the existing countywide average.

Additional CEQA Thresholds

The following thresholds of significance were developed based on City of Pittsburg and East Contra Costa County Action Plan policies, as well as the CEQA Checklist criteria.

Would the project:

A. Conflict with a program, plan, ordinance, or policy addressing the circulation system, including roadway, transit, bicycle, and pedestrian facilities?

Transit System – The project would create a significant impact related to transit service if the following criteria is met:

1. The project interferes with existing transit facilities or precludes the construction of planned transit facilities.

Bicycle System – The project would create a significant impact related to the bicycle system if any of the following criteria are met:

1. Disrupt existing bicycle facilities; or
2. Interfere with planned bicycle facilities; or
3. Create inconsistencies with adopted bicycle system plans, guidelines, policies, or standards.

Pedestrian System – The project would create a significant impact related to the pedestrian system if any of the following criteria are met:

1. Disrupt existing pedestrian facilities; or
2. Interfere with planned pedestrian facilities; or
3. Create inconsistencies with adopted pedestrian system plans, guidelines, policies, or standards.

B. Conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?[2]

C. Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

D. Result in inadequate emergency access?

Non-CEQA Evaluation Criteria

Although not a CEQA metric, intersection levels of service were evaluated in this study for General Plan compliance and to identify potential transportation improvements that could be implemented as part of the project to improve the overall operations of the transportation system for all travel modes. The City of Pittsburg generally strives to maintain level of service D operations for signalized and stop-controlled intersections. In the designated Downtown core, LOS E would be considered an acceptable level of service standard to account for the more urban, pedestrian-oriented character of the area.

The project could have a noticeable effect on local and regional travel if it would cause an increase in traffic which is substantial in relation to the traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, or delay and congestion at intersections), or change the condition of an existing street (e.g., street closures, changing direction of travel) in a manner that would substantially change access or traffic load and capacity of the street system.

---

[2] This section of the CEQA Guidelines relates to the evaluation of vehicle miles of travel (VMT).

Report Organization

This report is divided into 7 chapters as described below:

- **Chapter 1 – Introduction** discusses the purpose and organization of the report.
- **Chapter 2 – Existing Conditions** describes the transportation system in the Project vicinity, including the surrounding roadway network, morning and evening peak period intersection turning movement volumes, existing bicycle, pedestrian, and transit facilities, and intersection operations.
- **Chapter 3 – Project Characteristics** presents relevant project information, such as the Project components and project trip generation, distribution, and assignment.
- **Chapter 4 – Existing with Project Traffic Conditions** addresses the existing conditions with the Project and discusses project vehicular impacts.
- **Chapter 5 – Cumulative Traffic Conditions** addresses the long-term future conditions, both without and with the Project, and discusses project vehicular impacts.
- **Chapter 6 – Site Plan Review** describes Project access and circulation for all travel modes.
- **Chapter 7 – Vehicle Miles of Travel** presents the results of the VMT assessment conducted for the Project.

2. Existing Conditions

This chapter describes transportation facilities in the Project study area, including the surrounding roadway network, and transit, pedestrian, and bicycle facilities in the Project site vicinity. Existing intersection operations are also described.

Roadway System

The Project site is surrounded by existing residential, school, industrial, and open space uses. Pittsburg is located in eastern Contra Costa County, adjacent to the cities of Bay Point, Antioch, and Concord located west, southeast, and southwest respectively.

Regional access to the site is provided by State Route 4, Pittsburg-Antioch Highway, and Auto Center Drive; Loveridge Road provides local access. The following roadways would provide access to the site and are most likely to experience direct traffic effects, if any, from the proposed Project:

Regional Access

Pittsburg-Antioch Highway is defined as a Route of Regional Significance in CCTA's *East County Action Plan for Routes of Regional Significance*. It is an east-west major arterial with two travel lanes in each direction. In the Project vicinity, sidewalks with no buffers are provided on one side heading east, after the Arcy Lane/Pittsburg-Antioch Highway intersection. Bicycle facilities are not present within the Project vicinity. The posted speed limit is 45 to 50 mph.

Auto Center Drive (formerly known as Somersville Road) is defined as a Route of Regional Significance in CCTA's *East County Action Plan for Routes of Regional Significance*. It is a north-south major arterial with two travel lanes in each direction and left turning median lanes. In the Project vicinity, sidewalks with no buffers and sidewalks with buffers are located along Auto Center Drive. No bicycle facilities are present within the Project vicinity. The posted speed limit is 35 mph.

State Route 4 (SR-4) is defined as a Route of Regional Significance in CCTA's *East County Action Plan for Routes of Regional Significance*. It is an east-west freeway that extends from Hercules in the west to Stockton and beyond in the east. The facility is an eight-lane freeway within the study area, with interchanges at Auto Center Drive/Somersville Road, Loveridge Road and California Avenue. All intersections at the interchanges are signalized and at its on- and off-ramps are operated by the California Department of Transportation (Caltrans).

Local Access

Loveridge Road is a north-south local road with two travel lanes in each direction and a center left turn lane. Sidewalks with no buffers and bicycle lanes are provided south of the Loveridge Road/Pittsburg-Antioch Highway intersection. The posted speed limit is 35 to 40 mph. Loveridge Road serves residential communities and commercial and industrial businesses located west and south of the Project site.

Existing Pedestrian and Bicycle Facilities

Pedestrian facilities in the study area include sidewalks, crosswalks, pedestrian signals, and multi-use trails. Eight-foot sidewalks are provided along the south side of Pittsburg-Antioch Highway heading east toward the Auto Center Drive/West Tenth Street intersection. No sidewalks are available west of the Arcy Lane/Pittsburg-Antioch Highway intersection. Crosswalks are provided at signalized and unsignalized intersections. Pedestrian push-button actuated signals are provided at signalized intersections in the study area.

Bicycle facilities in Pittsburg include the following:

- **Bike paths (Class I)** – Bike paths provide a completely separate right-of-way and are designated for the exclusive use of people riding bicycles and walking with minimal cross-flow traffic. Such paths can be well situated along creeks, canals, and rail lines. Class I Bikeways can also offer opportunities not provided by the road system by serving as both recreational areas and/or desirable commuter routes.

- **Bike lanes (Class II)** – Bike lanes provide designated street space for bicyclists, typically adjacent to the outer vehicle travel lanes. Bike lanes include special lane markings, pavement legends, and signage. Bike lanes may be enhanced with painted buffers between vehicle lanes and/or parking, and green paint at conflict zones (such as driveways or intersections).

- **Bike routes (Class III)** – Bike routes provide enhanced mixed-traffic conditions for bicyclists through signage, striping, and/or traffic calming treatments, and to provide continuity to a bikeway network. Bike routes are typically designated along gaps between bike trails or bike lanes, or along low-volume, low-speed streets. Bicycle boulevards provide further enhancements to bike routes to encourage slow speeds and discourage non-local vehicle traffic via traffic diverters, chicanes, traffic circles, and/or speed tables. Bicycle boulevards can also feature special wayfinding signage to nearby destinations or other bikeways.

Within the Project vicinity, there are currently no bicycle facilities. The City of Pittsburg’s Active Transportation Plan (Pittsburg Moves, December 2020) calls for the installation of sidewalks and a Class I bicycle facility along the Pittsburg-Antioch Highway in the vicinity of the Project site.

Existing Transit Service

The Eastern Contra Costa Transit Authority (Tri Delta Transit) provides transit service in eastern Contra Costa County, serving the communities of Brentwood, Antioch, Oakley, Concord, Discovery Bay, Bay Point and Pittsburg. The following routes operate in the vicinity of the Project site:

- Route 380 – Pittsburg-Bay Point BART/Antioch BART (Weekdays only)
- Route 381 – Pittsburg Marina/Los Medanos College Pittsburg (Weekdays only)
- Route 387 – Antioch BART/Pittsburg-Bay Point BART (Weekdays only)
- Route 388 – Pittsburg-Bay Point BART/Kaiser Antioch Medical Center (Weekdays only)
- Route 390 – Antioch BART/Pittsburg-Bay Point BART (Weekdays only/Commute hours)
- Route 391 – Brentwood Park & Ride/Pittsburg Center Station (Weekdays only)
- Route 392 – Antioch BART/Pittsburg-Bay Point BART (Weekends and Holidays)
- Route 394 – Antioch BART/Pittsburg-Bay Point BART (Weekends and Holidays)
- Route 396 – Somersville Towne Center/Bay Point (Weekends and Holidays)

Routes 388 and 392 are the closest to the Project site, with bus stops approximately two miles from the site, west of the Loveridge/Pittsburg-Antioch Highway intersection. This route provides connections to the other Tri Delta routes as well as the Pittsburg Transit Center, Pittsburg/Bay Point BART Station, and Antioch BART station.

In addition to the regular transit service to the study area, dial-a-ride door-to-door service within Eastern Contra Costa County is provided by Tri Delta Transit for disabled people of all ages and senior citizens.

Bay Area Rapid Transit (BART) provides fixed rail transit to eastern Contra Costa County. The Antioch-SFO/Millbrae line provides access to two stations located in Pittsburg. The Pittsburg/Bay Point station is approximately five miles west of the Project site. The Pittsburg Center station is approximately one and one-half miles south of the Project site. Weekday service is provided on approximately 15-minute headways and weekend service is provided on approximately 20-minute headways. The Antioch-SFO/Millbrae Line connects to key regional employment centers including Concord, Pleasant Hill, Walnut Creek, Oakland, and San Francisco. Transfers to other lines can be made in Oakland.

Existing Traffic Counts

Weekday morning (7:00 to 9:00 AM) and evening (4:00 to 6:00 PM) peak period intersection turning movement counts were collected at the study intersection in March 2023 with area schools in normal sessions. Peak hour intersection vehicle volumes are summarized in **Figure 3** along with existing lane configurations and traffic controls. The traffic counts for existing conditions are provided in **Appendix A**.

Existing Intersection Levels of Service

Existing intersection lane configurations, signal timings, and peak hour turning movement volumes were used to calculate the LOS for the study intersections during each peak hour. The Synchro 11.0 software program was used to analyze all intersections. The existing levels of service are presented in **Table 3.** Observed peak hour factors[3] were used at all intersections for the existing analysis. Detailed intersection LOS calculation worksheets are presented in **Appendix B**.

---

[3] The peak hour factor is the relationship between the peak 15-minute flow rate and the full hourly volume: PHF = Hourly volume / (4 x (volume during the peak 15 minutes of flow)). The analysis level of served is based on peak rates of flow occurring within the peak hour because substantial short term fluctuations typically occurring during an hour.

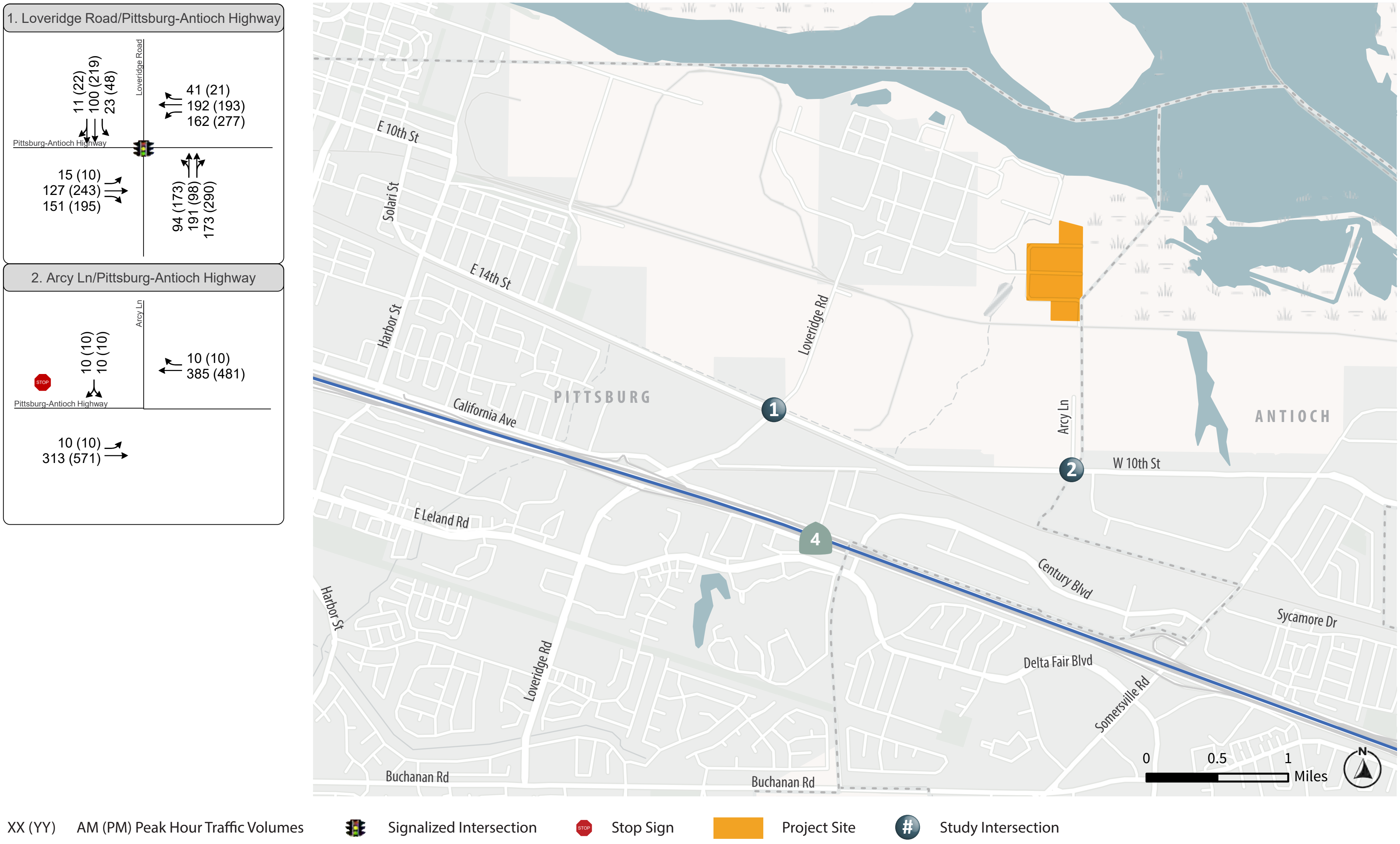


Figure 3

Existing Peak Hour
Intersection Volumes, Lane Configurations and Traffic Control

Table 3: Existing Conditions Peak Hour Intersection LOS Summary

Intersection	Control[1]	Peak Hour[2]	LOS Standard	Delay[3]	LOS
1. Loveridge Road / Pittsburg-Antioch Highway	Signal	AM PM	LOS D	22.9 28.4	C C
2. Arcy Lane / Pittsburg-Antioch Highway	SSSC	AM PM	LOS D	0.5 (13.4) 0.4 (17.5)	A (B) A (C)

Notes:
1. Traffic control type (Signal = Signalized; SSSC = Side-Street Stop-Controlled)
2. AM = Weekday morning peak hour, PM = Weekday evening peak hour
3. Whole intersection average delay reported for signalized intersections. Side-street stop-controlled delay presented as Whole Intersection Average Delay (Worst Movement Delay). Delay calculated per HCM 6th methodologies.
Bold indicates unacceptable operations.
Source: Fehr & Peers, 2023.

According to the City of Pittsburg's LOS standards, the study intersections operate acceptably under existing conditions.

3. Project Characteristics

This chapter provides an overview of the proposed Project components and addresses the proposed project trip generation, distribution, and assignment characteristics, allowing for an evaluation of potential project impacts on the surrounding roadway network. The amount of traffic associated with the Project was estimated using a three-step process:

1. **Trip Generation** – The *amount* of vehicle traffic entering/exiting the Project site was estimated.
2. **Trip Distribution** – The *direction* trips would use to approach and depart the site was projected.
3. **Trip Assignment** – Trips were then *assigned* to specific roadway segments and intersection turning movements.

Project Description

The Project site is located in Pittsburg, California, approximately one-half mile north of Arcy Lane/Pittsburg-Antioch Highway, as shown in Figure 1. The site is zoned for industrial use. The proposed project would construct an approximately 113,200 square-foot renewable hydrogen production facility occupied by roughly 30 full-time daily employees. The Project site plan is shown on Figure 2.

Vehicular access to the Project would be provided by Arcy Lane with the main entrance located in the southeast corner of the site. Emergency vehicle access would be provided via an existing access road on the western side of the site leading to East Third Street and Pittsburg Waterfront Road, as illustrated on Figure 2. Regional access is available via full movement interchanges with State Route 4 at Loveridge Road, and Somersville Road.

Trip Generation

Trip generation refers to the process of estimating the amount of vehicular traffic a project would add to the surrounding roadway system. Estimates are created for the daily condition and for the peak one-hour period during the morning and evening commute when traffic volumes on the adjacent streets are typically the highest. Project trip generation was estimated using rates from the Institute of Transportation Engineers (ITE) *Trip Generation Manual* (11th Edition). The amount of traffic that would be generated by the 30 full-time employees expected to be present on the site (22 during the day and 8 at night) was estimated using rates from the manual's Land Use Code 110, General Light Industrial. In addition to the employee-related traffic, the site would attract on an average day approximately 94 total truck trips accounting for inbound and outbound movements. These trips include waste feedstock delivery and return, produced hydrogen, and byproduct supply and disposal .

Using this data, trip generation estimates were developed for the proposed Project and are presented in

Table 4. The project is expected to generate approximately 187 daily vehicle trips, including approximately 32 morning peak hour trips and approximately 30 evening peak hour trips.

Table 4: Trip Generation Summary

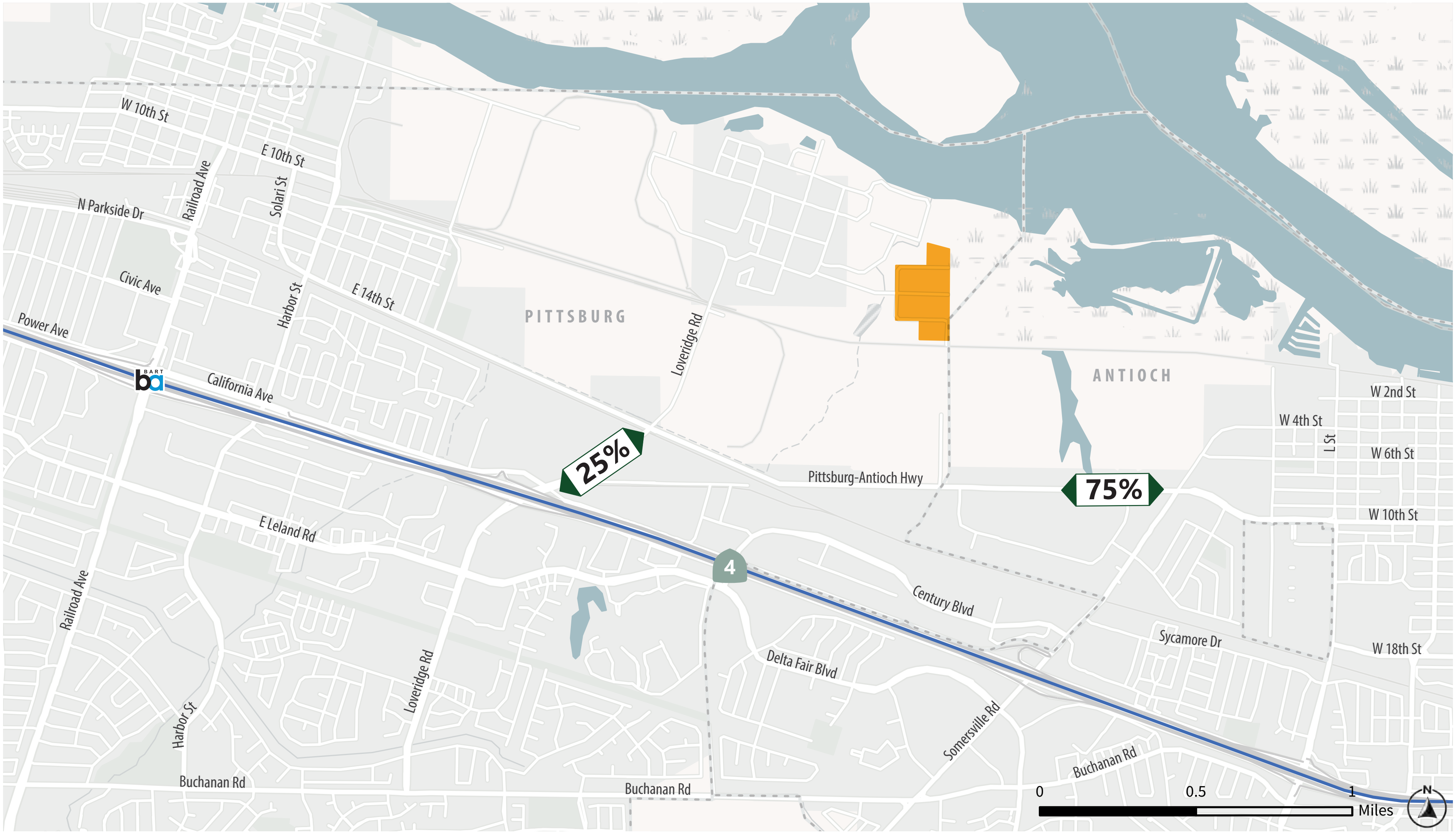
Land Use	Vehicle Type	Quantity[1]	Daily	AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
General Light Industrial[2]	Passenger Vehicles	30	93	13	3	16	3	12	15
	Heavy Vehicles		94	8	8	16	7	8	15
		Total New Vehicle Trips	***187***	***21***	***11***	***32***	***10***	***20***	***30***

1. Quantity in employees
2. ITE land use category 110 – General Light Industrial (Adj Streets, 7-9A, 4-6P):
   Daily: T = 3.10(X)
   AM Peak Hour: T = 0.53(X); Enter = 83%; Exit = 17%
   PM Peak Hour: T = 0.49(X); Enter = 22%; Exit = 78%

Source: *Trip Generation Manual* (11th Edition), ITE, 2017; Fehr & Peers, 2023.

Project Trip Distribution and Assignment

Project trip distribution refers to the directions of approach and departure that vehicles would take to access and leave the site. Estimates of regional project trip distribution were developed based on existing travel patterns in the area, a select zone analysis using the Contra Costa Transportation Authority (CCTA) travel demand model, and the location of complementary land uses. The resulting trip distribution percentages are shown on **Figure 4**. Project trips were then assigned to the roadway network, as shown on **Figure 5**.

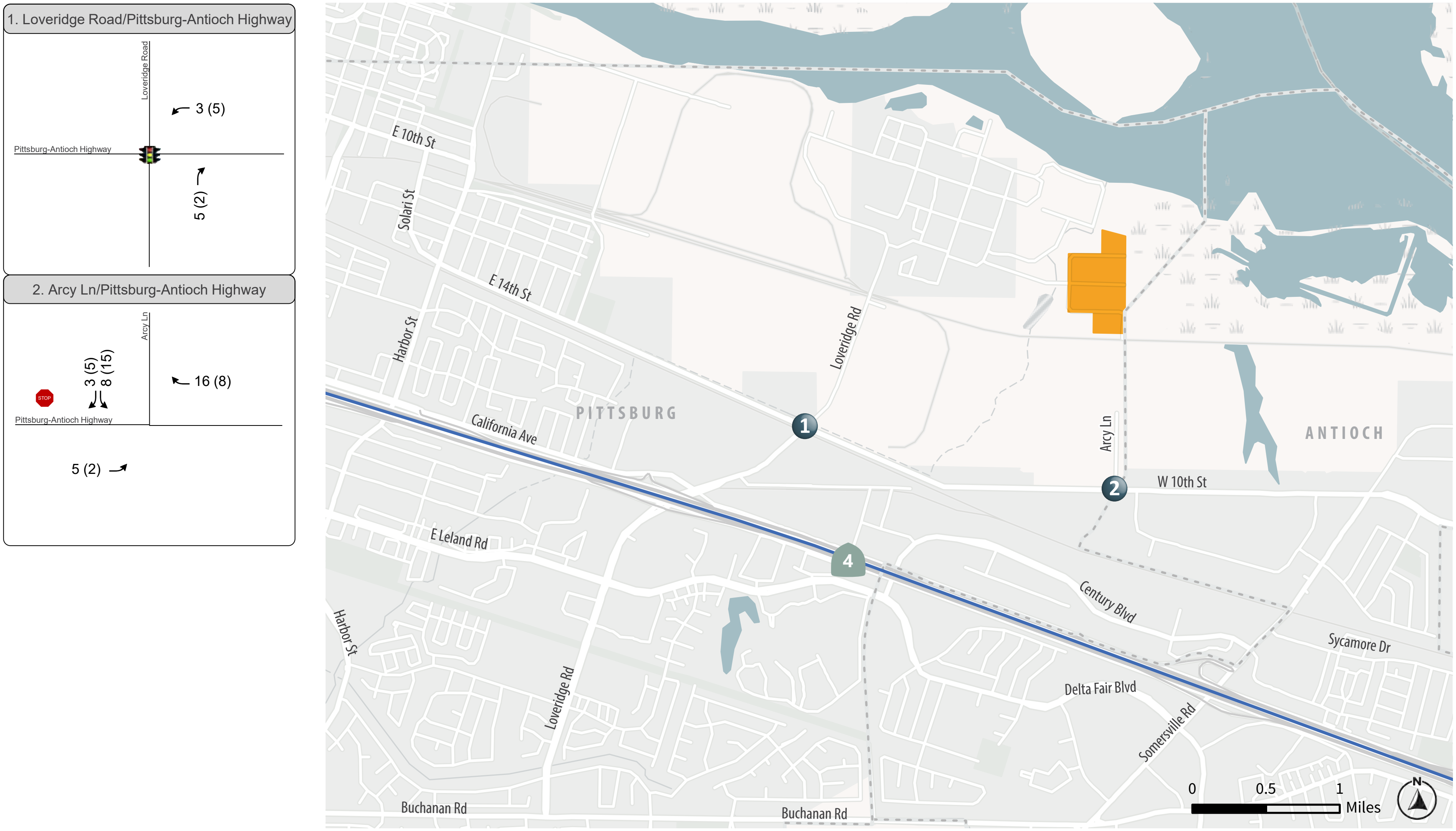


🟧 Project Site

XX% Project Trip Distribution

Figure 4

Project Trip Distribution



XX (YY) AM (PM) Peak Hour Traffic Volumes

🚦 Signalized Intersection

🛑 Stop Sign

🟧 Project Site

\# Study Intersection

Figure 5

Project Trip Assignment

4. Existing With Project Traffic Conditions

This chapter provides an evaluation of the project's potential off-site effects on intersection levels of service under Existing with Project conditions.

Existing with Project Traffic Volumes

The Project traffic volumes on Figure 5 were added to the existing traffic volumes from Figure 3 to estimate the Existing with Project traffic volumes, as shown on **Figure 6**. An assessment of site access is provided in the site plan review.

Analysis of Existing with Project Conditions

Intersection Operations

Existing with Project intersections were evaluated using the methods described in Chapter 1. The Existing with Project analysis results are based on the traffic volumes and intersection configurations presented in Figure 6. A comparison of Existing and Existing with Project operations results is presented in **Table 5**.

Table 5: Existing with Project Conditions Peak Hour Intersection LOS Summary

Intersection	Control[1]	Peak Hour[2]	LOS Standard	Existing		Existing with Project	
				Delay[3]	LOS	Delay[3]	LOS
1. Loveridge Road / Pittsburg-Antioch Highway	Signal	AM PM	LOS D	22.9 28.4	C C	23.0 28.7	C C
2. Arcy Lane / Pittsburg-Antioch Highway	SSSC	AM PM	LOS D	0.5 (13.4) 0.4 (17.5)	A (B) A (C)	0.7 (14.3) 0.8 (20.4)	A (B) A (C)

Notes:
1. Traffic control type (Signal = Signalized; SSSC = Side-Street Stop-Controlled)
2. AM = Weekday morning peak hour, PM = Weekday evening peak hour
3. Whole intersection average delay reported for signalized intersections. Side-street stop-controlled delay presented as Whole Intersection Average Delay (Worst Movement Delay). Delay calculated per HCM 6th methodologies.
Bold indicates unacceptable operations.
<u>Underline</u> indicates a policy violation related to Project-generated traffic.
Source: Fehr & Peers, 2023.

Existing Conditions Policy Violations and Improvements

No off-site intersection policy violations of the proposed Project were identified in the Existing with Project condition based on the established criteria and policies. The Project's access point at Arcy Lane/Pittsburg-Antioch Highway would operate at LOS A as a whole with LOS B and C on the minor street movement (left turn out of Arcy Lane).

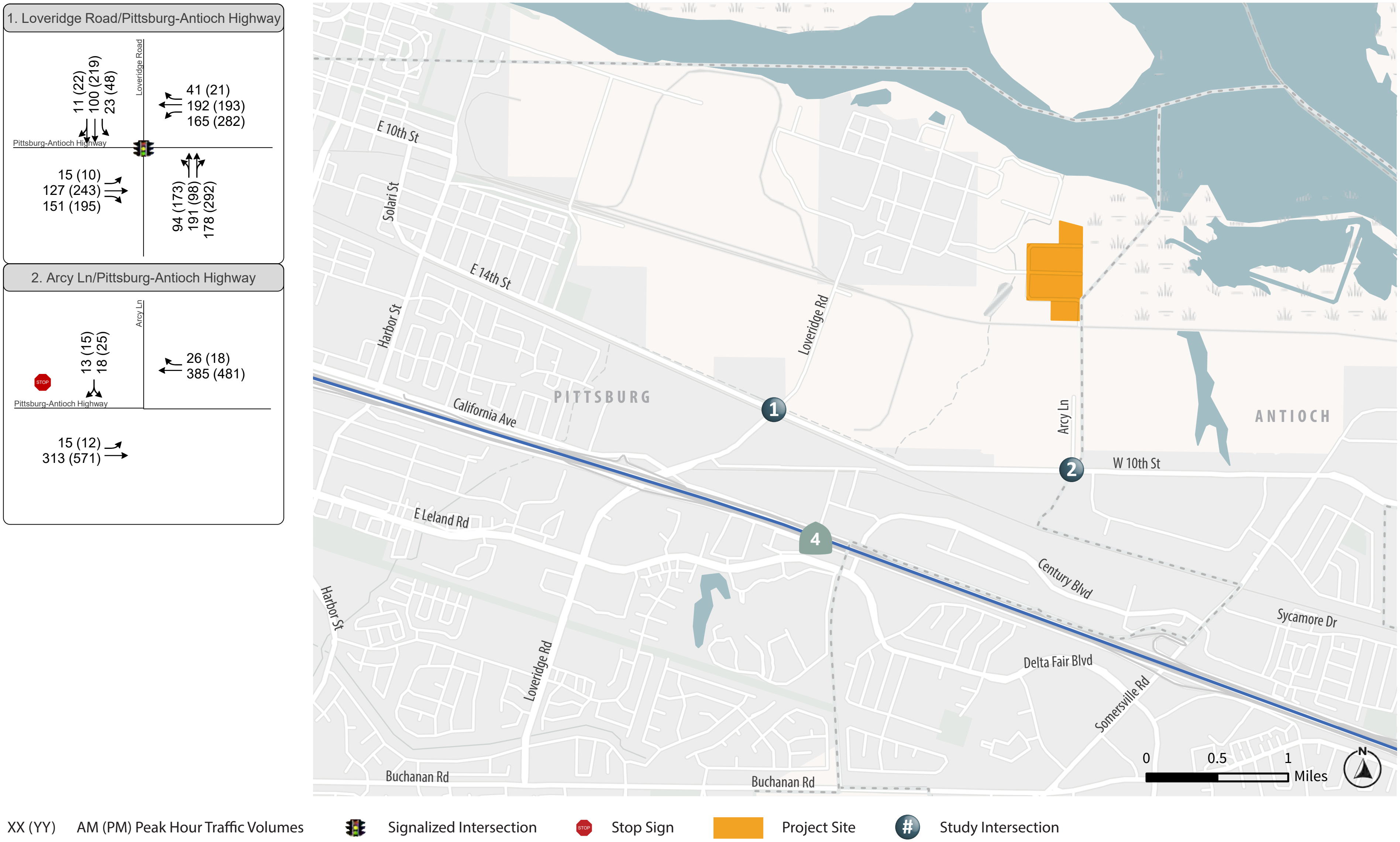


Figure 6

Existing with Project Peak Hour Intersection Volumes, Lane Configurations and Traffic Control

5. Cumulative Traffic Conditions

This chapter discusses Cumulative traffic conditions both without and with the Project. The future conditions analysis considers development within the City of Pittsburg as described in the General Plan.

Cumulative Traffic Forecasts

To assess future growth with planned development in the City of Pittsburg, several sources of data were reviewed, including the Contra Costa County Travel Demand Model (CCTA Model), and the traffic growth trends as described in the Pittsburg General Plan EIR. Traffic forecasts within the immediate study area were reviewed to ensure that known developments were adequately reflected in the forecasts. Minor adjustments were made to the forecasts to balance traffic volumes between closely spaced intersections in the study area. The resulting Cumulative without project forecasts are presented in **Figure 7**, which are representative of conditions over the next 20 years. The Project volumes from **Figure 5** were added to the Cumulative without Project traffic volumes to represent Cumulative with Project conditions, as presented on **Figure 8**.

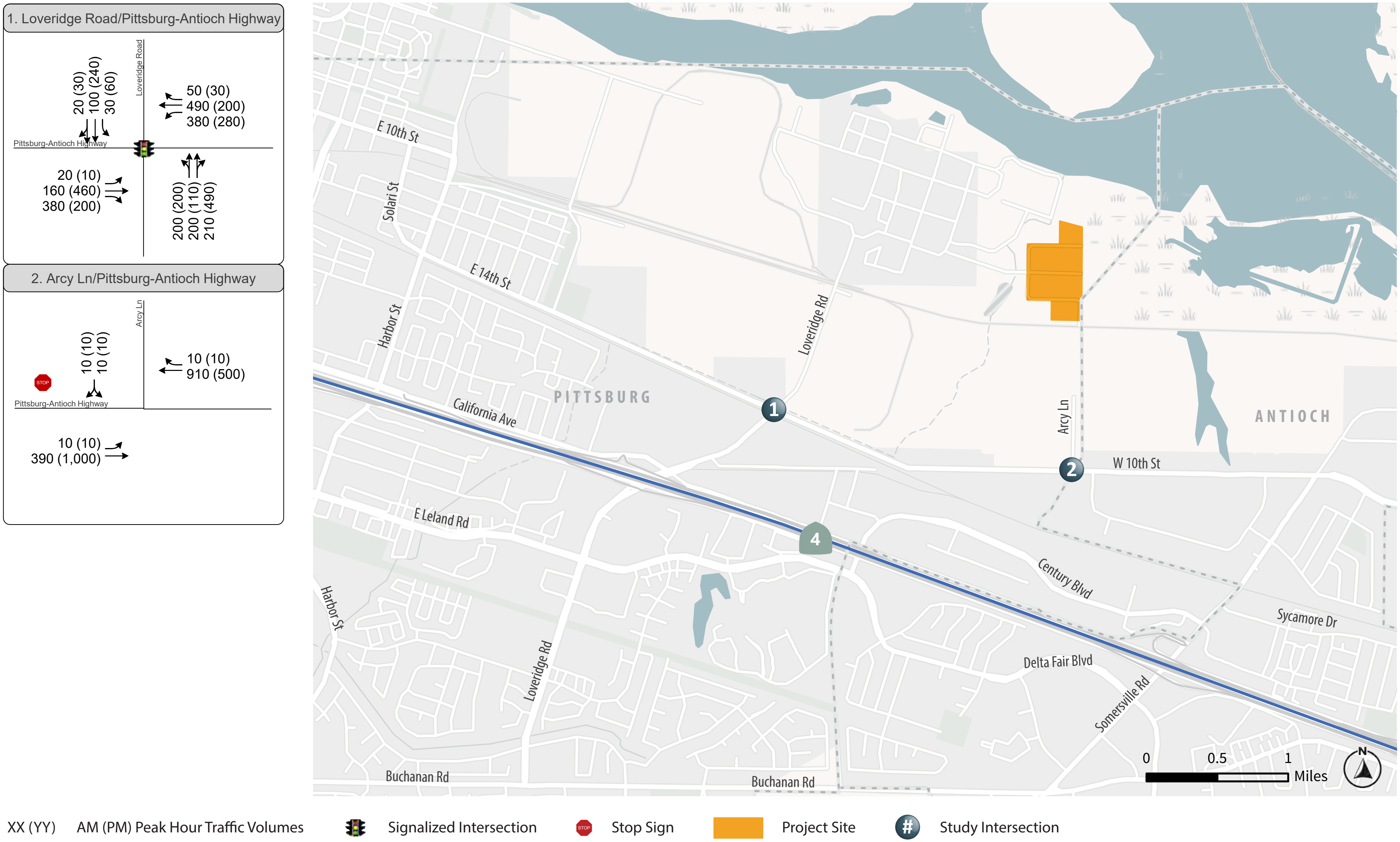


Figure 7

Cumulative without Project Peak Hour Intersection Volumes, Lane Configurations and Traffic Control

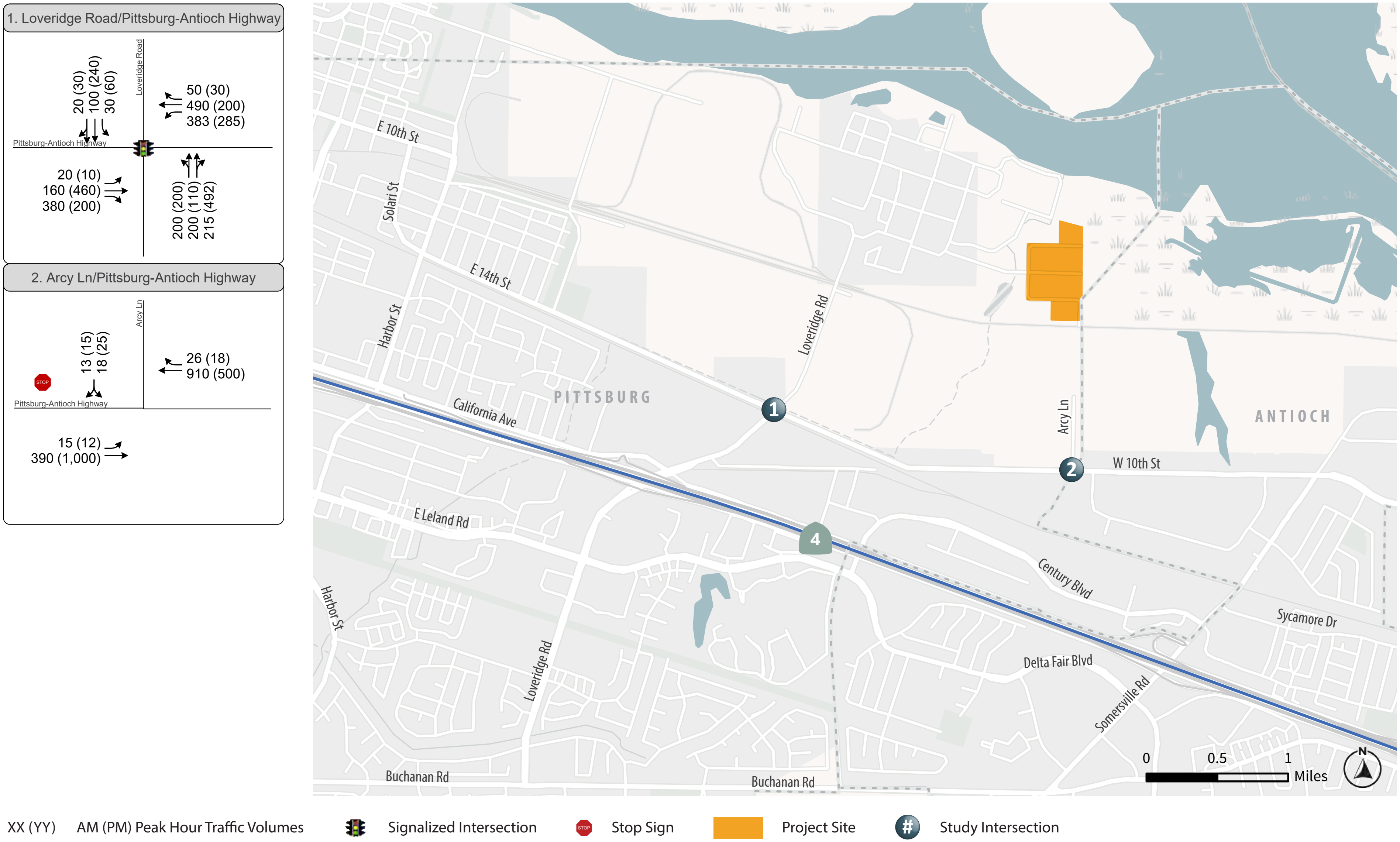


Figure 8

Cumulative with Project Peak Hour Intersection Volumes, Lane Configurations and Traffic Control

Analysis of Cumulative Conditions

Intersection Operations

Cumulative without and with Project conditions were evaluated using the methods described in Chapter 1. The analysis results are presented in **Table 6**, based on traffic volumes presented on Figure 7 and Figure 8.

Table 6: Cumulative Conditions Peak Hour Intersection LOS Summary

Intersection	Control[1]	Peak Hour[2]	LOS Standard	Cumulative		Cumulative with Project	
				Delay[3]	LOS	Delay[3]	LOS
1. Loveridge Road / Pittsburg-Antioch Highway	Signal	AM PM	LOS D	34.7 50.9	C D	35.2 51.5	D D
2. Arcy Lane / Pittsburg-Antioch Highway	SSSC	AM PM	LOS D	0.5 (26.8) 0.4 (27.6)	A (D) A (D)	0.8 (30.9) 1.0 (36.6)	A (D) A (E)

Notes:
1. Traffic control type (Signal = Signalized; SSSC = Side-Street Stop-Controlled)
2. AM = Weekday morning peak hour, PM = Weekday evening peak hour
3. Whole intersection average delay reported for signalized intersections. Side-street stop-controlled delay presented as Whole Intersection Average Delay (Worst Movement Delay). Delay calculated per HCM 6th methodologies.
Bold indicates unacceptable operations.
Underline indicates a policy violation related to Project-generated traffic.
Source: Fehr & Peers, 2023.

Cumulative Conditions Policy Violations and Improvements

No off-site intersection policy violations were identified in the Cumulative with Project condition based on the established criteria and policies. The Arcy Lane/Pittsburg-Antioch Highway intersection would operate at LOS for all movements; however, the worst minor street movement would function at LOS E with 36.6 seconds of delay in the PM peak hour. Signal warrants would not be met at this location in this scenario and thus this would not be considered a violation of City standards.

6. Site Plan Review

This chapter analyzes site access and internal circulation for vehicles, pedestrians, bicycles, and emergency vehicles based on the site plan presented previously on Figure 2.

Vehicular Site Access and Circulation

Vehicular access to the Project site would be provided via Arcy Lane. Emergency vehicle access would be provided via an existing access road on the western side of the site leading to East Third Street and Pittsburg Waterfront Road, as illustrated on Figure 2.

The posted speed limit on Arcy Lane is 25 miles per hour. Table 201.1 of the Caltrans *Highway Design Manual* (HDM) states that the stopping sight distance standard for a design speed of 25 miles per hour is 150 feet. Thus, adequate sight distance appears to be provided at the new driveway location proposed by the Project. However, as the Project's design is finalized, these distances should be checked, and the Project should propose no features (signs, landscaping, etc.) that would compromise driveway sight distance.

> ***Site Recommendation 1:*** The final site plan for the Project should be analyzed by the Project's Civil Engineer to ensure that adequate sight distance is maintained at all driveways. No objects (landscaping, monument signs, etc.) greater than three feet in height should be allowed within the sight distance triangles at driveway intersections. Review available speed survey information from the City and adjust required sight distance if necessary.

Parking spaces and aisles are visible at the building closest to the driveway at the southeast corner of the site but not clearly illustrated or noticeable throughout the rest of the site in Figure 2, but roadway widths connecting through the site are depicted and defined. Trucks are expected to travel on site for work purposes and emergency access.

> ***Site Recommendation 2*:** The final site plan for the Project should illustrate truck turning templates at project driveways and internal roadways showing that applicable routes of travel provide sufficient space for emergency vehicles, trucks, and automobiles.

Emergency Vehicle Access

Several factors determine whether a project has sufficient access for emergency vehicles, including the following:

1. Number of access points (both public and emergency access only)

2. Width of access points
3. Width of internal roadways

The project's proposed access points on Arcy Lane and a second connection to the west of the site would provide emergency vehicle access to the site.

> ***Site Recommendation 3:*** In accordance with City and Contra Costa County Fire District requirements and design standards, provide even surface pavement, appropriate signage, delineation, and other features at all emergency access points and internal roadways to accommodate emergency vehicles. As part of the Project's final design and permitting process, seek and obtain approval of the Contra Costa County Fire District.

Pedestrian Access and Circulation

The Project would create a significant impact related to the pedestrian system if any of the following criteria are met:

- Disrupt existing pedestrian facilities; or
- Interfere with planned pedestrian facilities; or
- Create inconsistencies with adopted pedestrian system plans, guidelines, policies, or standards.

However, the project proposes no features that would be hazardous to pedestrian travel and does not conflict with any pedestrian facilities plans or programs.

> ***Site Recommendation 4:*** Provide safe and adequate pedestrian facilities within the site that follow City standards and provide ADA compliant sidewalks on roadways throughout the project site. At all internal roadway intersections, ADA compliant ramps shall be provided. Pedestrian paths should be identified and marked crosswalks installed at key uncontrolled pedestrian crossing locations.

Bike Access and Circulation

The Project would create a significant impact related to the bicycle system if any of the following criteria are met:

- Disrupt existing bicycle facilities; or
- Interfere with planned bicycle facilities; or
- Create inconsistencies with adopted bicycle system plans, guidelines, policies, or standards.

While the project does not propose any designated bicycle facilities (lanes, routes, or paths), bicycles would be permitted on all internal roadways. The project proposes no features that would be hazardous to bicycle travel and does not conflict with any bicycle facilities plans or programs.

Transit Access

The Project would create a significant impact related to transit service if the following criteria are met:

- The project interferes with existing transit facilities or precludes the construction of planned transit facilities.

The project proposes no features which conflict with existing or planned transit services. The project is not expected to result in increases in ridership on local or regional transit facilities that would exceed their capacity. Significant adverse project impacts related to transit were not identified.

Construction

Project construction is anticipated to last 21 to 24 months and involve 150 to 225 on-site workers and staff. Construction would occur in three phases, with Phase 1 including demolition and removal of existing structures and site clearing. Phase 2 would begin following completion of Phase 1 and include installation of concrete foundations to support the buildings and equipment. Phase 3 would begin following completion of Phase 2 and include the building construction and connection, testing and commission of plant modules and systems. Construction laydown and staging are anticipated to be included within the project site study area. All construction vehicle entry and exit to the site, both trucks and worker vehicles, would occur via the proposed driveway along Arcy Lane, half mile north of the Arcy Lane/Pittsburg-Antioch Highway intersection.

> ***Site Recommendation 5:*** A Construction Traffic Management Plan shall be developed and implemented to minimize impacts to the transportation system. The Construction Traffic Management Plan shall detail the Project's construction schedule, vehicle type time-of-day plans, route planning, advanced public notices of partial or full street closures or traffic diversion, and other strategies to reduce potential conflicts during construction. The plan shall include, but not be limited to, the following:
>
> - Identification of the traffic controls and methods proposed during each phase of project construction. Provision of safe and adequate access for vehicles, transit, bicycles, and pedestrians. Traffic controls and methods employed during construction shall be in accordance with City of Pittsburg standards and the requirements of the Manual of Uniform Traffic Control Devices (FHWA, 2009 MUTCD with Revisions 1, 2 and 3, July 2022).

- Provision of notice to relevant emergency services, thereby avoiding interference with adopted emergency plans, emergency vehicle access, or emergency evacuation plans.

- Preservation of emergency vehicle access.

- Identification of approved truck routes in communication with City of Pittsburg.

- Location of staging areas and the location of construction worker parking.

- Identification of the means and locations of the separation (i.e., fencing) of construction areas and adjacent active uses.

- The provision of flaggers at all on-site locations where construction trucks and construction worker vehicles conflict with vehicle, bicycle, transit, or pedestrian traffic.

- Provision of a point of contact for residents to obtain construction information, have questions answered and convey complaints.

7. Vehicle Miles Traveled

This chapter evaluates the Project's baseline VMT impacts on the surrounding transportation system. Baseline land use assumptions are also described in this section.

Project Land Use Changes

The VMT analysis uses the latest CCTA model land use and network input files. Land use files for Baseline (2023) were updated based on the project description. **Table 7** summarizes the land use changes made in the Project's Traffic Analysis Zone (TAZ) within the CCTA Model to reflect the Project.

Table 7: Total TAZ Employment Land Use Assumptions – CCTA Model

Scenario	TAZ	No Project Land Use (Total Employment)	Plus Project Land Use (Total Employment)	Difference
Baseline	30648	145	175	30

Source: Fehr & Peers, June 2023, CCTA travel demand model.

Baseline (2023) VMT Results

To conduct the VMT assessment, the CCTA travel demand model was used to estimate average daily vehicle miles of travel for the Project. Per the City's guidance, home-work VMT per worker was used to evaluate project-generated VMT for this project. The weekday daily average home-work VMT per employee for the Project as compared to the relevant significance threshold are presented in **Table 8**.

Table 8: Baseline VMT Analysis Summary

Scenario	Baseline Threshold[1]	Project TAZ (Home-work VMT per worker)		Difference from Threshold
		No Project	With Project	
Baseline	12.8	11.4	11.6	-1.2 (-9.4%)

Notes:
1. Based on the City of Pittsburg's guidelines the applicable threshold is 85% of the countywide average home-work VMT per worker (15.0).

Source: Fehr & Peers, May 2023, CCTA travel demand model.

Based on the City of Pittsburg's VMT impact threshold, the Project would result in a significant VMT impact if the Project VMT exceeds 85% of the countywide home-work VMT per worker in the Baseline (No Project) conditions. The Project is expected to result in a VMT of 11.6 home-work VMT per worker, which is less than the 12.8 home-work VMT per worker threshold by approximately nine percent. Therefore, the Project results in a ***less than significant impact*** with respect to VMT under Baseline conditions.

8. Summary of Findings

The proposed Project was not found to result in any violations of the City of Pittsburg's standards related to roadway levels of service and adequate vehicular access to the site is provided to support the proposed use. No significant adverse impacts related to transportation were identified, including potential impacts related to vehicle, pedestrian, bicycle, and transit modes of access. Adequate emergency vehicle access would be provided to the site as proposed. The Project would have a less than significant impact related to VMT, with an average home based VMT per worker of 11.6 daily vehicle miles of travel.

Appendix A: Counts

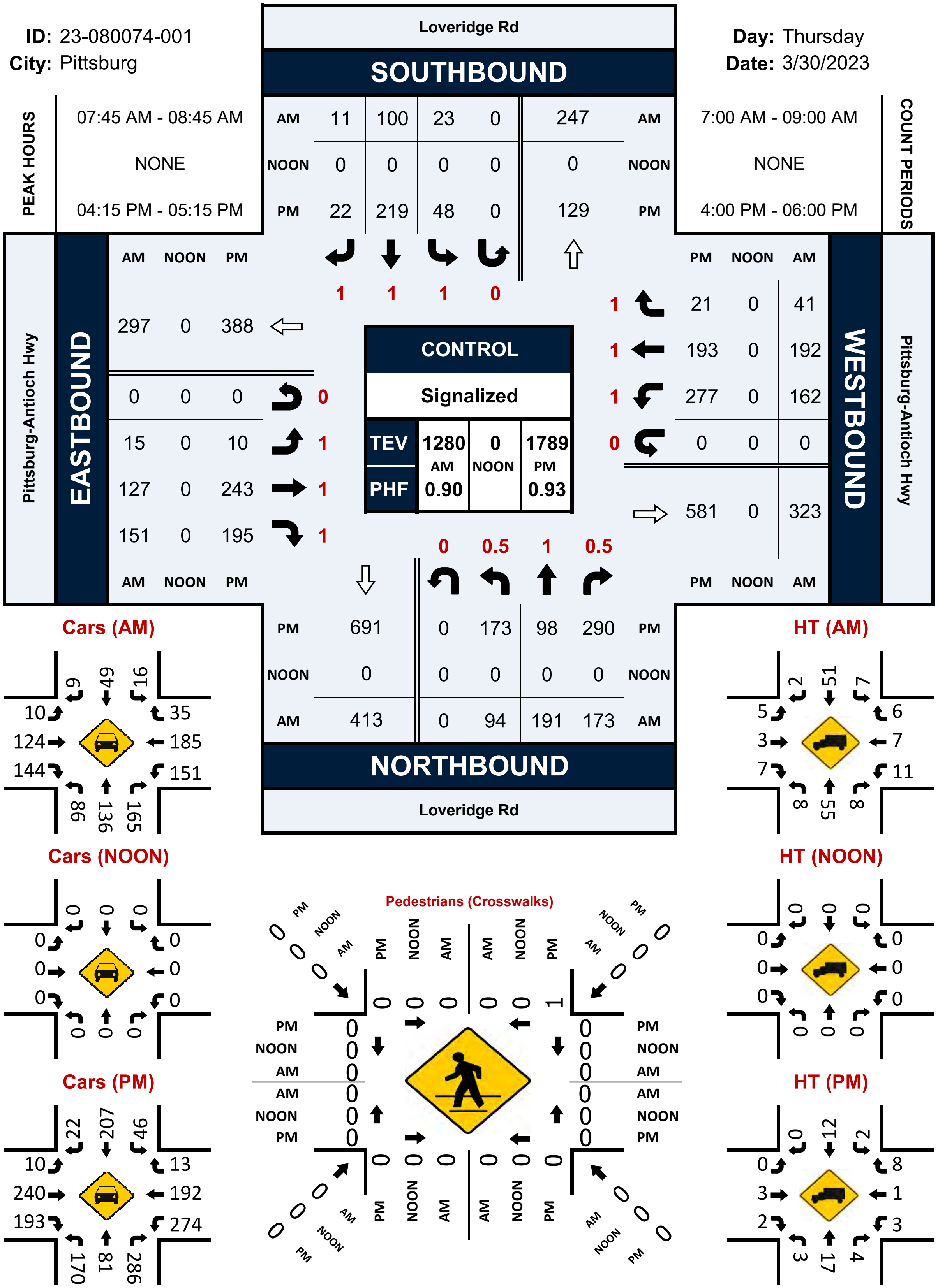
Prepared by National Data & Surveying Services

Loveridge Rd & Pittsburg-Antioch Hwy

Peak Hour Turning Movement Count

ID: 23-080074-001
City: Pittsburg

Day: Thursday
Date: 3/30/2023



PEAK HOURS		COUNT PERIODS
07:45 AM - 08:45 AM	AM	7:00 AM - 09:00 AM
NONE	NOON	NONE
04:15 PM - 05:15 PM	PM	4:00 PM - 06:00 PM

Loveridge Rd — SOUTHBOUND

AM	11	100	23	0	247
NOON	0	0	0	0	0
PM	22	219	48	0	129
	1	1	1	0	

Pittsburg-Antioch Hwy — EASTBOUND

	AM	NOON	PM	
	297	0	388	
	0	0	0	0
	15	0	10	1
	127	0	243	1
	151	0	195	1

Pittsburg-Antioch Hwy — WESTBOUND

		PM	NOON	AM
1		21	0	41
1		193	0	192
1		277	0	162
0		0	0	0
		581	0	323

Loveridge Rd — NORTHBOUND

		0	0.5	1	0.5
PM	691	0	173	98	290
NOON	0	0	0	0	0
AM	413	0	94	191	173

CONTROL

Signalized

	AM	NOON	PM
TEV	1280	0	1789
PHF	0.90		0.93

Cars (AM)

Southbound	9	49	16
Eastbound	10	124	144
Westbound	35	185	151
Northbound	86	136	165

HT (AM)

Southbound	2	51	7
Eastbound	5	3	7
Westbound	6	7	11
Northbound	8	55	8

Cars (NOON)

Southbound	0	0	0
Eastbound	0	0	0
Westbound	0	0	0
Northbound	0	0	0

HT (NOON)

Southbound	0	0	0
Eastbound	0	0	0
Westbound	0	0	0
Northbound	0	0	0

Cars (PM)

Southbound	22	207	46
Eastbound	10	240	193
Westbound	13	192	274
Northbound	170	81	286

HT (PM)

Southbound	0	12	2
Eastbound	0	3	2
Westbound	8	1	3
Northbound	3	17	4

Pedestrians (Crosswalks)

	PM	NOON	AM	AM	NOON	PM
North	0	0	0	0	0	1
West	0	0	0	0	0	0
East	0	0	0	0	0	0
South	0	0	0	0	0	0

	PM	NOON	AM
NW corner	0	0	0
NE corner	0	0	0
SW corner	0	0	0
SE corner	0	0	0

Appendix B: LOS Calculation Worksheets

HCM 6th Signalized Intersection Summary
1: Loveridge Road & Pittsburg-Antioch Highway

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱		↰↑↱		↰	↑↱	
Traffic Volume (veh/h)	15	127	151	162	192	41	94	191	173	23	100	11
Future Volume (veh/h)	15	127	151	162	192	41	94	191	173	23	100	11
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	17	141	34	180	213	0	104	212	132	26	111	6
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	36	319	271	232	525		156	327	213	305	587	31
Arrive On Green	0.02	0.17	0.17	0.13	0.28	0.00	0.20	0.20	0.20	0.17	0.17	0.17
Sat Flow, veh/h	1767	1856	1572	1767	1856	1572	782	1634	1064	1767	3403	183
Grp Volume(v), veh/h	17	141	34	180	213	0	242	0	206	26	57	60
Grp Sat Flow(s),veh/h/ln	1767	1856	1572	1767	1856	1572	1816	0	1664	1767	1763	1823
Q Serve(g_s), s	0.6	3.9	1.1	5.7	5.4	0.0	7.1	0.0	6.6	0.7	1.6	1.6
Cycle Q Clear(g_c), s	0.6	3.9	1.1	5.7	5.4	0.0	7.1	0.0	6.6	0.7	1.6	1.6
Prop In Lane	1.00		1.00	1.00		1.00	0.43		0.64	1.00		0.10
Lane Grp Cap(c), veh/h	36	319	271	232	525		363	0	333	305	304	314
V/C Ratio(X)	0.47	0.44	0.13	0.78	0.41		0.66	0.00	0.62	0.09	0.19	0.19
Avail Cap(c_a), veh/h	183	1430	1212	618	1714		864	0	792	1036	1033	1068
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.1	21.5	20.3	24.4	16.9	0.0	21.4	0.0	21.2	20.2	20.5	20.5
Incr Delay (d2), s/veh	9.0	1.0	0.2	5.5	0.5	0.0	2.1	0.0	1.9	0.1	0.3	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	1.6	0.4	2.4	1.9	0.0	2.9	0.0	2.5	0.3	0.6	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	37.0	22.5	20.5	29.9	17.4	0.0	23.5	0.0	23.1	20.3	20.8	20.8
LnGrp LOS	D	C	C	C	B		C	A	C	C	C	C
Approach Vol, veh/h		192			393	A		448			143	
Approach Delay, s/veh		23.4			23.1			23.3			20.7	
Approach LOS		C			C			C			C	

Timer - Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		16.3	12.3	14.7		14.7	5.9	21.1
Change Period (Y+Rc), s		* 4.7	* 4.7	* 4.7		4.7	* 4.7	* 4.7
Max Green Setting (Gmax), s		* 28	* 20	* 45		34.0	* 6	* 54
Max Q Clear Time (g_c+I1), s		9.1	7.7	5.9		3.6	2.6	7.4
Green Ext Time (p_c), s		2.5	0.3	0.8		0.6	0.0	1.1

Intersection Summary	
HCM 6th Ctrl Delay	22.9
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

2: Pittsburg-Antioch Highway & Arcy Ln

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↑	↱	Y	
Traffic Vol, veh/h	10	313	385	10	10	10
Future Vol, veh/h	10	313	385	10	10	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	500	-	-	0	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	11	348	428	11	11	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	439	0	-	0	798	428
Stage 1	-	-	-	-	428	-
Stage 2	-	-	-	-	370	-
Critical Hdwy	4.13	-	-	-	6.43	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.227	-	-	-	3.527	3.327
Pot Cap-1 Maneuver	1116	-	-	-	354	625
Stage 1	-	-	-	-	655	-
Stage 2	-	-	-	-	696	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1116	-	-	-	350	625
Mov Cap-2 Maneuver	-	-	-	-	350	-
Stage 1	-	-	-	-	648	-
Stage 2	-	-	-	-	696	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	13.4
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1116	-	-	-	449
HCM Lane V/C Ratio	0.01	-	-	-	0.049
HCM Control Delay (s)	8.3	-	-	-	13.4
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

1: Loveridge Road & Pittsburg-Antioch Highway

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱		↰↑↱		↰	↑↱	
Traffic Volume (veh/h)	10	243	195	277	193	21	173	98	290	48	219	22
Future Volume (veh/h)	10	243	195	277	193	21	173	98	290	48	219	22
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	11	261	51	298	208	0	186	105	182	52	235	18
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	24	352	298	349	694		259	149	271	253	476	36
Arrive On Green	0.01	0.19	0.19	0.20	0.37	0.00	0.20	0.20	0.20	0.14	0.14	0.14
Sat Flow, veh/h	1767	1856	1570	1767	1856	1572	1296	748	1358	1767	3320	253
Grp Volume(v), veh/h	11	261	51	298	208	0	257	0	216	52	124	129
Grp Sat Flow(s),veh/h/ln	1767	1856	1570	1767	1856	1572	1791	0	1611	1767	1763	1810
Q Serve(g_s), s	0.4	9.3	1.9	11.4	5.5	0.0	9.4	0.0	8.6	1.8	4.5	4.6
Cycle Q Clear(g_c), s	0.4	9.3	1.9	11.4	5.5	0.0	9.4	0.0	8.6	1.8	4.5	4.6
Prop In Lane	1.00		1.00	1.00		1.00	0.72		0.84	1.00		0.14
Lane Grp Cap(c), veh/h	24	352	298	349	694		357	0	322	253	253	259
V/C Ratio(X)	0.45	0.74	0.17	0.85	0.30		0.72	0.00	0.67	0.21	0.49	0.50
Avail Cap(c_a), veh/h	152	1189	1006	514	1426		708	0	637	861	859	882
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.1	26.6	23.7	27.0	15.4	0.0	26.1	0.0	25.8	26.4	27.5	27.6
Incr Delay (d2), s/veh	12.6	3.1	0.3	9.0	0.2	0.0	2.7	0.0	2.4	0.4	1.5	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	4.0	0.7	5.1	2.0	0.0	4.0	0.0	3.3	0.7	1.9	1.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.7	29.7	23.9	36.0	15.6	0.0	28.8	0.0	28.2	26.8	29.0	29.0
LnGrp LOS	D	C	C	D	B		C	A	C	C	C	C
Approach Vol, veh/h		323			506	A		473			305	
Approach Delay, s/veh		29.4			27.6			28.6			28.6	
Approach LOS		C			C			C			C	
Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		18.6	18.5	18.0		14.7	5.7	30.8				
Change Period (Y+Rc), s		* 4.7	* 4.7	* 4.7		4.7	* 4.7	* 4.7				
Max Green Setting (Gmax), s		* 28	* 20	* 45		34.0	* 6	* 54				
Max Q Clear Time (g_c+I1), s		11.4	13.4	11.3		6.6	2.4	7.5				
Green Ext Time (p_c), s		2.6	0.5	1.6		1.5	0.0	1.1				
Intersection Summary												
HCM 6th Ctrl Delay			28.4									
HCM 6th LOS			C									

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

2: Pittsburg-Antioch Highway & Arcy Ln

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↑	↱	↰↱	
Traffic Vol, veh/h	10	571	481	10	10	10
Future Vol, veh/h	10	571	481	10	10	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	500	-	-	0	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	11	614	517	11	11	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	528	0	-	0	1153	517
Stage 1	-	-	-	-	517	-
Stage 2	-	-	-	-	636	-
Critical Hdwy	4.13	-	-	-	6.43	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.227	-	-	-	3.527	3.327
Pot Cap-1 Maneuver	1034	-	-	-	217	556
Stage 1	-	-	-	-	596	-
Stage 2	-	-	-	-	526	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1034	-	-	-	215	556
Mov Cap-2 Maneuver	-	-	-	-	215	-
Stage 1	-	-	-	-	589	-
Stage 2	-	-	-	-	526	-

Approach	EB		WB		SB
HCM Control Delay, s	0.1		0		17.5
HCM LOS					C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1034	-	-	-	310
HCM Lane V/C Ratio	0.01	-	-	-	0.069
HCM Control Delay (s)	8.5	-	-	-	17.5
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.2

HCM 6th Signalized Intersection Summary
1: Loveridge Road & Pittsburg-Antioch Highway

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱		↰↑↱		↰	↑↱	
Traffic Volume (veh/h)	15	127	151	165	192	41	94	191	178	23	100	11
Future Volume (veh/h)	15	127	151	165	192	41	94	191	178	23	100	11
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	17	141	34	183	213	0	104	212	134	26	111	6
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	36	318	270	236	527		156	326	216	304	584	31
Arrive On Green	0.02	0.17	0.17	0.13	0.28	0.00	0.20	0.20	0.20	0.17	0.17	0.17
Sat Flow, veh/h	1767	1856	1572	1767	1856	1572	778	1626	1075	1767	3403	183
Grp Volume(v), veh/h	17	141	34	183	213	0	243	0	207	26	57	60
Grp Sat Flow(s),veh/h/ln	1767	1856	1572	1767	1856	1572	1817	0	1662	1767	1763	1823
Q Serve(g_s), s	0.6	4.0	1.1	5.8	5.4	0.0	7.2	0.0	6.6	0.7	1.6	1.6
Cycle Q Clear(g_c), s	0.6	4.0	1.1	5.8	5.4	0.0	7.2	0.0	6.6	0.7	1.6	1.6
Prop In Lane	1.00		1.00	1.00		1.00	0.43		0.65	1.00		0.10
Lane Grp Cap(c), veh/h	36	318	270	236	527		364	0	333	304	303	313
V/C Ratio(X)	0.47	0.44	0.13	0.78	0.40		0.67	0.00	0.62	0.09	0.19	0.19
Avail Cap(c_a), veh/h	182	1425	1207	616	1708		861	0	788	1032	1029	1064
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.2	21.6	20.4	24.4	16.9	0.0	21.5	0.0	21.3	20.3	20.6	20.6
Incr Delay (d2), s/veh	9.0	1.0	0.2	5.5	0.5	0.0	2.1	0.0	1.9	0.1	0.3	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	1.6	0.4	2.4	1.9	0.0	3.0	0.0	2.5	0.3	0.6	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	37.2	22.6	20.6	29.9	17.4	0.0	23.6	0.0	23.1	20.4	20.9	20.9
LnGrp LOS	D	C	C	C	B		C	A	C	C	C	C
Approach Vol, veh/h		192			396	A		450			143	
Approach Delay, s/veh		23.5			23.1			23.4			20.8	
Approach LOS		C			C			C			C	

Timer - Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		16.4	12.5	14.7		14.7	5.9	21.2
Change Period (Y+Rc), s		* 4.7	* 4.7	* 4.7		4.7	* 4.7	* 4.7
Max Green Setting (Gmax), s		* 28	* 20	* 45		34.0	* 6	* 54
Max Q Clear Time (g_c+I1), s		9.2	7.8	6.0		3.6	2.6	7.4
Green Ext Time (p_c), s		2.5	0.4	0.8		0.6	0.0	1.1

Intersection Summary			
HCM 6th Ctrl Delay			23.0
HCM 6th LOS			C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↑	↱	Y	
Traffic Vol, veh/h	15	313	385	26	18	13
Future Vol, veh/h	15	313	385	26	18	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	500	-	-	0	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	17	348	428	29	20	14

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	457	0	-	0	810	428
Stage 1	-	-	-	-	428	-
Stage 2	-	-	-	-	382	-
Critical Hdwy	4.13	-	-	-	6.43	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.227	-	-	-	3.527	3.327
Pot Cap-1 Maneuver	1099	-	-	-	348	625
Stage 1	-	-	-	-	655	-
Stage 2	-	-	-	-	688	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1099	-	-	-	343	625
Mov Cap-2 Maneuver	-	-	-	-	343	-
Stage 1	-	-	-	-	645	-
Stage 2	-	-	-	-	688	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	14.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1099	-	-	-	423
HCM Lane V/C Ratio	0.015	-	-	-	0.081
HCM Control Delay (s)	8.3	-	-	-	14.3
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱		↰↑↱		↰	↑↱	
Traffic Volume (veh/h)	10	243	195	282	193	21	173	98	292	48	219	22
Future Volume (veh/h)	10	243	195	282	193	21	173	98	292	48	219	22
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	11	261	51	303	208	0	186	105	183	52	235	18
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	24	352	298	354	698		258	149	272	252	473	36
Arrive On Green	0.01	0.19	0.19	0.20	0.38	0.00	0.20	0.20	0.20	0.14	0.14	0.14
Sat Flow, veh/h	1767	1856	1570	1767	1856	1572	1293	746	1362	1767	3320	253
Grp Volume(v), veh/h	11	261	51	303	208	0	258	0	216	52	124	129
Grp Sat Flow(s),veh/h/ln	1767	1856	1570	1767	1856	1572	1791	0	1610	1767	1763	1810
Q Serve(g_s), s	0.4	9.3	1.9	11.6	5.5	0.0	9.4	0.0	8.7	1.8	4.6	4.6
Cycle Q Clear(g_c), s	0.4	9.3	1.9	11.6	5.5	0.0	9.4	0.0	8.7	1.8	4.6	4.6
Prop In Lane	1.00		1.00	1.00		1.00	0.72		0.85	1.00		0.14
Lane Grp Cap(c), veh/h	24	352	298	354	698		357	0	321	252	251	258
V/C Ratio(X)	0.45	0.74	0.17	0.86	0.30		0.72	0.00	0.67	0.21	0.49	0.50
Avail Cap(c_a), veh/h	151	1182	1000	511	1417		704	0	633	856	854	877
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.3	26.8	23.8	27.1	15.4	0.0	26.3	0.0	26.0	26.6	27.7	27.8
Incr Delay (d2), s/veh	12.6	3.1	0.3	9.5	0.2	0.0	2.7	0.0	2.5	0.4	1.5	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	4.0	0.7	5.3	2.0	0.0	4.0	0.0	3.3	0.7	1.9	2.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.9	29.9	24.1	36.6	15.6	0.0	29.0	0.0	28.4	27.0	29.2	29.3
LnGrp LOS	D	C	C	D	B		C	A	C	C	C	C
Approach Vol, veh/h		323			511	A		474			305	
Approach Delay, s/veh		29.6			28.0			28.7			28.9	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	2	3	4	6	7	8
Phs Duration (G+Y+Rc), s	18.7	18.8	18.0	14.7	5.7	31.1
Change Period (Y+Rc), s	* 4.7	* 4.7	* 4.7	4.7	* 4.7	* 4.7
Max Green Setting (Gmax), s	* 28	* 20	* 45	34.0	* 6	* 54
Max Q Clear Time (g_c+I1), s	11.4	13.6	11.3	6.6	2.4	7.5
Green Ext Time (p_c), s	2.6	0.5	1.6	1.5	0.0	1.1

Intersection Summary	
HCM 6th Ctrl Delay	28.7
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↑	↱	Y	
Traffic Vol, veh/h	12	571	481	18	25	15
Future Vol, veh/h	12	571	481	18	25	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	500	-	-	0	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	13	614	517	19	27	16

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	536	0	-	0	1157	517
Stage 1	-	-	-	-	517	-
Stage 2	-	-	-	-	640	-
Critical Hdwy	4.13	-	-	-	6.43	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.227	-	-	-	3.527	3.327
Pot Cap-1 Maneuver	1027	-	-	-	216	556
Stage 1	-	-	-	-	596	-
Stage 2	-	-	-	-	523	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1027	-	-	-	213	556
Mov Cap-2 Maneuver	-	-	-	-	213	-
Stage 1	-	-	-	-	588	-
Stage 2	-	-	-	-	523	-

Approach	EB		WB		SB	
HCM Control Delay, s	0.2		0		20.4	
HCM LOS					C	

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1027	-	-	-	277
HCM Lane V/C Ratio	0.013	-	-	-	0.155
HCM Control Delay (s)	8.6	-	-	-	20.4
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.5

1: Loveridge Road & Pittsburg-Antioch Highway

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱		↰↑↱		↰	↑↱	
Traffic Volume (veh/h)	20	160	380	380	490	50	200	200	210	30	100	20
Future Volume (veh/h)	20	160	380	380	490	50	200	200	210	30	100	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	22	178	91	422	544	0	222	222	191	33	111	9
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	43	247	209	456	680		282	293	264	225	420	34
Arrive On Green	0.02	0.13	0.13	0.26	0.37	0.00	0.24	0.24	0.24	0.13	0.13	0.13
Sat Flow, veh/h	1767	1856	1572	1767	1856	1572	1161	1208	1088	1767	3305	265
Grp Volume(v), veh/h	22	178	91	422	544	0	344	0	291	33	59	61
Grp Sat Flow(s),veh/h/ln	1767	1856	1572	1767	1856	1572	1797	0	1660	1767	1763	1808
Q Serve(g_s), s	1.0	7.2	4.2	18.3	20.7	0.0	14.1	0.0	12.7	1.3	2.4	2.4
Cycle Q Clear(g_c), s	1.0	7.2	4.2	18.3	20.7	0.0	14.1	0.0	12.7	1.3	2.4	2.4
Prop In Lane	1.00		1.00	1.00		1.00	0.65		0.66	1.00		0.15
Lane Grp Cap(c), veh/h	43	247	209	456	680		436	0	403	225	224	230
V/C Ratio(X)	0.51	0.72	0.44	0.93	0.80		0.79	0.00	0.72	0.15	0.26	0.27
Avail Cap(c_a), veh/h	135	1055	894	456	1265		631	0	582	764	762	782
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.9	32.7	31.4	28.4	22.3	0.0	27.9	0.0	27.3	30.5	31.0	31.0
Incr Delay (d2), s/veh	9.2	4.0	1.4	24.8	2.2	0.0	4.2	0.0	2.5	0.3	0.6	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	3.3	1.6	10.0	8.2	0.0	6.2	0.0	5.0	0.5	1.0	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	47.1	36.7	32.8	53.2	24.5	0.0	32.1	0.0	29.8	30.8	31.6	31.6
LnGrp LOS	D	D	C	D	C		C	A	C	C	C	C
Approach Vol, veh/h		291			966	A		635			153	
Approach Delay, s/veh		36.3			37.1			31.0			31.4	
Approach LOS		D			D			C			C	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		23.8	25.0	15.1		14.7	6.6	33.5				
Change Period (Y+Rc), s		* 4.7	* 4.7	* 4.7		4.7	* 4.7	* 4.7				
Max Green Setting (Gmax), s		* 28	* 20	* 45		34.0	* 6	* 54				
Max Q Clear Time (g_c+I1), s		16.1	20.3	9.2		4.4	3.0	22.7				
Green Ext Time (p_c), s		3.0	0.0	1.2		0.7	0.0	3.3				

Intersection Summary			
HCM 6th Ctrl Delay			34.7
HCM 6th LOS			C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↑	↱	⇆	
Traffic Vol, veh/h	10	390	910	10	10	10
Future Vol, veh/h	10	390	910	10	10	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	500	-	-	0	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	11	433	1011	11	11	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1022	0	-	0	1466	1011
Stage 1	-	-	-	-	1011	-
Stage 2	-	-	-	-	455	-
Critical Hdwy	4.13	-	-	-	6.43	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.227	-	-	-	3.527	3.327
Pot Cap-1 Maneuver	675	-	-	-	140	289
Stage 1	-	-	-	-	350	-
Stage 2	-	-	-	-	637	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	675	-	-	-	138	289
Mov Cap-2 Maneuver	-	-	-	-	138	-
Stage 1	-	-	-	-	344	-
Stage 2	-	-	-	-	637	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	26.8
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	675	-	-	-	187
HCM Lane V/C Ratio	0.016	-	-	-	0.119
HCM Control Delay (s)	10.4	-	-	-	26.8
HCM Lane LOS	B	-	-	-	D
HCM 95th %tile Q(veh)	0.1	-	-	-	0.4

HCM 6th Signalized Intersection Summary
1: Loveridge Road & Pittsburg-Antioch Highway

Pittsburg H Cycle
Cumulative PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱		↰↑↱		↰	↑↱	
Traffic Volume (veh/h)	10	460	200	280	200	30	200	110	490	60	240	30
Future Volume (veh/h)	10	460	200	280	200	30	200	110	490	60	240	30
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	11	495	118	301	215	0	215	118	338	65	258	24
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	23	555	470	325	872		275	151	372	194	359	33
Arrive On Green	0.01	0.30	0.30	0.18	0.47	0.00	0.24	0.24	0.24	0.11	0.11	0.11
Sat Flow, veh/h	1767	1856	1571	1767	1856	1572	1161	637	1572	1767	3263	301
Grp Volume(v), veh/h	11	495	118	301	215	0	333	0	338	65	138	144
Grp Sat Flow(s),veh/h/ln	1767	1856	1571	1767	1856	1572	1798	0	1572	1767	1763	1801
Q Serve(g_s), s	0.7	28.1	6.3	18.5	7.7	0.0	19.2	0.0	23.1	3.8	8.4	8.5
Cycle Q Clear(g_c), s	0.7	28.1	6.3	18.5	7.7	0.0	19.2	0.0	23.1	3.8	8.4	8.5
Prop In Lane	1.00		1.00	1.00		1.00	0.65		1.00	1.00		0.17
Lane Grp Cap(c), veh/h	23	555	470	325	872		425	0	372	194	194	198
V/C Ratio(X)	0.48	0.89	0.25	0.93	0.25		0.78	0.00	0.91	0.33	0.71	0.72
Avail Cap(c_a), veh/h	96	752	636	325	901		450	0	393	544	543	555
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	54.1	37.0	29.3	44.3	17.5	0.0	39.5	0.0	41.0	45.4	47.4	47.5
Incr Delay (d2), s/veh	14.7	10.3	0.3	31.5	0.1	0.0	8.3	0.0	23.7	1.0	4.8	5.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	13.7	2.3	10.5	3.1	0.0	9.3	0.0	11.2	1.7	3.9	4.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	68.8	47.3	29.6	75.7	17.7	0.0	47.8	0.0	64.7	46.4	52.3	52.5
LnGrp LOS	E	D	C	E	B		D	A	E	D	D	D
Approach Vol, veh/h		624			516	A		671			347	
Approach Delay, s/veh		44.3			51.5			56.3			51.2	
Approach LOS		D			D			E			D	
Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		30.8	25.0	37.7		16.8	6.1	56.6				
Change Period (Y+Rc), s		* 4.7	* 4.7	* 4.7		4.7	* 4.7	* 4.7				
Max Green Setting (Gmax), s		* 28	* 20	* 45		34.0	* 6	* 54				
Max Q Clear Time (g_c+I1), s		25.1	20.5	30.1		10.5	2.7	9.7				
Green Ext Time (p_c), s		1.1	0.0	2.8		1.6	0.0	1.1				

Intersection Summary	
HCM 6th Ctrl Delay	50.9
HCM 6th LOS	D

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↑	↱	↰↱	
Traffic Vol, veh/h	10	1000	500	10	10	10
Future Vol, veh/h	10	1000	500	10	10	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	500	-	-	0	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	11	1075	538	11	11	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	549	0	-	0	1635	538
Stage 1	-	-	-	-	538	-
Stage 2	-	-	-	-	1097	-
Critical Hdwy	4.13	-	-	-	6.43	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.227	-	-	-	3.527	3.327
Pot Cap-1 Maneuver	1016	-	-	-	110	541
Stage 1	-	-	-	-	583	-
Stage 2	-	-	-	-	318	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1016	-	-	-	109	541
Mov Cap-2 Maneuver	-	-	-	-	109	-
Stage 1	-	-	-	-	577	-
Stage 2	-	-	-	-	318	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	27.6
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1016	-	-	-	181
HCM Lane V/C Ratio	0.011	-	-	-	0.119
HCM Control Delay (s)	8.6	-	-	-	27.6
HCM Lane LOS	A	-	-	-	D
HCM 95th %tile Q(veh)	0	-	-	-	0.4

HCM 6th Signalized Intersection Summary
1: Loveridge Road & Pittsburg-Antioch Highway

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱		↰↑↱		↰	↑↑↱	
Traffic Volume (veh/h)	20	160	380	383	490	50	200	200	215	30	100	20
Future Volume (veh/h)	20	160	380	383	490	50	200	200	215	30	100	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	22	178	91	426	544	0	222	222	195	33	111	9
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	43	246	209	455	679		281	292	269	224	420	34
Arrive On Green	0.02	0.13	0.13	0.26	0.37	0.00	0.24	0.24	0.24	0.13	0.13	0.13
Sat Flow, veh/h	1767	1856	1572	1767	1856	1572	1153	1198	1103	1767	3305	265
Grp Volume(v), veh/h	22	178	91	426	544	0	346	0	293	33	59	61
Grp Sat Flow(s),veh/h/ln	1767	1856	1572	1767	1856	1572	1798	0	1657	1767	1763	1808
Q Serve(g_s), s	1.0	7.2	4.2	18.6	20.7	0.0	14.2	0.0	12.8	1.3	2.4	2.4
Cycle Q Clear(g_c), s	1.0	7.2	4.2	18.6	20.7	0.0	14.2	0.0	12.8	1.3	2.4	2.4
Prop In Lane	1.00		1.00	1.00		1.00	0.64		0.67	1.00		0.15
Lane Grp Cap(c), veh/h	43	246	209	455	679		439	0	404	224	224	229
V/C Ratio(X)	0.51	0.72	0.44	0.94	0.80		0.79	0.00	0.72	0.15	0.26	0.27
Avail Cap(c_a), veh/h	135	1053	892	455	1262		630	0	580	763	761	780
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	38.0	32.8	31.4	28.6	22.4	0.0	27.9	0.0	27.3	30.6	31.1	31.1
Incr Delay (d2), s/veh	9.2	4.0	1.4	26.8	2.2	0.0	4.3	0.0	2.6	0.3	0.6	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	3.3	1.6	10.4	8.2	0.0	6.3	0.0	5.1	0.5	1.0	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	47.2	36.8	32.9	55.4	24.6	0.0	32.2	0.0	29.9	30.9	31.7	31.7
LnGrp LOS	D	D	C	E	C		C	A	C	C	C	C
Approach Vol, veh/h		291			970	A		639			153	
Approach Delay, s/veh		36.3			38.2			31.1			31.5	
Approach LOS		D			D			C			C	

Timer - Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		23.9	25.0	15.2		14.7	6.6	33.6
Change Period (Y+Rc), s		* 4.7	* 4.7	* 4.7		4.7	* 4.7	* 4.7
Max Green Setting (Gmax), s		* 28	* 20	* 45		34.0	* 6	* 54
Max Q Clear Time (g_c+I1), s		16.2	20.6	9.2		4.4	3.0	22.7
Green Ext Time (p_c), s		3.0	0.0	1.2		0.7	0.0	3.3

Intersection Summary	
HCM 6th Ctrl Delay	35.2
HCM 6th LOS	D

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↑	↱	↰↱	
Traffic Vol, veh/h	15	390	910	26	18	13
Future Vol, veh/h	15	390	910	26	18	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	500	-	-	0	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	17	433	1011	29	20	14

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1040	0	-	0	1478	1011
Stage 1	-	-	-	-	1011	-
Stage 2	-	-	-	-	467	-
Critical Hdwy	4.13	-	-	-	6.43	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.227	-	-	-	3.527	3.327
Pot Cap-1 Maneuver	665	-	-	-	138	289
Stage 1	-	-	-	-	350	-
Stage 2	-	-	-	-	629	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	665	-	-	-	134	289
Mov Cap-2 Maneuver	-	-	-	-	134	-
Stage 1	-	-	-	-	341	-
Stage 2	-	-	-	-	629	-

Approach	EB		WB		SB	
HCM Control Delay, s	0.4		0		30.9	
HCM LOS					D	

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	665	-	-	-	173
HCM Lane V/C Ratio	0.025	-	-	-	0.199
HCM Control Delay (s)	10.6	-	-	-	30.9
HCM Lane LOS	B	-	-	-	D
HCM 95th %tile Q(veh)	0.1	-	-	-	0.7

1: Loveridge Road & Pittsburg-Antioch Highway

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱		↰↑↱		↰	↑↱	
Traffic Volume (veh/h)	10	460	200	285	200	30	200	110	492	60	240	30
Future Volume (veh/h)	10	460	200	285	200	30	200	110	492	60	240	30
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	11	495	118	306	215	0	215	118	339	65	258	24
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	23	555	470	325	872		275	151	373	194	359	33
Arrive On Green	0.01	0.30	0.30	0.18	0.47	0.00	0.24	0.24	0.24	0.11	0.11	0.11
Sat Flow, veh/h	1767	1856	1571	1767	1856	1572	1161	637	1572	1767	3263	301
Grp Volume(v), veh/h	11	495	118	306	215	0	333	0	339	65	138	144
Grp Sat Flow(s),veh/h/ln	1767	1856	1571	1767	1856	1572	1798	0	1572	1767	1763	1801
Q Serve(g_s), s	0.7	28.2	6.3	18.9	7.7	0.0	19.2	0.0	23.2	3.8	8.4	8.5
Cycle Q Clear(g_c), s	0.7	28.2	6.3	18.9	7.7	0.0	19.2	0.0	23.2	3.8	8.4	8.5
Prop In Lane	1.00		1.00	1.00		1.00	0.65		1.00	1.00		0.17
Lane Grp Cap(c), veh/h	23	555	470	325	872		426	0	373	194	194	198
V/C Ratio(X)	0.48	0.89	0.25	0.94	0.25		0.78	0.00	0.91	0.33	0.71	0.72
Avail Cap(c_a), veh/h	96	751	636	325	901		449	0	393	544	543	555
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	54.1	37.0	29.3	44.5	17.6	0.0	39.5	0.0	41.0	45.4	47.5	47.5
Incr Delay (d2), s/veh	14.7	10.3	0.3	35.0	0.1	0.0	8.3	0.0	24.0	1.0	4.8	5.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	13.7	2.3	11.0	3.1	0.0	9.3	0.0	11.2	1.7	3.9	4.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	68.9	47.3	29.6	79.5	17.7	0.0	47.7	0.0	65.0	46.4	52.3	52.5
LnGrp LOS	E	D	C	E	B		D	A	E	D	D	D
Approach Vol, veh/h		624			521	A		672			347	
Approach Delay, s/veh		44.4			54.0			56.4			51.3	
Approach LOS		D			D			E			D	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		30.9	25.0	37.7		16.8	6.1	56.6				
Change Period (Y+Rc), s		* 4.7	* 4.7	* 4.7		4.7	* 4.7	* 4.7				
Max Green Setting (Gmax), s		* 28	* 20	* 45		34.0	* 6	* 54				
Max Q Clear Time (g_c+I1), s		25.2	20.9	30.2		10.5	2.7	9.7				
Green Ext Time (p_c), s		1.0	0.0	2.8		1.6	0.0	1.1				

Intersection Summary	
HCM 6th Ctrl Delay	51.5
HCM 6th LOS	D

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

2: Pittsburg-Antioch Highway & Arcy Ln

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↑	↱	Y	
Traffic Vol, veh/h	12	1000	500	18	25	15
Future Vol, veh/h	12	1000	500	18	25	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	500	-	-	0	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	13	1075	538	19	27	16

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	557	0	-	0	1639	538
Stage 1	-	-	-	-	538	-
Stage 2	-	-	-	-	1101	-
Critical Hdwy	4.13	-	-	-	6.43	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.227	-	-	-	3.527	3.327
Pot Cap-1 Maneuver	1009	-	-	-	110	541
Stage 1	-	-	-	-	583	-
Stage 2	-	-	-	-	317	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1009	-	-	-	109	541
Mov Cap-2 Maneuver	-	-	-	-	109	-
Stage 1	-	-	-	-	575	-
Stage 2	-	-	-	-	317	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	36.6
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1009	-	-	-	156
HCM Lane V/C Ratio	0.013	-	-	-	0.276
HCM Control Delay (s)	8.6	-	-	-	36.6
HCM Lane LOS	A	-	-	-	E
HCM 95th %tile Q(veh)	0	-	-	-	1.1