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TESORO
LOS ANGELES REFINERY

INTEGRATION AND COMPLIANCE PROJECT

FINAL
ENVIRONMENTAL IMPACT REPORT

VOLUME III: Appendix C through F

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APPENDIX C

WORST-CASE CONSEQUENCE ANALYSIS

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WORST-CASE CONSEQUENCE ANALYSIS FOR THE TESORO LOS ANGELES REFINERY

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WORST-CASE CONSEQUENCE ANALYSIS FOR THE TESORO LOS ANGELES REFINERY

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WORST-CASE CONSEQUENCE ANALYSIS FOR THE TESORO LOS ANGELES REFINERY

PREFACE

In April 2015, Quest prepared a Worst Case Consequence Analysis for the Tesoro Los Angeles Refinery Integration and Compliance Project. The objective of the analysis was to determine the largest potential hazard impacts to the public from the proposed project. This analysis was used to support the March 2016 Draft Environmental Impact Report (DEIR).

The analysis has been revised for the Final Environmental Impact Report (FEIR) to include updates and technical corrections identified during review of the document to respond to public comments on the DEIR. Updates and corrections include the following:

- The worst case consequence for pipelines is generated from the Interconnecting Pipelines. However, to provide a comprehensive pipeline analysis, the replacement pipeline was added to the analysis (Section 2.1.1.10 was added, Tables 4-1 and 4-2 were updated, and Figure 4-4 was updated and replaced).
- A clarifying paragraph was added to Section 3.0 – Modeling Methodology.
- Correct largest hazard description for railcar unloading in Table 4-2.

The corrections, clarifications, and updates made after April 2015 are minor in nature. The overall results and conclusion of this report are unchanged.

1.0 INTRODUCTION

Quest Consultants Inc.® was retained by Environmental Audit, Inc. and Tesoro Refining & Marketing Company LLC (Tesoro) to perform a worst-case consequence analysis on the proposed Los Angeles Refinery changes. The primary authors of this report are John B. Cornwell and David W. Johnson, and their resumes are listed in Appendix A. The objective of the study was to compute the potential increase or decrease in hazards to the public due to the proposed changes to the facility.

The study was divided into three tasks.

Task 1. Determine the maximum credible potential releases, and their consequences, for existing process units, transfer systems, and storage areas.

Task 2. Determine the maximum credible potential releases, and their consequences, for the modifications to the facility which have been proposed by Tesoro.

Task 3. Determine whether the consequences associated with the proposed modifications generate potential hazards that are larger or smaller than the potential hazards which currently exist.

Potential hazards from the existing and proposed equipment are associated with accidental releases of toxic and flammable materials. Hazardous events associated with these types of releases include toxic vapor clouds, flash fires, torch fires, pool fires, and vapor cloud explosions.

For each type of hazard identified (toxic, radiant, overpressure), maximum distances to potentially injurious levels (vulnerability/hazard zones) are determined. The hazard levels used are those that have been developed by the U.S. Environmental Protection Agency (EPA) and American Industrial Hygiene Association (AIHA) for risk management purposes.

2.0 OVERVIEW OF TESORO LOS ANGELES REFINERY

2.1 Facility Location

The Tesoro Los Angeles Refinery is comprised of two parts, one which is located in Wilmington, California and the other which is located across the street in Carson, California. Both are in the Los Angeles area. The proposed project will better integrate the Wilmington and Carson operations and will comply with federal, state, and local regulations. The layout of the Wilmington facility is shown in Figure 2-1; the Carson facility is shown in Figure 2-2; and the new proposed Carson tankage is presented in Figure 2-3.

2.1.1 Wilmington Operations

Proposed modifications for the Wilmington Operations are described further in the following subsections.

2.1.1.1 FCCU Shutdown

The Wilmington FCCU will be shut down and the equipment will be permanently removed from service. Shutting down this unit will eliminate hazards associated with it.

2.1.1.2 HCU Modification

The Wilmington Hydrocracker Unit (HCU) capacity would be increased approximately 15 percent, the overall integrated Refinery capacity would remain unchanged. The reactor and fractionation sections will be modified to increase the production of ultra-low sulfur diesel and gasoline.

Additionally, to recover propane for the Propane Sales Treating Unit (PSTU), the HCU product recovery section will be modified by installing two new water cooled exchangers, one knockout drum, and associated piping and instrumentation.

2.1.1.3 DCU Fresh Feed Heater (H-100)

The existing equipment description of the Wilmington Delayed Coking Unit Fresh Feed Heater in the Title V permit will be revised to conform to SCAQMD/Industry standards. The description will be changed from the ‘design heat release’ basis (252 million Btu/Hr) to the industry standard ‘maximum heat release’ basis (302.4 million Btu/Hr). No physical modifications will be made to the heater. These modifications do not produce changes in hazards, and this unit was not evaluated in the analysis

2.1.1.4 Propane Sales Treating Unit (PSTU)

A new PSTU will be constructed at the Wilmington Operations. The PSTU conditions liquid propane for sale using absorbers and dryers to meet sales specifications.

2.1.1.5 CRU3 Modification

The Wilmington Operations Catalytic Reformer Unit 3 (CRU3) will be modified to recover Hydrocracker propane from the refinery fuel gas system.

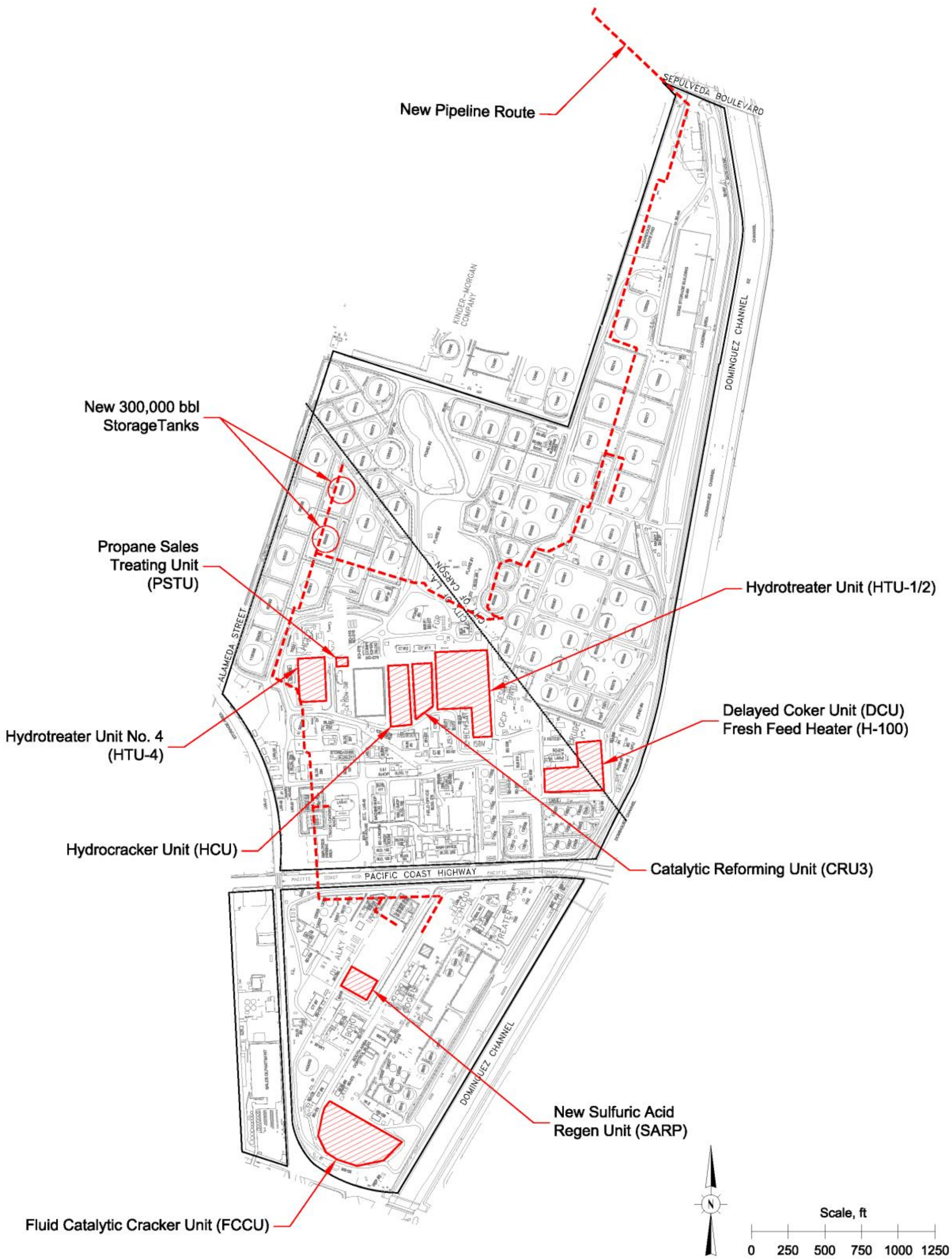


Figure 2-1
Plot Plan of Wilmington Operations at Tesoro Los Angeles Refinery

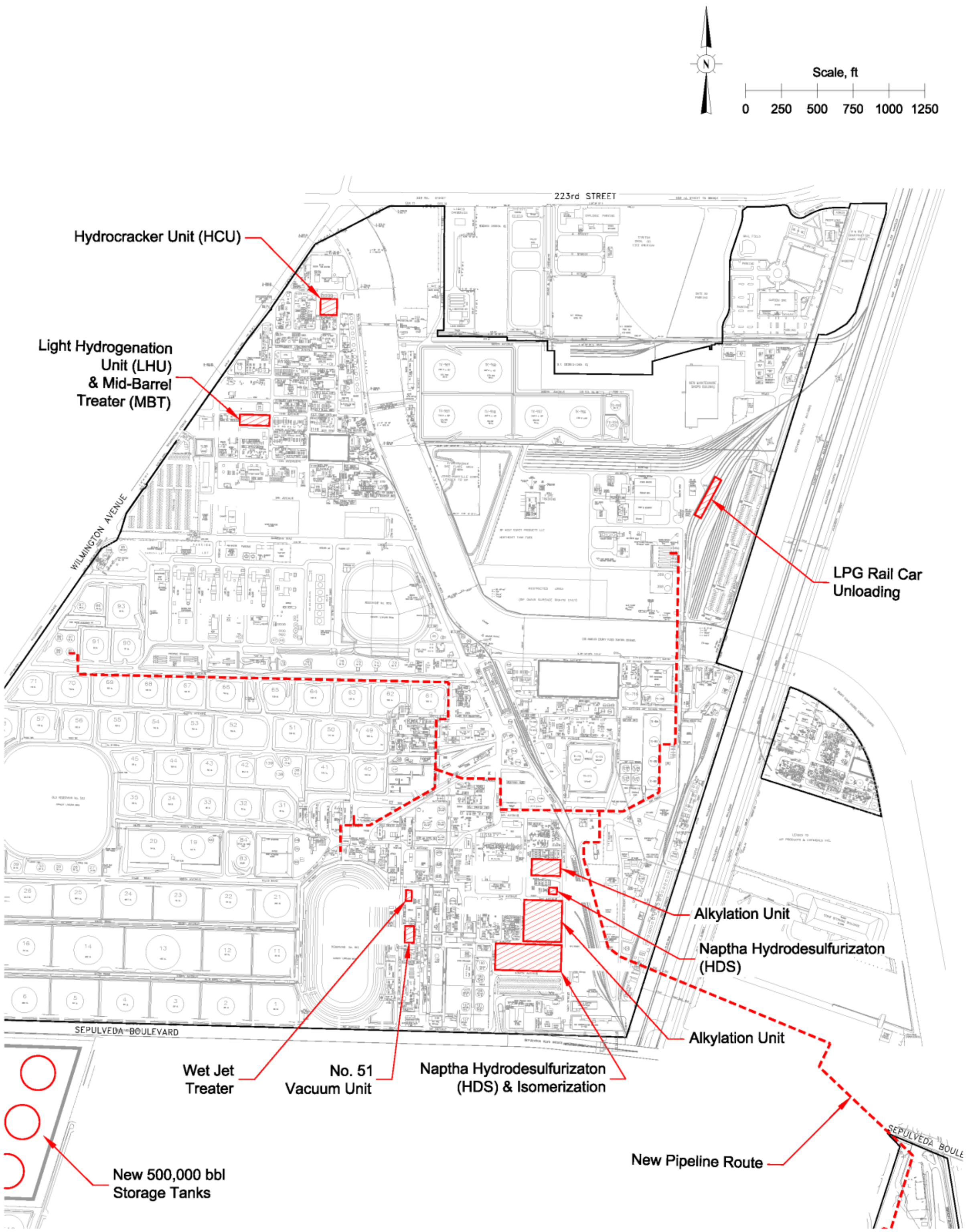


Figure 2-2
Plot Plan of Carson Operations at Tesoro Los Angeles Refinery

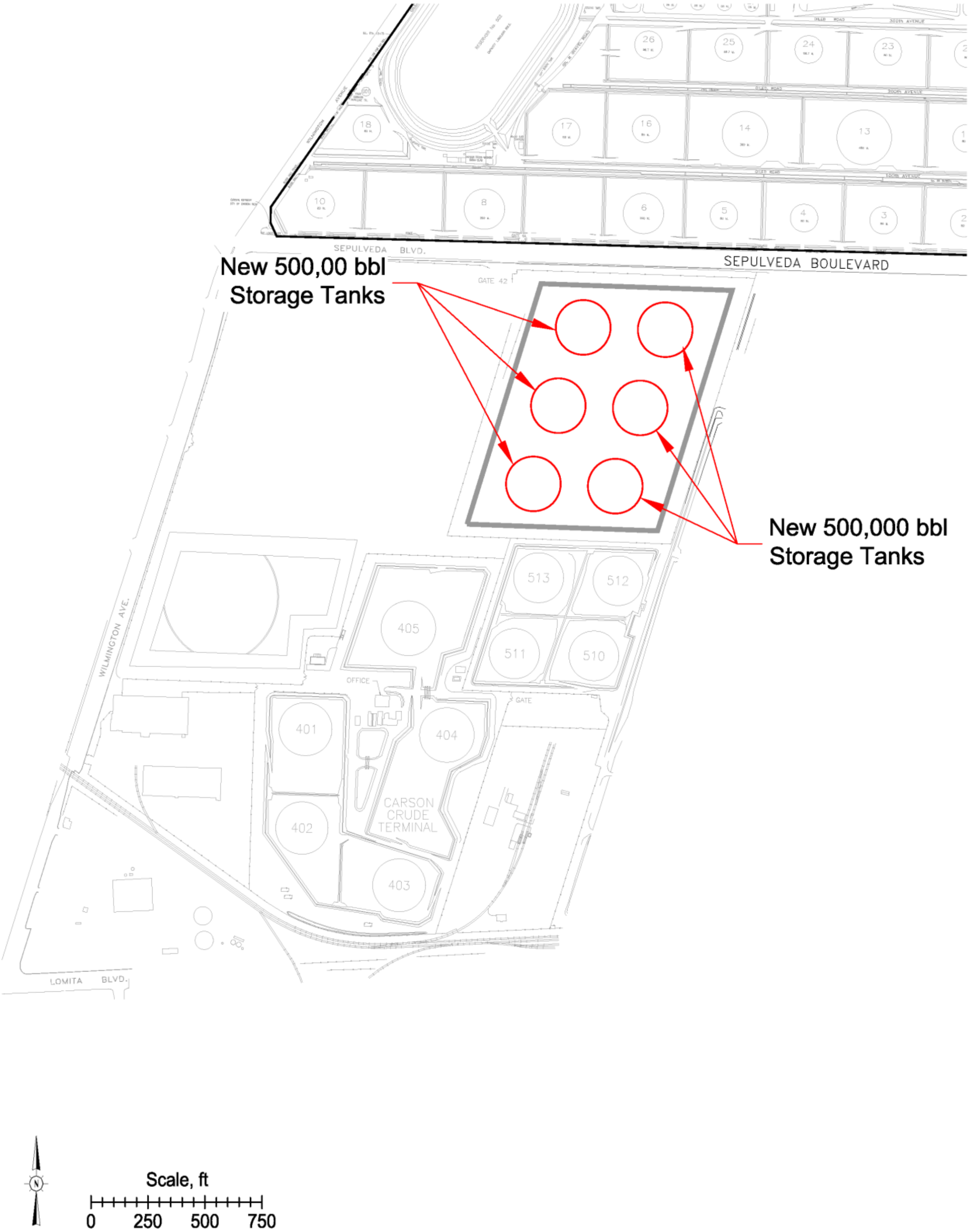


Figure 2-3
Plot Plan of New 500,000 bbl. Storage Tanks

2.1.1.6 HTU-1 and 2 Modifications (HTU-1/2)

The Wilmington Operations Hydrotreater Unit 1 (HTU-1) will be modified to hydrotreat approximately 20,000 BPD of FCCU gasoline to comply with the federally mandated Tier 3 gasoline specifications. HTU-2 feed will be separated from HTU-1 feed.

2.1.1.7 HTU-4 Modification

The Wilmington Operations Hydrotreater Unit No. 4 (HTU-4) will be modified to fully utilize the existing hydrotreating capacity to produce ultra-low sulfur diesel, to recover jet fuel, and to reduce energy consumption. These modifications do not produce changes in hazards, and this unit was not evaluated in the analysis.

2.1.1.8 New Sulfuric Acid Regeneration Plant

The proposed new Sulfuric Acid Regeneration Plant (SARP) will be constructed in the Wilmington operations area and will remove impurities from and recycle the Wilmington and Carson Operations spent sulfuric acid to produce fresh sulfuric acid.

2.1.1.9 Wilmington Storage Tanks

Two new 300,000 barrel internal floating roof storage tanks (Tanks 300035 and 300036) will replace two existing 80,000 barrel fixed-roof storage tanks (Tanks 80035 and 80036) in the north tank area of Wilmington Operations.

Tanks 80038, 80044, 80060, 80067, 80074, 80211, 80215, and 80217 will have increased utilization, increased throughput, or conversion to internal floating roofs. None of these changes will affect the hazard zone associated with each tank.

2.1.1.10 Replace Existing Section of Crude Oil Pipeline

The proposed project will replace 5,000 feet of 12-inch diameter piping with 24-inch diameter piping within the confines of the Wilmington Operations to allow the tank loading rate to increase from 5,000 bbl/hr to 15,000 bbl/hr when filling internal floating roof tanks.

2.1.2 Carson Operations

Proposed modifications to the Carson Operations are described in the following subsections.

2.1.2.1 No. 51 Vacuum Unit Modifications

The No. 51 Vacuum Unit (51VAC) will be modified to provide the flexibility to increase diesel production by decreasing vacuum gas oil production by approximately 8,000 BPD.

2.1.2.2 New Wet Jet Treater

One new 50,000 BPD Wet Jet Treater (WetJet) will be installed at Carson Operations to remove mercaptans and to reduce the total acid number (TAN), or organic acid content, in jet fuel.

2.1.2.3 HCU Modification

The Carson Operations Hydrocracker (HCU) will be modified to add flexibility of running the distillate recovered from the No. 51 Vacuum and the Fluid Feed Hydrodesulfurization (FFHDS) Units. The HCU capacity will be increased by 10 percent.

2.1.2.4 LHU Modifications

The Carson Operations Light Hydrotreating Unit (LHU) will be modified to more effectively remove sulfur from FCCU gasoline to comply with the federally mandated Tier 3 gasoline sulfur specification.

2.1.2.5 Naphtha HDS Unit Modification

The Carson Operations Naphtha Hydrodesulfurization (Naptha HDS) unit will be modified with the installation of new equipment to allow removal of contaminants from unit feed and sulfur from pentanes.

2.1.2.6 Naphtha Isomerization Unit Modifications

The Carson Operations Naphtha Isomerization Unit (ISOM) will be modified to recover propane and heavier material from the Unit off-gas.

2.1.2.7 Alkylation Modification

The Carson Operations Alkylation Unit (ALKY) will be modified to separate amylenes to feed the Carson Operations Alkylation Unit.

2.1.2.8 Mid-Barrel Distillate Treater Modifications

The existing Mid Barrel Distillate Treater (MBT) will be modified to remove sulfur from heavy FCCU naptha as well as to continue to treat straight run diesel.

2.1.2.9 Steam System Balance Modification

The Carson Operations steam system balance will be impacted due to Tier 3 conformance and the shifting of distillates draws. Implementing the projects described above will result in an increased steam demand at the Carson Operations. The increased steam demand will be met by a combination of; installing waste heat steam generators, generating more steam from the existing Cogen Units and reducing steam demand from existing steam turbines.

2.1.2.10 Carson Storage Tanks

Up to six new 500,000 barrel floating roof crude oil storage tanks will be constructed adjacent to the Carson Crude Terminal.

Tanks 14, 31, 62, 63, 64, 502, and 959 will have increased utilization. This will not affect the hazard zones associated with each tank.

2.1.3 Modifications to Supporting Equipment

2.1.3.1 Interconnecting Pipeway

The proposed project will require an interconnecting pipeway between the Wilmington and Carson Operations. The pipeway will be comprised of one pipe bundle of up to 15 pipelines ranging from 4 inches to 12 inches in diameter. The pipeway is proposed to exit the Carson Operations and be routed underneath S. Alameda Street to land near the Tesoro Coke Barn. The pipeway would then be routed underneath E. Sepulveda Boulevard to connect to the Wilmington Operations. The pipeway would then be routed above ground on pipe racks or ground level pipe supports into the respective product and supply manifolds within the Refinery.

2.1.3.2 Liquid Petroleum Gas (LPG) Rail Loading/Unloading

The LPG Rail Car Unloading facilities at Wilmington will be modified to allow increased receiving capacity of approximately 4,000 BPD at Wilmington of Alkylation Unit feedstocks (propane, propylene, butane, butylene, etc.). Butane is received from rail cars into pressurized tanks for use in the Refinery process. LPG Rail Unloading facilities will be used to transfer LPG to and from the Refinery to supplement Alkylation Unit feed and remove products

The LPG rail loading modifications will allow the Refinery to transfer up to about 15,000 BPD of LPG, resulting in the increase of about 4,000 BPD or ten rail cars per day at the Refinery. It is expected that these additional rail cars would be added onto existing trains that visit the Refinery.

3.0 MODELING METHODOLOGY

For any one of the hazards that are inherent to the existing or proposed process systems at the Tesoro Los Angeles Refinery facility to impact an area, a loss of containment (LOC) must occur. If the hydrocarbons normally contained within the piping or equipment at the site are released, the resulting flash fire, vapor cloud explosion (VCE), torch fire, pool fire, or toxic vapor cloud has specific consequences that can be described by modeling.

To describe the hazards at any facility handling or storing hazardous materials, release scenarios are developed to simulate the potential LOC events. This first requires calculations of material release rates and the properties of the material following release. Following these calculations, hazard models are applied to describe the extent of a toxic or flammable vapor cloud (flash fire), torch fire radiation, pool fire radiation, Boiling Liquid Expanding Vapor Explosion (BLEVE) or overpressure from a vapor cloud explosion. With the results of these calculations, the extent of the potential impacts can be determined.

In the current study, the facility was divided up into 19 sections that generally correspond to the units in the facility. The units and the potential changes to them are described in Section 2. The units requiring evaluation are listed in Table 4-1. As described above, the hazards associated with the release of flammable and/or toxic fluids are well known. However, the extent or size of a particular hazard following an accidental release is a function of the fluid's composition, temperature, pressure, inventory, pipe size, normal flowrate, release orientation, etc. Not all of these parameters will change within a portion of a unit, but many will change as a fluid passes through a unit. In Quest's accident selection methodology, thousands of potential releases and hazard zone calculations are made, but only the largest (worst case) results are presented in Section 4.

3.1 CANARY Consequence Analysis Models

When performing site-specific consequence analysis studies, the ability to accurately model the release, dilution, and dispersion of gases and aerosols is important if an accurate assessment of potential exposure is to be attained. For this reason, Quest uses a modeling package, CANARY by Quest®, that contains a set of complex models that calculate release conditions, initial dilution of the vapor (dependent upon the release characteristics), and the subsequent dispersion of the vapor introduced into the atmosphere. The models contain algorithms that account for thermodynamics, mixture behavior, transient release rates, gas cloud density relative to air, initial velocity of the released gas, and heat transfer effects from the surrounding atmosphere and the substrate. The release and dispersion models contained in the QuestFOCUS package (the predecessor to CANARY by Quest®) were reviewed in a United States Environmental Protection Agency (EPA) sponsored study [TRC, 1991] and an American Petroleum Institute (API) study [Hanna, Strimaitis, and Chang, 1991]. In both studies, the QuestFOCUS software was evaluated on technical merit (appropriateness of models for specific applications) and on model predictions for specific releases. One conclusion drawn by both studies was that the dispersion software tended to overpredict the extent of the gas cloud travel, thus resulting in too large a cloud when compared to the test data (i.e., a conservative approach).

A study prepared for the Minerals Management Service (MMS) [Chang, et al., 1998] reviewed models for use in modeling routine and accidental releases of flammable and toxic gases. The MMS recommends CANARY for use when evaluating toxic and flammable gas releases. The specific models (e.g., SLAB) contained in the CANARY software package have also been extensively reviewed.

CANARY also contains models for pool fire, torch fire, and boiling liquid expanding vapor explosions (BLEVEs) radiation. These models account for impoundment configuration, material composition, target height relative to the flame, target distance from the flame, atmospheric attenuation (includes humidity), wind speed, and atmospheric temperature. Both are based on information in the public domain (published literature) and have been validated with experimental data.

3.2 The QMEFS Model for Vapor Cloud Explosions

For vapor cloud explosion (VCE) calculations, Quest uses a model that is a variation of the Baker-Strehlow-Tang (BST) method. The Quest Model for Estimation of Flame Speeds (QMEFS) [Melton & Marx, 2009] is based on experimental data involving vapor cloud explosions, and is related to the amount of confinement and/or obstruction present in the volume occupied by the vapor cloud.

Quest's QMEFS model is based on the premise that the strength of the blast wave generated by a VCE is dependent on the reactivity of the flammable gas involved, the presence (or absence) of structures such as walls or ceilings that partially confine the vapor cloud, the spatial density of obstructions within the flammable cloud [Baker, et al., 1994, 1998], the average size of those obstacles, and the overall size of the confined or congested space [Mercx, 1994a, 1994b, 1997; Mercx, Van den Berg, & Van Dongen, 1996]. This model reflects the results of several international research programs on vapor cloud explosions, which show that the strength of the blast wave generated by a VCE increases as the degree of confinement and/or obstruction of the cloud increases. The following quotations illustrate this point.

> "On the evidence of the trials performed at Maplin Sands, the deflagration [explosion] of truly unconfined flat clouds of natural gas or propane does not constitute a blast hazard." [Hirst and Eyre, 1982] (Tests conducted by Shell Research Ltd., in the United Kingdom.)

> "Both in two- and three-dimensional geometries, a continuous accelerating flame was observed in the presence of repeated obstacles. A positive feedback mechanism between the flame front and a disturbed flow field generated by the flame is responsible for this. The disturbances in the flow field mainly concern flow velocity gradients. Without repeated obstacles, the flame front velocities reached are low both in two-dimensional and three-dimensional geometry." [van Wingerden and Zeeuwen, 1983] (Tests conducted by TNO in the Netherlands.)

> "The current understanding of vapor cloud explosions involving natural gas is that combustion only of that part of the cloud which engulfs a severely congested region, formed by repeated obstacles, will contribute to the generation of pressure." [Johnson, Sutton, and Wickens, 1991] (Tests conducted by British Gas in the United Kingdom.)

Researchers who have studied case histories of accidental vapor cloud explosions have reached similar conclusions.

> "It is a necessary condition that obstacles or other forms of semi-confinement are present within the explosive region at the moment of ignition in order to generate an explosion." [Wiekema, 1984]

> "A common feature of vapor cloud explosions is that they have all involved ignition of vapor clouds, at least part of which have engulfed regions of repeated obstacles." [Harris and Wickens, 1989]

The strength of the blast wave predicted by the QMEFS VCE model is directly related to the size of the obstructed or partially confined volume that is filled with a flammable mixture of gas and air, and fuel reactivity.

3.3 Hazards Identification and Modeling Endpoints

The potential hazards associated with this facility are common to most oil processing facilities worldwide, and are a function of the materials being processed, processing systems, procedures used for operating and maintaining the facility, and hazard detection and mitigation systems. The hazards that are likely to exist are identified by the physical and chemical properties of the materials being handled and the process conditions. For hydrocarbon fuel and petrochemical facilities, the common hazards are:

- toxic gas clouds (e.g., gas with hydrogen sulfide, sulfur dioxide, or sulfur trioxide)
- flash fires
- torch fires
- pool fires
- boiling liquid expanding vapor explosions (BLEVEs)
- vapor cloud explosions (VCEs)

When comparing a toxic hazard to a flammable or explosive hazard, the magnitude of the hazard's impact must be identically defined. For instance, it would not be meaningful to compare human exposure to nonlethal overpressures (low overpressures which break windows) to human exposure to lethal fire radiation (34,500 Btu/(hr•ft^2) for five seconds). Thus, in order to compare the hazards of toxic gases, fires, and explosions on humans, equivalent levels of hazard must be defined.

The endpoint hazard criterion defined in this study corresponds to a hazard level which might cause an injury. With this definition, the injury level must be defined for each type of hazard (toxic, radiant heat, or overpressure exposure). Fortunately, data exist which approximate an equivalent injury level for each of the hazards listed. Table 3-1 presents the endpoint hazard criteria used by federal agencies and national associations for this type of analysis.

3.4 Weather Conditions

The weather conditions at the time of an accidental release (a LOC event) can influence the extents of the resulting hazards. For the purposes of a consequence-based study, a set of weather conditions – consisting of atmospheric stability and wind speed – must be assigned for each calculation. Atmospheric stability is classified by the letters A through F. In general, the most unstable atmosphere is characterized by stability class A. Stability A would correspond to an atmospheric condition where there is strong solar radiation and moderate winds. This combination of radiation and wind allows for rapid fluctuations in the air and thus greater mixing of the released gas with time. Stability D is characterized by fully overcast or partial cloud cover during both daytime and nighttime. The atmospheric turbulence is not as great during D conditions as during A conditions; thus, the gas will not mix as quickly with the surrounding atmosphere. Stability F corresponds to the most "stable" atmospheric conditions. Stability F generally occurs during the early morning hours before sunrise (thus, no solar radiation) and under low wind. The combination of low wind and lack of solar heating allows for an atmosphere which appears calm or still and thus restricts the ability to actively mix with the released gas.

Table 3-1
Consequence Analysis Hazard Levels
(Endpoint Criteria for Consequence Analysis)

Hazard Type	Injury Threshold		
	Exposure Duration	Hazard Level	Reference
Sulfur Dioxide (SO_2) exposure	Up to 60 min	3 ppm	ERPG-2 [AIHA, 2011]
Sulfur Trioxide (SO_3) exposure	Up to 60 min	2.5 ppm	ERPG-2 [AIHA, 2011]
Hydrogen Sulfide (H_2S) exposure	Up to 60 min	30 ppm	ERPG-2 [AIHA, 2011]
Radiant heat exposure	40 sec	1,600 Btu/(hr•ft^2) †	40 CFR 68 [EPA, 1996]
Explosion overpressure	Instantaneous	1.0 psig ‡	40 CFR 68 [EPA, 1996]
Flash fires (flammable vapor clouds)	Instantaneous	LFL	40 CFR 68 [EPA, 1996]

ERPG-2. The maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to one hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair an individual's ability to take protective action.
40 CFR 68. United States Environmental Protection Agency RMP endpoints.
† Corresponds to second-degree skin burns.
‡ An overpressure of 1 psi may cause partial demolition of houses, which can result in serious injuries to people, and shattering of glass windows, which may cause skin laceration from flying glass.

For vapor dispersion calculations, the typical worst-case weather assumption is a stable atmosphere with low wind, which tends to produce longer vapor dispersion distances. The conditions chosen for the dispersion analyses are:

Atmospheric Stability	Class F
Wind Speed	4.5 mph (2.0 m/s)

For fire radiation, higher wind speeds generally result in longer impact distances due to flame bending. Atmospheric stability does not affect the size or characteristics of a flame. Thus, a worst-case wind speed for fire radiation was chosen as:

Wind Speed	20 mph (8.9 m/s)

For all calculations, annual average air temperature and relative humidity values were taken from local meteorological data [weatherspark, 2014]:

Air Temperature	65°F (18.3 °C)
Relative Humidity	70%

4.0 IMPLEMENTATION OF WORST-CASE CONSEQUENCE MODELING METHODOLOGY

The results of the worst-case consequence modeling calculations for the existing and proposed processes are presented in this section. In addition, for several processes, the vulnerability zone which extends the greatest distance from the point of release is overlaid onto the local area in order to determine possible public exposure to the defined hazard levels.

4.1 Accident Selection

The inherent flammable hazards associated with refineries are well known. A review of the Los Angeles Refinery process shows that there are multiple release scenarios that could result in fire or explosion hazards that may generate significant impacts. The hazards from the various release scenarios are identified in the following sections.

4.2 Releases Resulting in the Largest Downwind Hazard Zones

When the hazard identification and consequence modeling calculations described in Section 3.0 are completed for the accidents selected in Section 4.1 for both the existing facility and the proposed changes to the facility, the releases which generate the largest hazard zones can be defined for the facility and associated pipeway. Table 4-1 summarizes the worst-case releases identified and Table 4-2 summarizes the maximum hazard zones for each worst-case release. In Table 4-2, P indicates a proposed modification and E indicates an existing unit.

4.3 Worst-Case Consequences

4.3.1 Flash Fires

Flash fires are the result of a release, formation of a flammable vapor cloud and ignition of the cloud. Flash fire hazard zones are defined by the maximum extent of the LFL portion of the vapor cloud. For example, a release from the line feeding the Carson light hydrotreater unit (LHU) stabilizer column could result in a flash fire.

In this release scenario, the flash fire is the maximum hazard. For the LHU, this scenario is the worst-case scenario because it goes further than the other scenarios chosen for the LHU, so it is used to define the vulnerability zone for the LHU.

An example hazard footprint and vulnerability zone associated with this "worst-case" event is illustrated in Figure 4-1. The vulnerability zone (the circle) depicts the potential area that could be affected due to a release from the feed line to the LHU stabilizer column. This presentation is misleading since all locations within this zone cannot be simultaneously exposed to potential flash fire hazard from any single accident. There are other possible hazard zones following this loss of containment that form smaller footprints. The scenario that creates the maximum hazard footprint is just one of the many possible outcomes found when considering variables such as hole size, orientation, wind speed, atmospheric stability, and wind direction. The hazard footprint in Figure 4-1 (the cross hatching) shows what would be expected <u>if</u> the pipe were to rupture, <u>and</u> low speed wind is blowing to the northeast, <u>and</u> the atmosphere is stable, <u>and</u> the release is oriented horizontal, <u>and</u> the gas is ignited after reaching a maximum extent.

As shown in Table 4-2, a large fraction of the worst-case release scenarios are flash fires.

Table 4-1
Summary of Unit Worst-Case Scenarios

Unit	Description of Release
Carson Refinery	
51 Vacuum	Vacuum column LGO product
Alkylation	Olefin feed from surge drums
HCU	Reactor 3 effluent
Mid-Barrel Hydrotreater	Reactor effluent
Naptha HDS	Debutanizer bottoms liquid
Naptha Isomerization	Hot flash drum liquid
LHU	Feed to stabilizer column
Wet Jet Treater	Liquid to reactors
New Crude Tanks	500,000 bbl. crude tank fire
Wilmington Refinery	
FCCU	Unit Shutdown – not evaluated
HTU-1/2	Liquid from HP Separator to Stripper
HTU4	No change in hazards – not evaluated
CRU3	Total liquid from depropanizer reflux receiver
PSTU	Liquid from depropanizer reflux receiver to treater
HCU	Liquid from 1st stage surge drum and DEA contactor
SARP	Vapor from discharge of main compressor
Replace Crude Tanks	300,000 bbl. crude tank fire
Replace Portion of Crude Transfer Pipeline	Crude oil release
Other	
Interconnecting Pipeway	*n*-Butane release
Rail Car Unloading	LPG BLEVE at loading/unloading area

Table 4-2
Summary of Worst-Case Hazard Distances

Unit	Case ID (P/E)	Distance to Hazard (feet)		Largest Hazard (P/E)
		Proposed (P)	Existing (E)	
Carson Refinery				
51 Vacuum	51V-03/02	150	155	Flash Fire
Alkylation	AU-04/04	360	585	Flash Fire
HCU	HC-08/08	1245	1250	Toxic
Mid-Barrel Hydrotreater	MBT-01/01	275	400	Torch Fire/ Toxic
Naptha HDS	IO-03/01	865	1035	Flash Fire
Naptha Isomerization	IS-02/01	665	530	Flash Fire
LHU	LH-04/04	600	585	Flash Fire
Wet Jet Treater	WJ-10	205	DNCE	Flash Fire
New Crude Tanks	TNK500k	340	DNCE	Pool Fire
Wilmington Refinery				
FCCU	Shutdown			
HTU1/2	HT-04/04	1170	1065	Flash Fire
HTU4	Modifications do not affect vulnerability zone			
CRU3	CR-04/20	1595	2190	Toxic
PSTU	CR-05/20	1085	2190**	Toxic
HCU	HC-07/10	1320	1450	Flash Fire
SARP	SAR-03A	1905	DNCE	Toxic
Replace Crude Tanks	TNK300k	265	190	Pool Fire
Replace Portion of Crude Transfer Pipeline	PL12/24	120	70	Pool Fire
Other				
Interconnecting Pipeway	IC-01	380	DNCE	Flash Fire
Rail Car Unloading	C4BLEV	1700	1700	BLEVE Fireball

DNCE = Does Not Currently Exist
NCR = No Calculations Required
** Existing hazard in CRU3 unit. See Figure 4-2

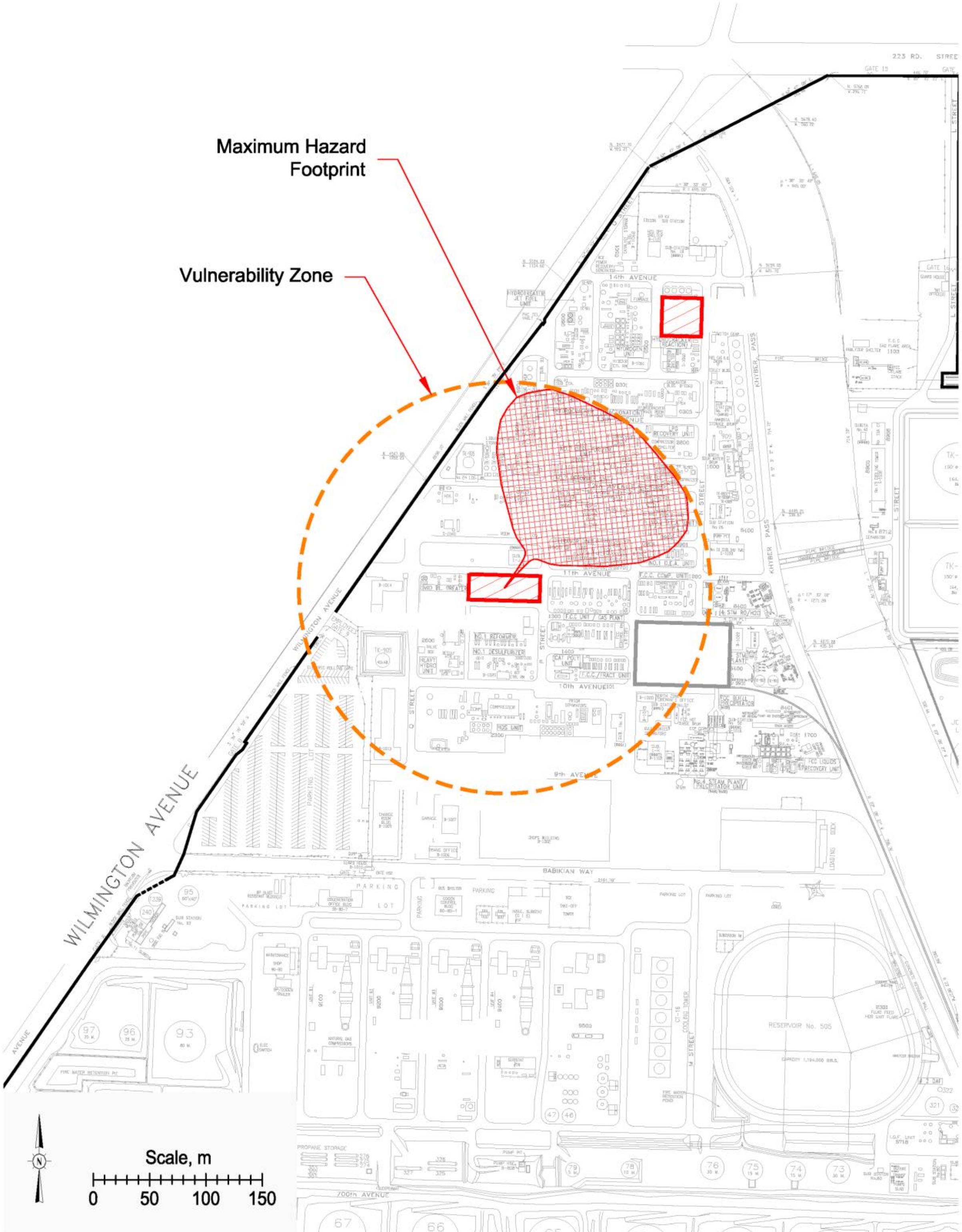


Figure 4-1
Example Vulnerability Zone

4.3.2 Fire Radiation

Fire radiation hazards for this facility are a result of torch fires, pool fires, or BLEVEs. Consequence results for the units where fire radiation is the worst-case scenario are shown in Table 4-2.

The largest fire radiation hazard shown in the table is an LPG rail car BLEVE.

4.3.3 Toxic Vapor Clouds

H_2S, SO_2, and SO_3 are the only toxic components in any of the processed fluids in the modified areas of the facility. A release of a stream containing H_2S, SO_2, or SO_3 may produce a toxic vapor cloud. The hazard zone of a toxic vapor cloud containing H_2S, SO_2, or SO_3 is defined by the ERPG-2 concentration level (30 ppm H_2S, 3 ppm SO_2, 2.5 ppm SO_3).

Releases of material containing H_2S produce worst-case vulnerability zones in four areas (Carson HCU and Wilmington CRU3, and PSTU). Releases of material containing SO_2 and SO_3 produce worst-case vulnerability zones in one unit (Wilmington SARP). The results from the toxic vapor cloud analysis are listed in Table 4-2.

4.3.4 Vapor Cloud Explosions (VCE)

One of the possible results of a flammable fluid or gas release is the potential ignition of the vapor which could then result in a VCE. There are no LOC events that could result in VCEs that are not also possible in the existing refinery configuration. No new vulnerability zones are produced by VCE events.

4.4 Summary of Maximum Vulnerability Zones

The maximum vulnerability zones for the existing equipment and proposed changes are presented in Figure 4-2 and 4-3 for the Wilmington operation and Figure 4-3 for the Carson operation. Figures 4-4 and 4-5 show the vulnerability zones for the new pipeway in the Wilmington and Carson operation areas. Figure 4-6 shows the vulnerability zone for the new 500,000 bbl. storage tanks.

Many of the units have vulnerability zones that are the same size or larger for the existing facility (solid blue lines) than for those that would be produced following the proposed changes (dashed orange lines). New units do not have existing vulnerability zones, so the proposed vulnerability zones would be larger (Carson Wet Jet, Wilmington PSTU and SARP units).

The potential hazard zones from releases originating inside the facility at the Carson operation are dominated by the toxic hazards from the HCU and at the Wilmington operation by toxic hazards in the CRU3, PTSU, and SARP areas. The largest potential hazard zone occurring within any modified area is found in the Wilmington SARP area and covers a vulnerability zone with a radius of 1,905 feet.

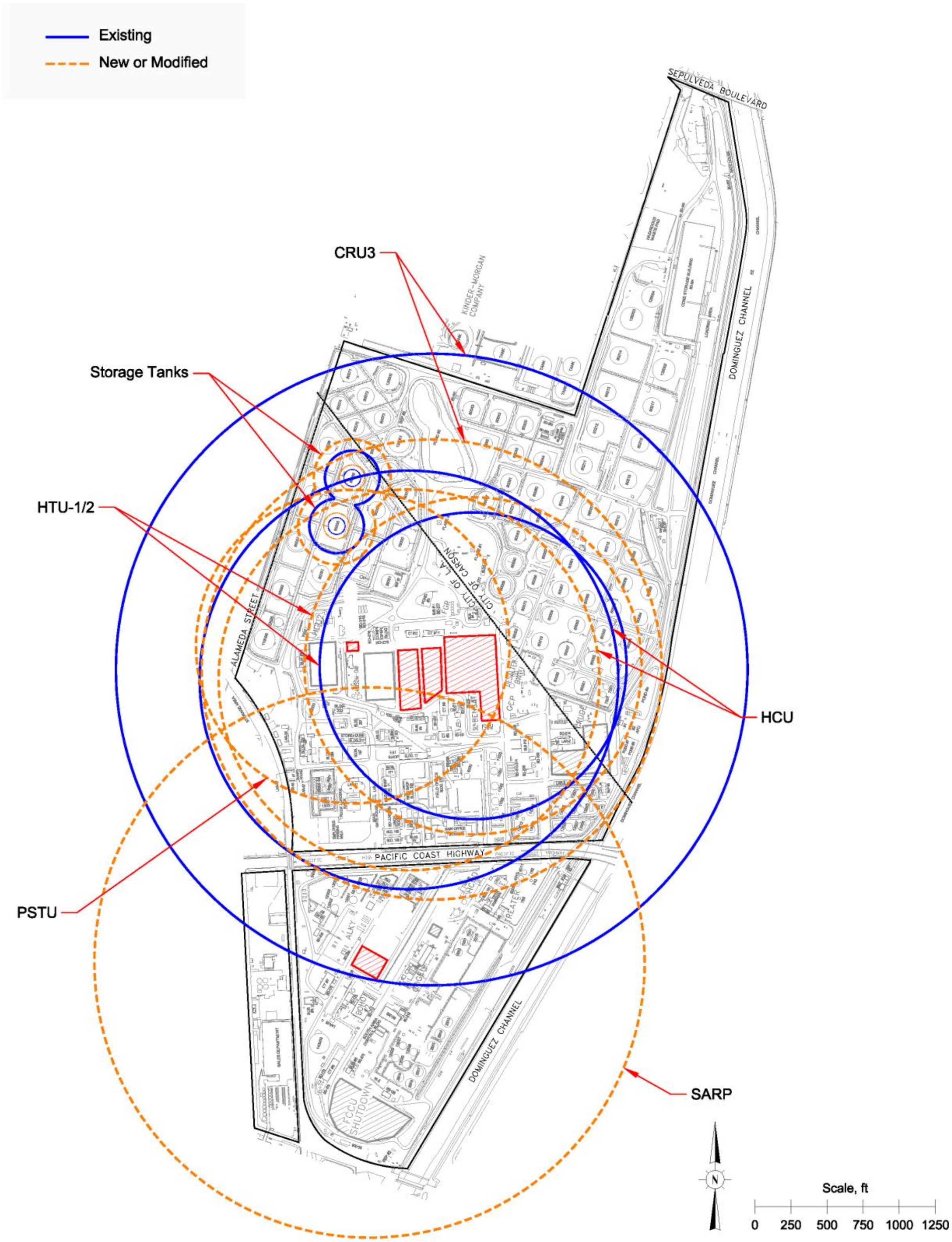


Figure 4-2
Vulnerability Zones for Wilmington Operations

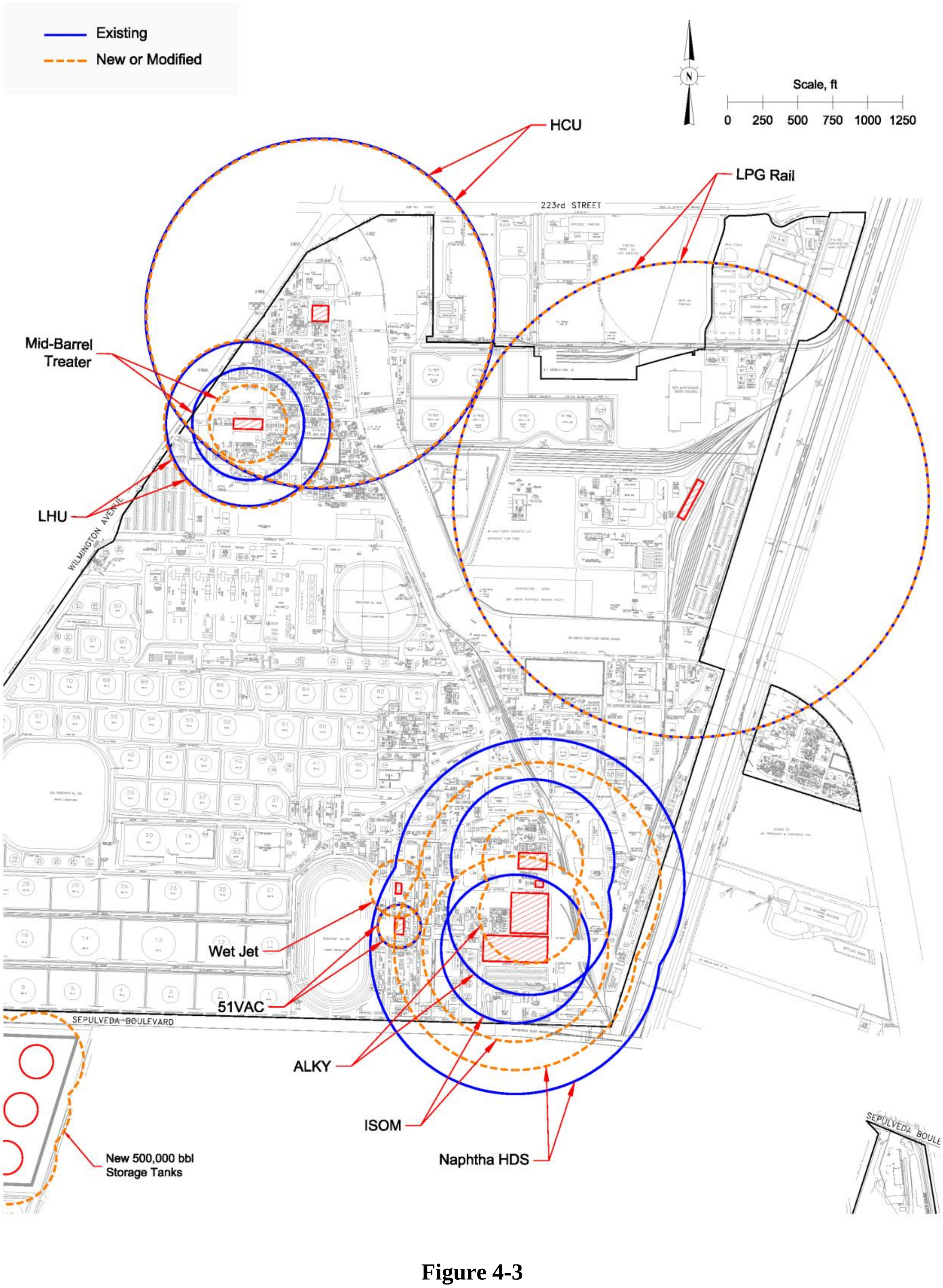
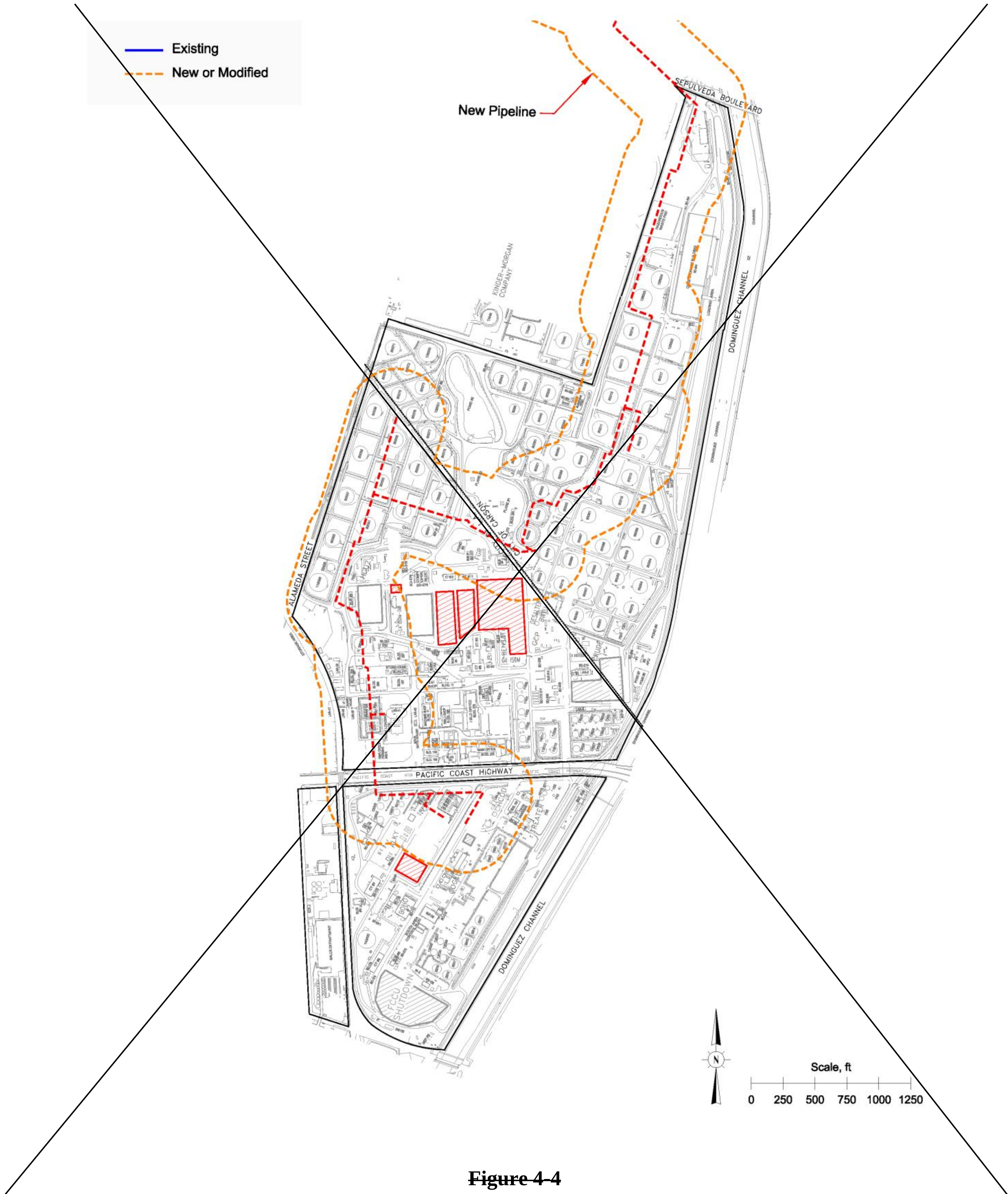


Figure 4-3
Vulnerability Zones for Carson Operations



~~**Figure 4-4**~~
~~**Vulnerability Zone for New Pipeway – Wilmington Operations**~~

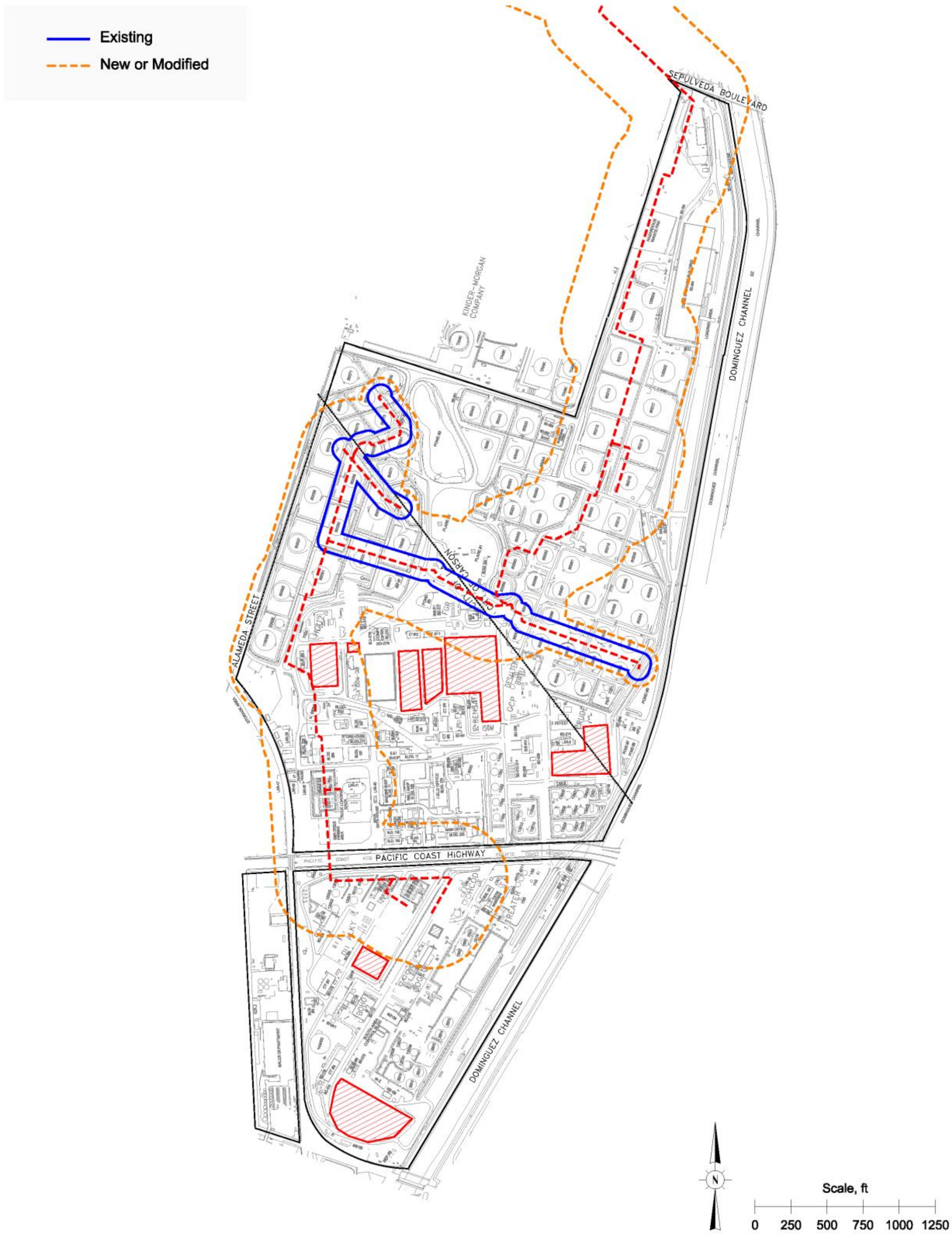


Figure 4-4
Vulnerability Zone for New Pipeway – Wilmington Operations

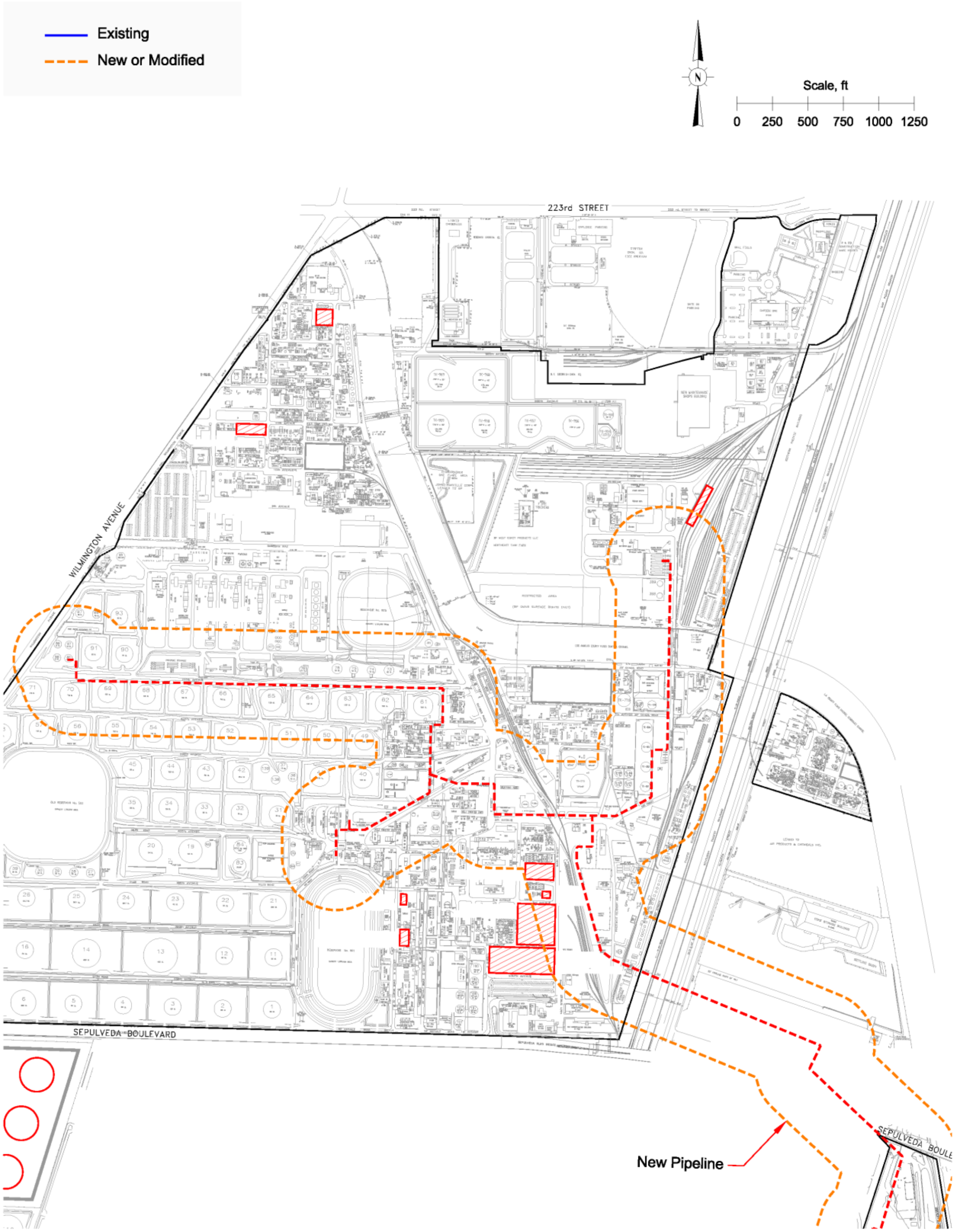


Figure 4-5
Vulnerability Zones for New Pipeway – Carson Operations

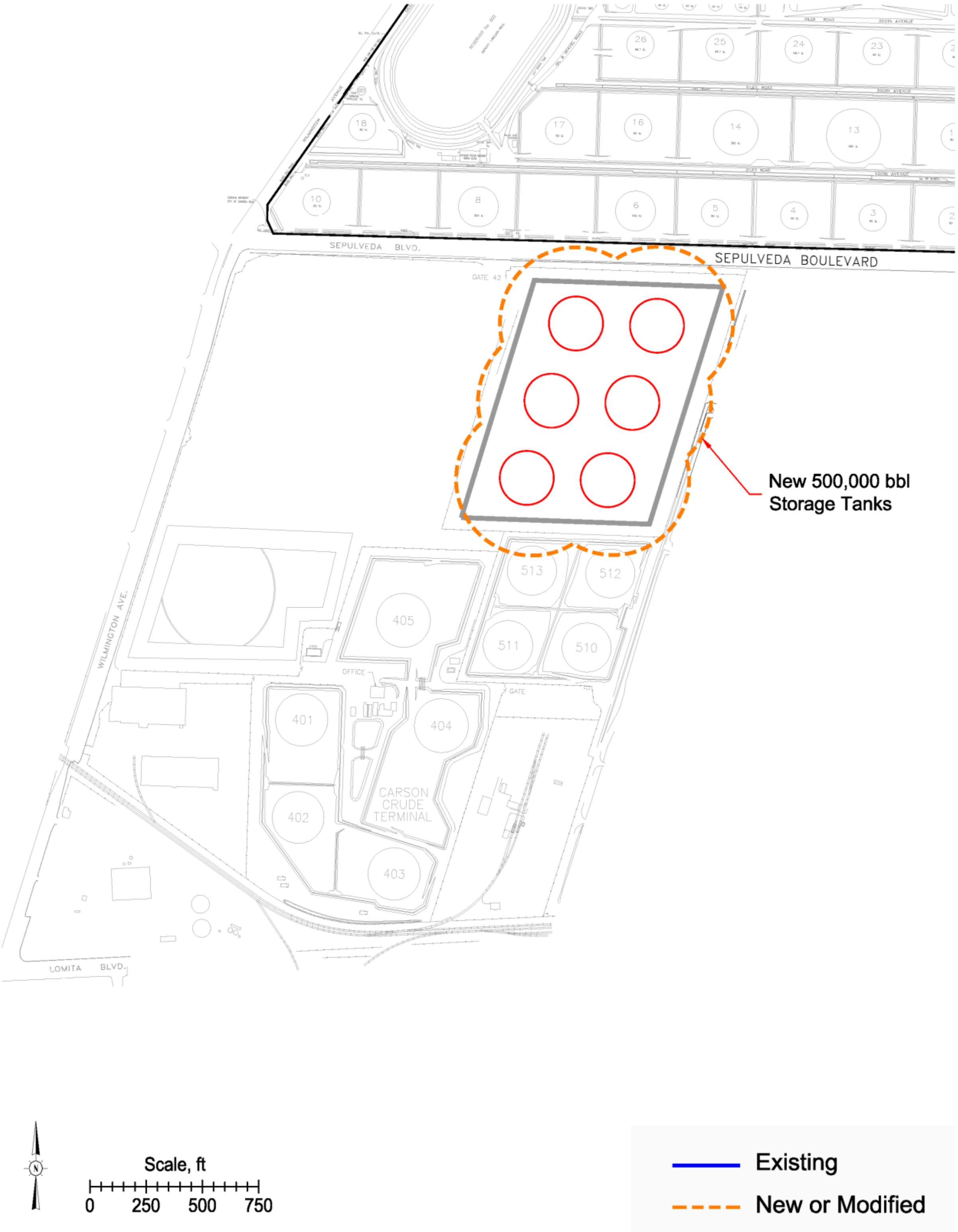


Figure 4-6
Vulnerability Zone for New 500,000 bbl. Storage Tanks

5.0 CONCLUSIONS

The primary conclusions drawn from the worst-case consequence modeling results are that for most potential releases, the proposed changes result in similar or smaller potential vulnerability zones than those posed by the existing facility configuration.

With the maximum vulnerability zones defined for each release evaluated under the existing and proposed refinery configurations, the areas can be divided into three categories, dependent on their potential to impact the public. The categories are defined as:

- Areas with no potential off-site impacts for proposed refinery configurations (hazard zones are contained onsite within the facility fence line).
  Carson: Alkylation, Wet Jet, 51VAC, MBT
  Wilmington: HTU-1/2, 80,000 to 300,000 bbl. tank replacement

- Areas with potential off-site impacts, but no public residential exposure under proposed refinery configurations where project modified impacts are similar to or smaller than existing impacts.
  Carson: HCU, Naptha HDS, LHU, Rail Loading/Unloading
  Wilmington: PSTU, CRU3, HCU

- Areas with potential off-site impacts, but no public residential exposure under proposed refinery configurations where project modified impacts are larger than existing impacts.
  Carson: Naptha Isomerization, new 500,000 bbl. Tanks, New Pipeway
  Wilmington: New Pipeway

- Areas with potential public residential exposure.
  Carson: none
  Wilmington: New SARP

These conclusions are driven by the nature of the proposed changes to the Tesoro Los Angeles Refinery. The consequences are determined by the process conditions at the time of release. The proposed changes to the Tesoro Los Angeles Refinery are not expected to significantly change those conditions. Thus, for the purposes of this study, using the hazard endpoints developed by the U.S. EPA and AIHA, the off-site hazard increases associated with the proposed project are limited to adjacent industrial areas near the facility.

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APPENDIX A

RESUMES

John B. Cornwell
Quest Consultants Inc.®
Principal Engineer

EDUCATION

1978 M.S., Mechanical Engineering
University of Texas, Austin, Texas

1975 B.S., Chemical Engineering
University of Texas, Austin, Texas

EXPERIENCE

1989 - Present Quest Consultants Inc., Norman, Oklahoma
Principal Engineer

Directs the company's hazards analysis and risk analysis efforts. Directs the use of the company's state-of-the-art phenomenological models to determine the extent of potential flammable/toxic/explosive hazards. Presents the technology behind the studies to corporate and regulatory groups.

Directs quantitative risk analysis studies (QRAs) involving:

- LNG import and export terminals
- LPG storage/marketing terminals
- LPG import terminals
- Refinery complexes
- Alkylation units (HF and H_2SO_4)
- Ammonia plants
- Transportation of toxic materials (road and rail)
- Pipeline networks (natural gas, LPG, ammonia, liquids)
- Exploration and production systems (oil and natural gas)
- Gas plants

Directs development of computer software, CANARY by Quest®, that provides analysis tools for the company. Oversees the use of public domain (e.g. DEGADIS, SLAB, LNGFIRE3) and special application software.

1985 - 1989 Energy Analysts, Inc., Norman, Oklahoma
Principal Engineer

Directed the development of computer models to simulate the hazards associated with accidental releases of toxic/flammable materials. These models were contained in a commercially available software package named EAHAP.

John B. Cornwell

Modeled the simulation of heavier-than-air gases and momentum jet releases of gases and aerosols. Directed the comparison analysis of several heavier-than-air gas dispersion models against the large-scale test data produced by the Thorney Island Trials, Desert Tortoise Ammonia Releases, and the Goldfish Hydrofluoric Acid Releases.

Directed numerous risk analysis/assessment studies using results of the consequence modeling and in-house risk modeling capabilities. Prepared and reviewed California RMPPs (Risk Management and Prevention Plans).

1984 - 1985 Los Alamos National Laboratory, Los Alamos, New Mexico
Staff Member/Research Scientist, Advanced Technologies Division
Security Clearance Level Q (DoE)

Evaluated advanced energy systems, including advanced fusion devices, liquid oxygen/liquid hydrogen turbogenerators, advanced photovoltaic systems, and conventional petroleum-based turbine systems.

1981 - 1984 Energy Analysts, Inc., Norman, Oklahoma
Senior Engineer

Directed the development of advanced simulation models for the dispersion of heavier-than-air vapors. Developed compatible thermodynamic systems and methodologies for predicting transient vaporization history of cryogenic fluids.

Directed development of a risk analysis model for use in conjunction with results of vapor dispersion and fire radiation analyses. The risk analysis model was employed in studies requiring the time-varying/site-dependent risk profile for petrochemical facilities and the surrounding area.

Evaluated transient fire hazards and the analysis of toxic combustion products.

1978 - 1981 University of Texas, Austin, Texas
Research Scientist, Center for Energy Studies

Developed a series of mathematical models to evaluate geopressured/geothermal resources along the Texas gulf coast.

PROFESSIONAL MEMBERSHIPS

American Institute of Chemical Engineers
Air and Waste Management Association
American Nuclear Society

John B. Cornwell

PUBLICATIONS

Authored papers on hazards analysis modeling, risk analysis methodologies, project siting issues, and model-to-test data analysis.

RELEVANT PROJECT EXPERIENCE

Quantitative Risk Analysis for an LNG Import Terminal: ***Project Manager*** for a full QRA of an LNG import terminal on Mexico's gulf coast. QRA was submitted to Mexico's Department of the Environment (SEMARNAT). Other studies completed under this contract included a qualitative risk analysis and siting study per Mexico's Secretary of Energy, Energy Regulation Commission (CRE). Terminal is now under construction. *Client: Shell Global Solutions.*

Quantitative Risk Analysis of a Refrigerated LPG Import Terminal: ***Project Manager*** for a study that included refrigerated LPG ship loading/unloading and cavern storage. Full QRA was completed and submitted for review to Chinese authorities. *Client: Caltex Corporation (now part of ChevronTexaco).*

LNG Facility Siting Safety Study for a Pacific Ocean Gravity Based Structure (GBS) for Use as an Import Terminal: Participant in a study to determine if a proposed LNG import terminal could be built upon a GBS in the Mexican waters off Baja California. The study applied Mexico's NOM-EM-001-SECRE-2002 to the design. The project involved vapor dispersion, fire radiation, and vapor cloud explosion modeling for numerous hypothetical releases of LNG. *Client: ChevronTexaco*

Quantitative Risk Analysis for an Existing HF Alkylation Unit: ***Project Manager*** for a full QRA of an existing HF alkylation unit. QRA was used to develop potential mitigation options. *Client: Sunoco*

Quantitative Risk Analysis for Natural Gas Transmission Pipeline: ***Project Manager*** for a full QRA of a natural gas transmission line spanning the Gulf of Mexico from Alabama to Florida. Torch fire and flash fire radiation hazards were defined. QRA was submitted to US FERC as part of project permitting. *Client: Willbros Engineers, Inc.*

Quantitative Risk Analysis of a Refrigerated and Pressurized LPG Storage Depot: ***Project Manager*** for a full QRA of a LPG storage depot and a nearby chemical facility. Analysis of terrorist threat included. Facility had been target of failed domestic terrorism in 1999. *Client: City of Elk Grove, California.*

Quantitative Risk Analysis for Natural Gas Gathering Pipeline Network: ***Project Manager*** for a full QRA of a natural gas gathering network in Venezuela. Wellhead, compression and pipeline releases were evaluated. Toxic (Hydrogen Sulfide) and fire radiation hazards were defined. QRA was submitted to Petroleos de Venezuela (PDVSA) for review and approved per PDVSA standard IR-S-02. *Client: Petroleos de Venezuela.*

Quantitative Risk Analysis for an Existing HF Alkylation Unit: ***Project Manager*** two full QRAs of an existing HF alkylation unit were conducted to identify the possible risk benefit afforded by the use of acid additive. *Client: Texaco*

John B. Cornwell

Quantitative Risk Analysis for an LNG Import Terminal: ***Project Manager*** for a full QRA of an LNG import terminal on Mexico's Pacific coast. QRA was submitted to Mexico's Department of the Environment (SEMARNAT). Other studies completed under this contract included a qualitative risk analysis and siting study per Mexico's Secretary of Energy (CRE). *Client: Sempra Energy.*

LNG Carrier Spill Hazards Analysis: ***Project Manager*** for an analysis of possible large scale LNG carrier releases in Boston Harbor. Results used by U.S. Department of Energy in designing LNG tanker operations in Boston Harbor following September 11, 2001 terrorist attacks. *Client: U.S. Department of Energy.*

Comparative Quantitative Risk Analysis for an HF Alkylation Unit Upgrade: ***Project Manager*** for a comparative (before and after) set of QRAs of an existing HF alkylation unit. The QRAs were used to demonstrate the benefits associated with three mitigation measures (individually or in concert); rapid dump system, water curtains, and water cannons. *Client: Ampol*

LNG Facility Siting Safety Study for Gulf of Mexico Gravity Based Structure (GBS) for Use as an Import Terminal: Participant in a study to determine if the proposed LNG import terminal could be built upon a GBS in the Gulf of Mexico. The study included meshing the import terminal design with applicable LNG standards. This involved vapor dispersion, fire radiation, and vapor cloud explosion modeling for numerous hypothetical releases of LNG. *Client: ChevronTexaco*

Consequence Analysis Course: ***Instructor*** for an introductory course covering the principals of consequence analysis. Course covers accidental releases and the methods to predict the extent of potential fire, explosion and toxic hazards. Course is provided through the Mary Kay O'Conner Process Safety Center located at Texas A&M University. *Client: Texas A&M University, College Station, Texas*

Quantitative Risk Analysis for an LNG Import Terminal: ***Project Manager*** for a full QRA of an LNG import terminal on Mexico's Pacific coast. QRA was submitted to Mexico's Department of the Environment (SEMARNAT). Other studies completed under this contract included a qualitative risk analysis and siting study per Mexico's Secretary of Energy (CRE). *Client: ConocoPhillips.*

Quantitative Risk Analysis for Natural Gas Gathering Pipeline Network: ***Project Manager*** for a full QRA of a natural gas gathering network. Wellhead and pipeline releases were evaluated. Toxic (Hydrogen Sulfide) and fire radiation hazards were defined. QRA was submitted to US EPA's technical staff for review and approved. *Client: Union Pacific Resources.*

Quantitative Risk Analysis for an HF Alkylation Unit Addition to Existing Refinery: ***Project Manager*** for a full QRA of a new HF alkylation unit to be added to an existing refinery. QRA was submitted to local and Federal Israeli authorities. Evaluation included acid additive as well as water spray mitigation systems. *Client: Paz Ashdod Refinery Limited.*

Quantitative Risk Analysis for a Proposed Gas-to-Liquids Facility: ***Project Manager*** for a full QRA of a new gas-to-liquids facility along the Nigerian coast. QRA was submitted to local and Federal Nigerian authorities. *Client: Chevron Energy and Technology*

David W. Johnson
Quest Consultants Inc.®
Principal Engineer

EDUCATION

1969	Ph.D., Chemical Engineering University of Oklahoma, Norman, Oklahoma
1965	B.S., Chemical Engineering University of Texas, Austin, Texas

EXPERIENCE

1989 - Present Quest Consultants Inc., Norman, Oklahoma
Principal Engineer

Facilitated HAZOP, SIL/LOPA, What If?, HAZID, and HEMP (bowtie) reviews for numerous projects, including:

- Chemical complex
- Oil and gas processing facilities
- Refinery units
- LNG baseload (export) facilities
- LNG import facilities
- Offshore oil and gas processing

Performed consequence modeling for siting and safety studies of several liquefied natural gas (LNG) facilities. Involved in numerous consequence analysis, risk analysis, and facility siting studies involving refineries, gas plants, pipelines, and petrochemical plants.

Responsible for Quest's testing and research programs, and for the development and implementation of analytical models for predicting accidental release rates, aerosol formation, pool spreading, heat transfer, and vaporization rates.

Directed all major aspects of several experimental programs involving releases of hazardous fluids.

- On-site tests conducted to determine if the flammable cloud produced by emergency venting of ullage gas from a crude oil pipeline surge tank could reach associated process areas.
- Two field-test programs conducted to evaluate the efficacy of additives designed to reduce the amount of aerosol formed during accidental releases from HF alkylation units.
- Release tests conducted for the Petroleum Environmental Research Foundation (PERF) to determine the potential for a hydrocarbon/sulfuric acid emulsion to form an aerosol upon its release.

David W. Johnson

- Aerosol release tests conducted for the CCPS at the DOE Nevada Test Site.

Assisted in development of RMPPs for several refinery units in California, including alkylation, hydrotreating, hydrocracking, catalytic cracking, delayed coking, and product storage. This work included a review of unit HAZOPs, selection of potential release scenarios, estimation of accident frequencies, and supervision of hazard modeling.

1983 - 1989 Energy Analysts, Inc., Norman, Oklahoma
Principal Engineer

Conducted HAZOP study for a proposed refinery expansion in the Philippines. Trained refinery personnel as HAZOP leaders for future HAZOP studies.

Responsible for the technical content of the final safety analysis report (FSAR) for the Big Hill Strategic Petroleum Reserve (SPR) site. Tasks completed included identification and analysis of hazards; review of site layout and design; and equipment, piping, and instrumentation evaluation. Made recommendations to improve site operations.

Developed risk models in the areas of fire and thermal radiation, rate of fluid release from containment, and Gaussian dispersion for EAHAP hazards analysis computer code.

Designed and participated in several large-scale outdoor fire and fluid release tests designed to determine the burning and release characteristics of hydrocarbon fluids.

1977 - 1983 Applied Technology Corporation, Norman, Oklahoma
Vice President

Developed mathematical models in the areas of fire radiation, vapor dispersion, and heat transfer. Applied these models to LNG facility safety studies.

Designed and conducted several large-scale outdoor tests involving fire and materials combustion. Tests included the burning and subsequent extinguishment of hexane, LPG, and carbon disulfide pool fires.

1970 - 1977 University Engineers, Inc., Norman, Oklahoma
Senior Engineer

Project manager of a semi-works seawater desalination project utilizing direct contact heat transfer and freezing to produce potable water.

Involved in several large-scale outdoor fire tests to study the flammability characteristics of thermal insulation products.

1965 Celanese Fibers Corporation, Rock Hill, South Carolina
Development Engineer

Adapted existing plant equipment for new and more productive uses, developed computer models describing machine operations, and assisted in plant start-up.

David W. Johnson

PROFESSIONAL MEMBERSHIPS

National Society of Professional Engineers
American Institute of Chemical Engineers
Oklahoma Society of Professional Engineers

PUBLICATIONS

Authored more than twenty-five papers in the areas of physical properties, kinetics, and process plant safety.

RELEVANT PROJECT EXPERIENCE

Process Hazards Analysis (PHA) of a Large LNG Liquefaction Facility: ***Directed*** the HAZOP and LOPA studies for a large scale grass roots LNG facility in Texas. Studies for both the FEED and EPC were performed as well as Management of Change (MOC) reviews. *Client: Sabine Pass LNG*.

Process Hazards Analysis (PHA) of a Large LNG Liquefaction Facility: ***Directed*** the HAZOP and LOPA studies for a large scale grass roots LNG facility in Australia. Studies for both the FEED and EPC were performed as well as Management of Change (MOC) reviews. *Client: Gladstone LNG*.

Process Hazards Analysis (PHA) of Multiple Nitrogen Rejection (NRU) and Cryogenic Processing Units: ***Directed*** the HAZOP and MOC studies for multiple nitrogen rejection and cryogenic units in Texas, New Mexico, and Wyoming. *Client: BCCK Engineering*.

Process Hazards Analysis (PHA) of a Refinery Crude Unit: ***Directed*** the HAZOP for a refinery crude unit. *Client: Caltex Corporation (now part of ChevronTexaco)*.

Development of an Improved Hydrogen Fluoride Alkylation Catalyst: ***Project Manager*** for a research project involving the large scale outdoor release of anhydrous hydrogen fluoride (HF) and hydrogen fluoride mixed with vapor pressure reducing additives. The purpose of the testing was to validate lab scale results with respect to the reduction of aerosol formation of the released HF. *Client: Mobil Research and Development Corporation (now a part of Exxon/Mobil).*

Development of an Improved Hydrogen Fluoride Alkylation Catalyst: ***Project Manager*** for a research project involving the large scale outdoor release of anhydrous hydrogen fluoride (HF) and hydrogen fluoride mixed with vapor pressure reducing additives. The purpose of the testing was to validate lab scale results with respect to the reduction of aerosol formation of the released HF. *Client: Texaco Inc.(now a part of ChevronTexaco).*

APPENDIX D

NOISE IMPACT ASSESSMENT

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Navcon Engineering Report No. 143110d (Rev D)

NOISE IMPACT ASSESSMENT

for the

Tesoro LA Refinery Integration and Compliance Project

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1.0 INTRODUCTION

This report documents the results of the Tesoro Refining & Marketing Company, LLC Los Angeles Refinery Integration and Compliance Project (Project) noise impact assessment. The principal objectives were as follows:

1. To determine whether the noise impact during the facility construction will exceed the Project's thresholds of significance, and

2. To determine whether noise impact associated with the operation of the new equipment will exceed the Project's thresholds of significance (refer to ***Section 4.1***).

The noise impact assessment included the following tasks:

1. An environmental noise survey was conducted to document the current ambient noise environment in the residential communities closest to the refinery (refer to ***Section 4.2***).

2. A three dimensional acoustical model was developed to predict the residential noise impact from the construction activities and from the operation of the new equipment (refer to ***Section 4.3***).

3. A noise impact assessment was conducted by comparing the noise levels predicted from the construction activities and operation of the new equipment the thresholds of significance (refer to ***Section 4.4***).

The noise impact assessment project was conducted by Hans Forschner and Jim Steedman of Navcon Engineering under the direction of Debbie Bright Stevens, Senior Vice President, Environmental Audit Inc.

2.0 TESORO LA REFINERY INTEGRATION AND COMPLIANCE PROJECT OVERVIEW

The purpose of the Tesoro LA Refinery Integration and Compliance Project is to further integrate the Tesoro Wilmington Operations with the Tesoro Carson Operations. As part of the proposed project the operation of the adjacent facilities will be redesigned to comply with federally mandated Tier 3 gasoline specification and State and local regulations mandating emission reductions.

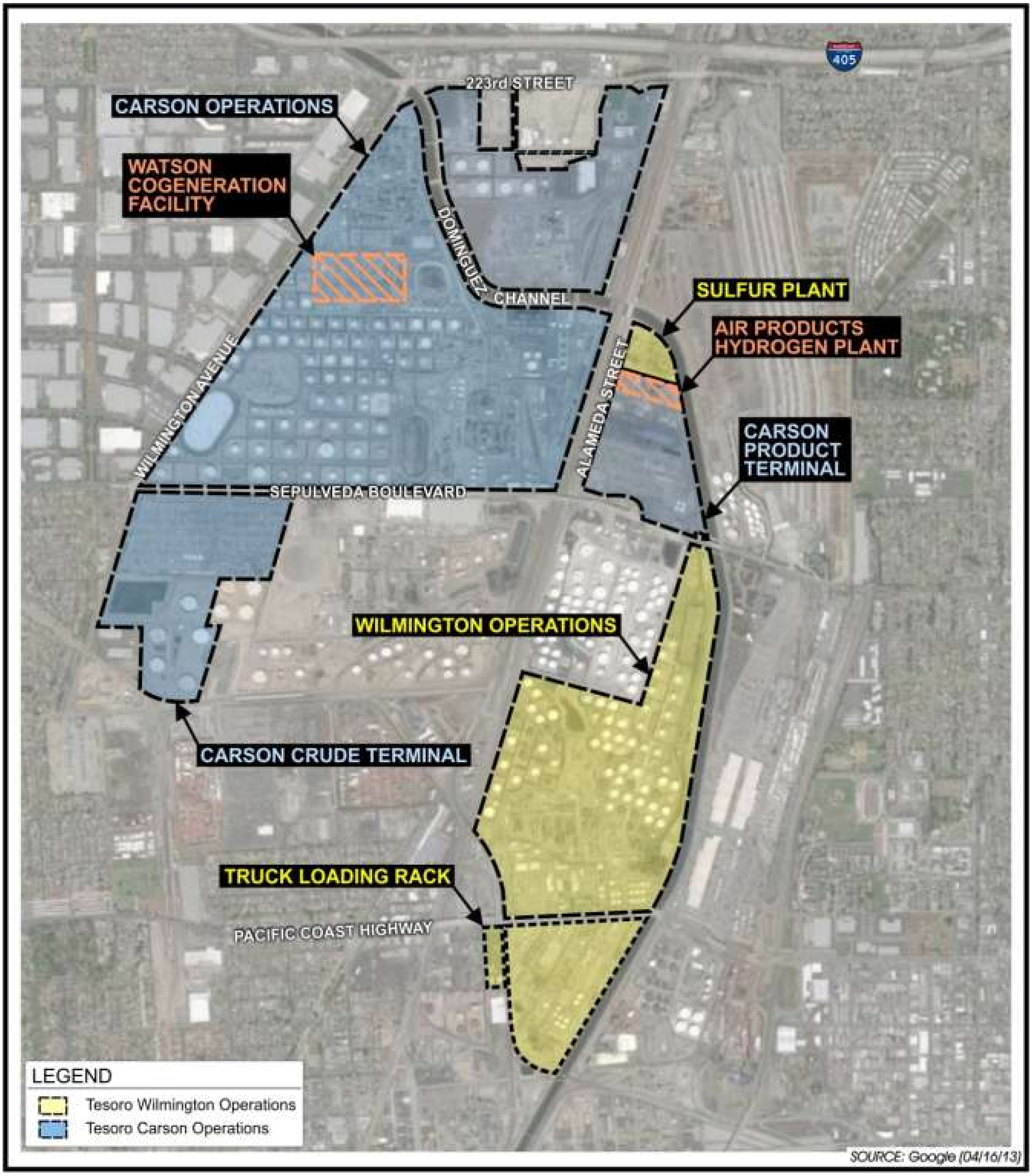
The Tesoro Wilmington Operations is located within Wilmington, a community under the jurisdiction of the City of Los Angeles, at 2101 East Pacific Coast Highway, Wilmington, Los Angeles County, California 90744. The Tesoro Carson Operations is located at 2350 E 223rd Street, Carson, California, 90745. ***Aerial Photo 2-1*** depicts the Site Location Map. Both new and modified equipment, as well as connecting piping, will be located within portions of the Refinery under both the City of Carson jurisdiction and the City of Los Angeles jurisdiction.

The Wilmington Operations are bounded to the north by Sepulveda Boulevard, to the west by Alameda Street, to the south by railroad tracks, and to the east by the Dominguez Channel (see ***Aerial Photo 2-1***). The Wilmington Operations are bisected by Pacific Coast Highway, with the larger portion of the Wilmington Operations to the north of Pacific Coast Highway and the smaller portion to the south. The Refinery and all adjacent areas are zoned for heavy industrial use (M3-1).

The Carson Operations are bounded by Wilmington Avenue to the west, 223rd Avenue to the north, Alameda Street to the east, and Sepulveda Boulevard to the south. The Dominguez Channel flows through the Carson Operations, dividing the property into two sections: Northeastern and Southern (see ***Aerial Photo 2-1***). Several industrial/commercial facilities and the 405 Freeway border the Carson Operations to the north. The Alameda Corridor and other industrial facilities, including the Tesoro Coke Barn, the Air Products Hydrogen Plant, and the Tesoro Sulfur Plant, are located to the east of the Carson Operations. Commercial and residential areas are located to the west of the Carson Operations. The Phillips 66 Refinery and tank farms occupy the area located to the south of the Tesoro Carson Operations.

The Carson Operations and all adjacent properties are zoned manufacturing heavy (MH). The closest residential area to the Carson Operations is approximately 250 feet southwest of the Refinery on the southwest corner of the Sepulveda Boulevard/Wilmington Avenue intersection.

Aerial Photo 2-1, Site Plan (Source: Environmental Audit)



3.0 EXECUTIVE SUMMARY

The principal objective of this study was to assess whether the Tesoro LA Refinery Integration and Compliance Project will result in a significant noise impact to the surrounding communities based upon the project's thresholds of significance. The project's thresholds of significance were derived from the project's applicable noise regulations.

The results of the noise analysis concluded that:

- The proposed Tesoro LA Refinery Integration and Compliance Project construction noise will not represent a significant noise impact to the residential communities.

- The proposed Tesoro LA Refinery Integration and Compliance Project operations noise will not represent a significant noise impact to the residential communities.

4.0 ENVIRONMENTAL NOISE

4.1 Noise Impact Assessment Criteria & Thresholds of Significance

The Tesoro LA Refinery Integration and Compliance Project noise impact assessment criteria are based upon the noise metrics, limits, methods and procedures contained in the City of Los Angeles Municipal Code, the City of Los Angeles Noise Element, the City of Carson Municipal Code, the California Department of Health Services, the Federal Rail Administration, and the Federal Highway Administration. The regulations and codes are described in detail in Tesoro LA Refinery Integration and Compliance Project EIR.

The Tesoro LA Refinery Integration and Compliance Project noise impact assessment was conducted by applying the most stringent limits from each of the regulations listed above. The Project noise limits are described in three thresholds of significance.

NOI-1 Construction of the proposed Project would have a significant noise impact if construction noise levels exceed the local noise ordinances, or if the noise ordinance is currently exceed, if ambient Community Noise Exposure Levels (CNEL) would be increased by three (3) dBA or more at a noise sensitive receptor during the construction period.

NOI-2 Operation of the proposed project would have a significant noise impact if proposed project operational noise levels exceed any of the local noise ordinances at the site boundary or, if the noise threshold is currently exceed, ambient CNEL noise levels would be increased by three (3) dBA or more at a noise sensitive receptor.

NOI-3 Operation of the new equipment would have a significant noise impact if Daytime ambient noise level (Leq,day) or Nighttime ambient noise level (Leq,night) would be increased by three (3) dBA or more at a noise sensitive receptor.

4.2 Environmental Noise Survey

Environmental noise surveys were conducted to characterize the existing ambient noise environment. No immediate residential communities are located to the North or North-East of the facilities. The surveys were conducted between August 29th, 2014 and September 18th, 2014 and focused on the closest residential communities located to the South-East, South-West and West of the Tesoro Refineries.

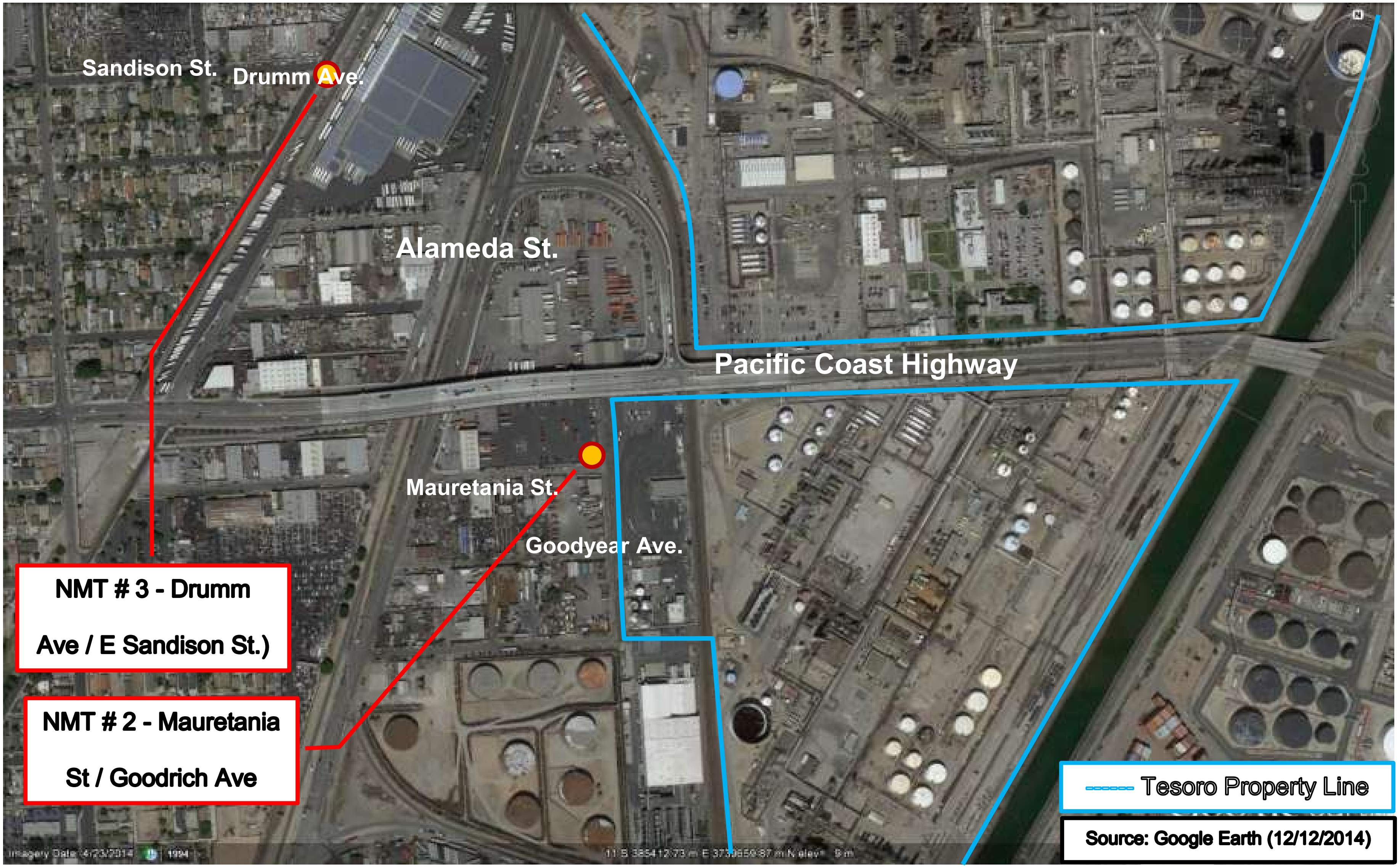
The noise monitoring locations are shown in ***Aerial Photo 4-1***, ***Aerial Photo 4-2, Aerial Photo 4-3*** and ***Photo 4-1*** through ***Photo 4-4***. The noise data was collected using stationary noise monitoring terminals (NMT). Each NMT was placed in a weatherproof enclosure and collected data continuously throughout the survey period.

The noise monitoring terminals were based upon Larson Davis (LD) Model 831 sound level analyzers, LD PRM813 pre-amplifiers and 377B02 microphones. The analyzers meet the American National Standards Institute (ANSI) S1.4, 1983 specification for Type I (Precision) sound level meters. The system sensitivities were set immediately prior to each survey using a Bruel & Kjaer (B&K) Type 4230 Sound Level Calibrator. The system sensitivities were checked immediately following each survey using the B&K 4230 calibrator to confirm that the sensitivity had not changed. The NMTs are calibrated on an annual basis in accordance with the National Institute of Standards Technology (NIST).

The hourly Leq and L90 levels are presented in ***Graphic 4-1*** through ***Graphic 4-4***. The daytime noise levels (Ld), evening noise levels (Le), nighttime noise levels (Ln) and community noise equivalent noise levels (CNEL) are presented in ***Table 4-1***.

Aerial Photo 4-1, Noise Monitoring Locations (NMT # 1, Sep. 18 - 19, 2014)

Aerial Photo 4-2, Noise Monitoring Locations (NMT # 2, Aug. 31 - Sep. 1, 2014, NMT # 3, Aug. 29 – Aug. 30, 2014)



Aerial Photo 4-3, Noise Monitoring Locations (NMT # 4, August 29 – August 30, 2014)

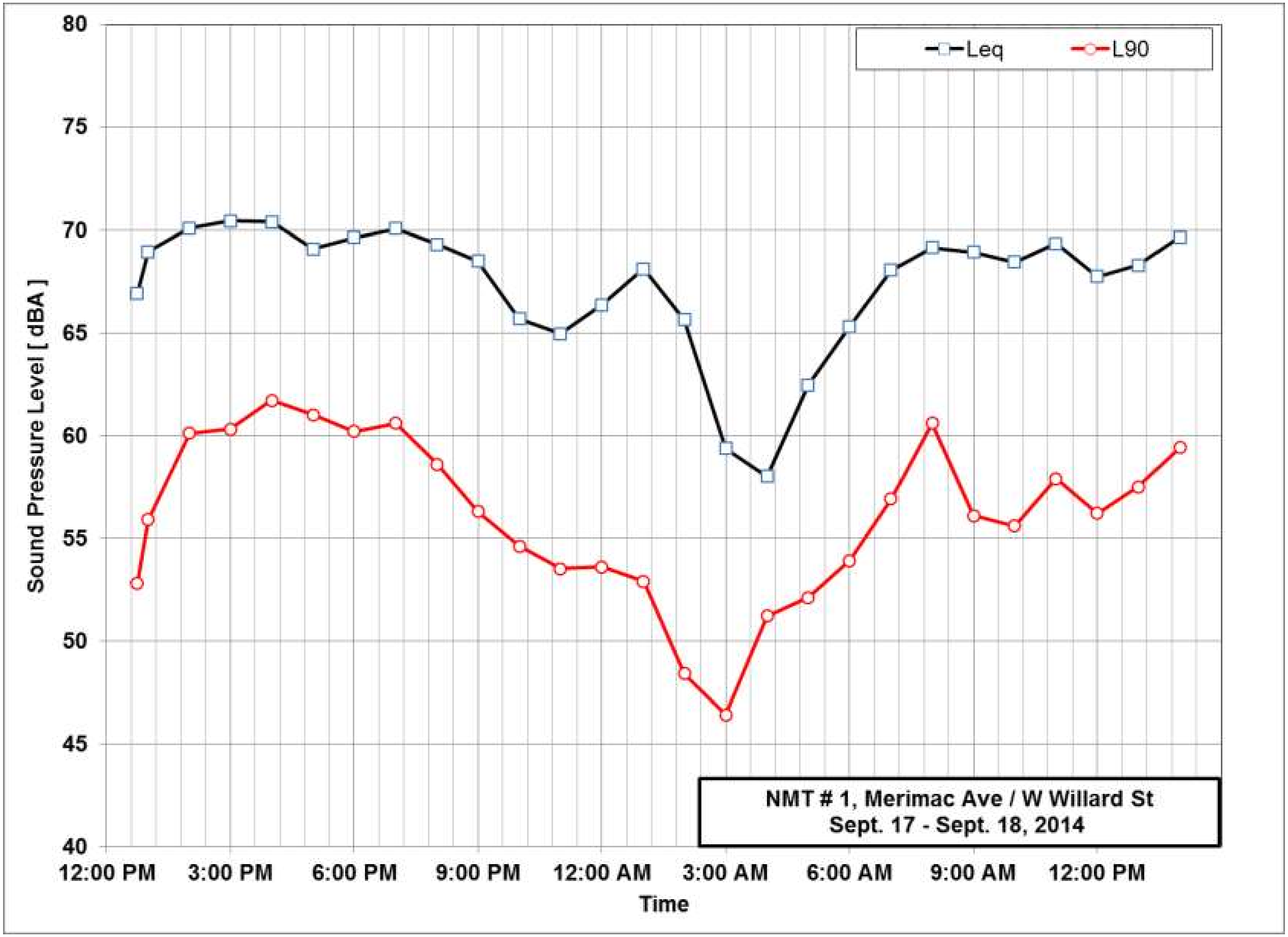
Photo 4-1 NMT-1 Merimac Ave / W Willard St.

Photo 4-2 NMT-2 Mauretania St / Goodrich Ave.

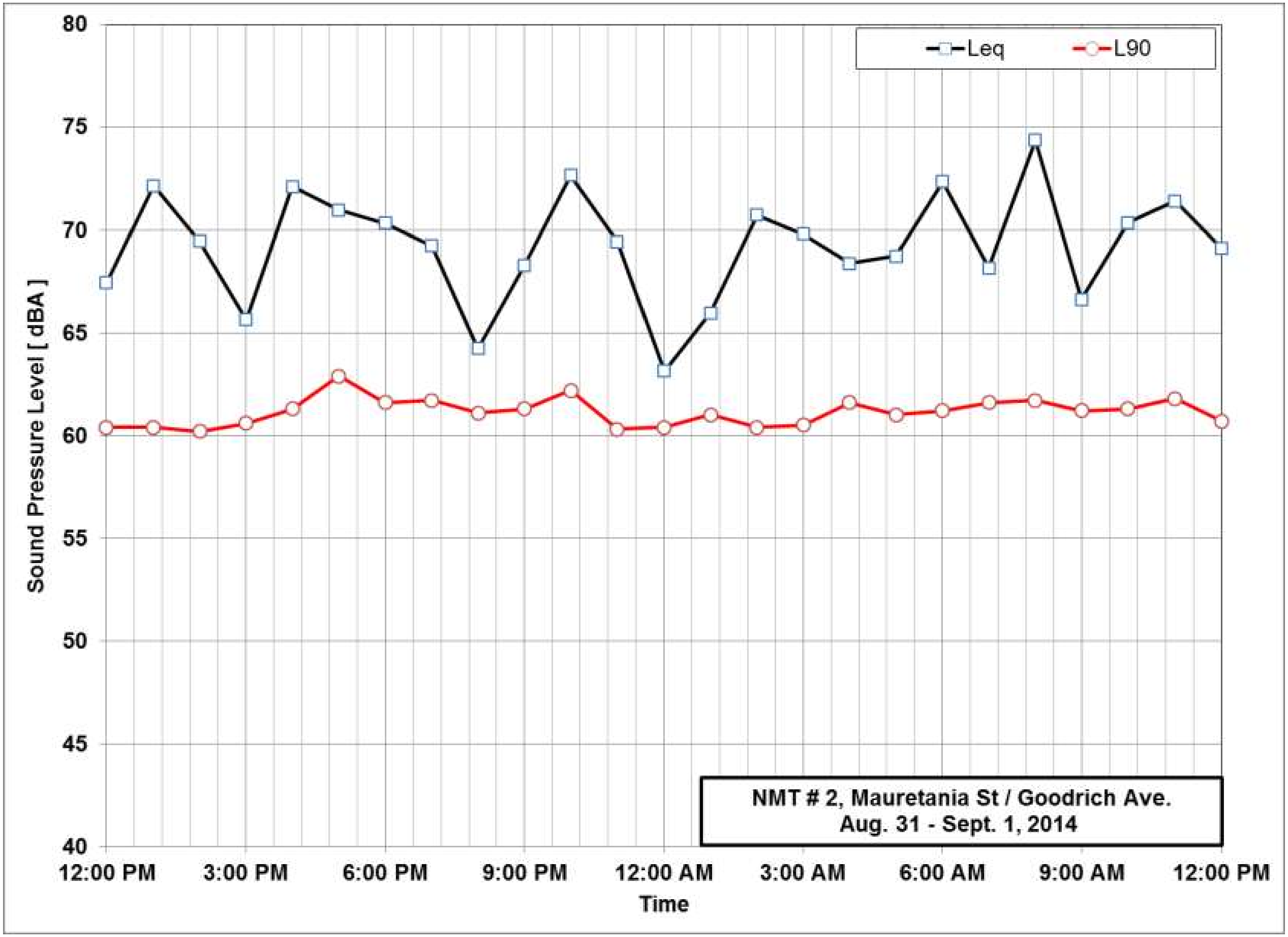
Photo 4-3 NMT-3 Drumm Ave / E Sandison St.

Photo 4-4, NMT-4 Wilmington Ave / E Pacific St.

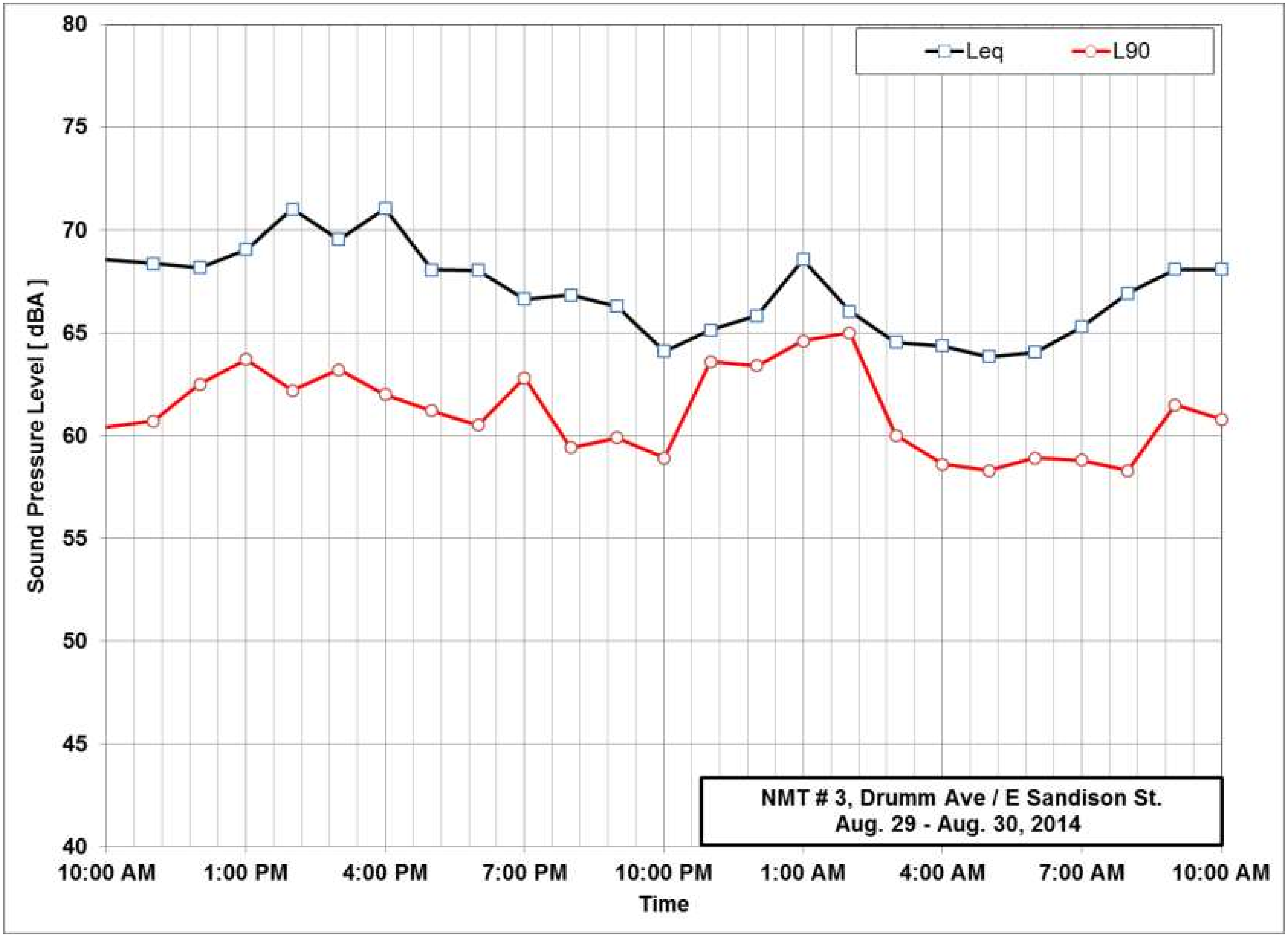
Graphic 4-1 NMT # 1, Merimac Ave / W Willard St. Sound Pressure Level (Sep. 17th - 18th, 2014)



Graphic 4-2 NMT # 2, Mauretania St / Goodrich Ave. Sound Pressure Level (Aug. 31 - Sep. 1, 2014)



Graphic 4-3 NMT # 3, Drumm Ave / E Sandison St. Sound Pressure Level (Aug. 29 - 30, 2014)



Graphic 4-4 NMT # 4, Wilmington Ave / E Pacific St. Sound Pressure Level (Aug. 29 - 30, 2014)

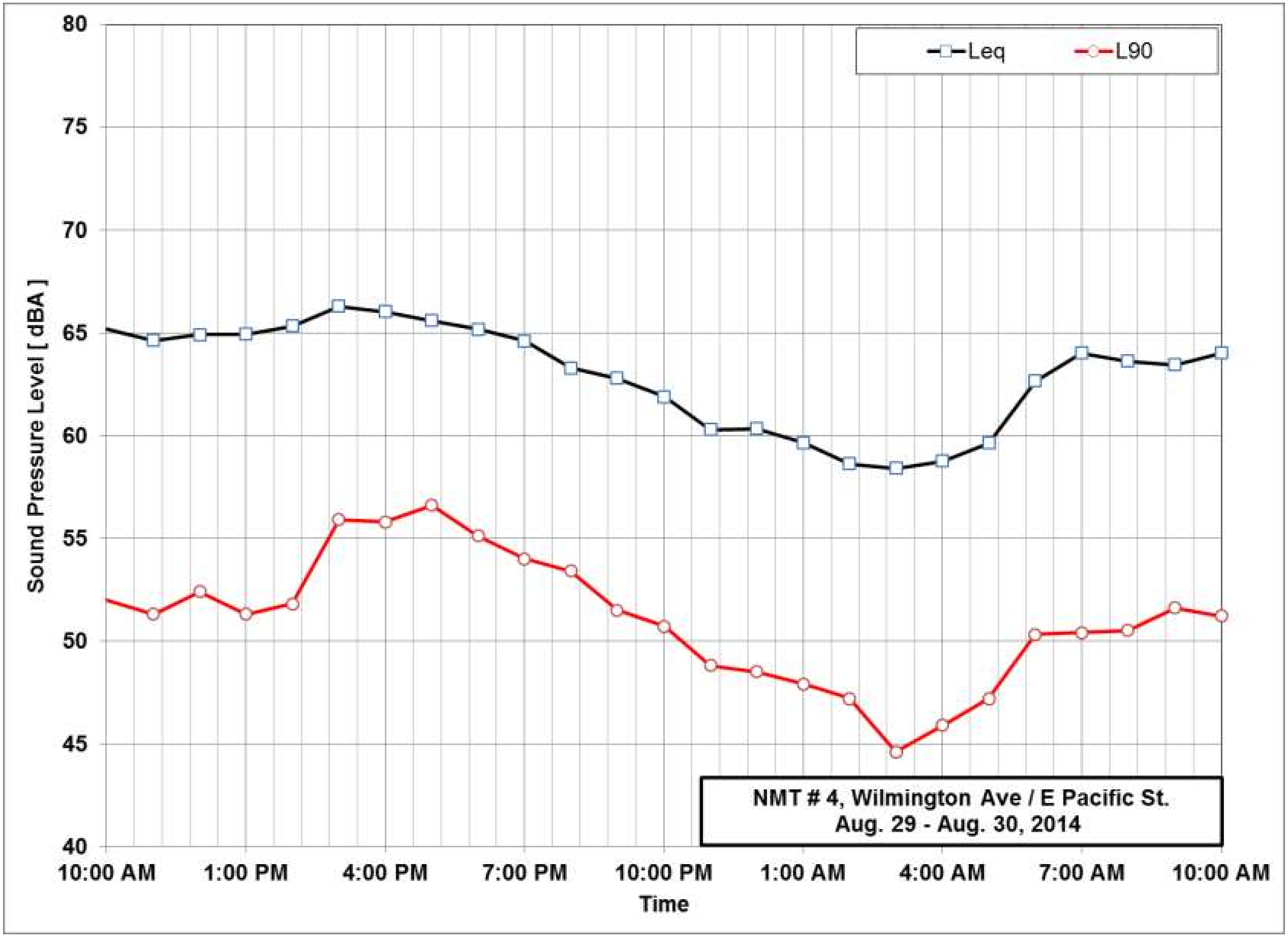


Table 4-1, Noise Monitoring Terminals - Daytime/Evening/Nighttime Levels & CNELs

	Average Hourly Leq			
Time	**NMT-1**	**NMT-2**	**NMT-3**	**NMT-4**
00:00:00	66.4	63.1	65.8	60.3
01:00:00	68.1	66.0	68.6	59.6
02:00:00	65.6	70.7	66.0	58.6
03:00:00	59.4	69.8	64.5	58.4
04:00:00	58.0	68.4	64.4	58.8
05:00:00	62.5	68.7	63.8	59.6
06:00:00	65.3	72.3	64.1	62.7
07:00:00	68.0	68.2	65.3	64.0
08:00:00	69.1	74.4	66.9	65.8
09:00:00	68.9	66.6	68.1	64.9
10:00:00	68.4	70.3	68.5	65.2
11:00:00	69.3	71.4	68.4	64.6
12:00:00	67.7	67.4	68.2	64.9
13:00:00	68.3	72.1	69.1	64.9
14:00:00	70.1	69.5	71.0	65.3
15:00:00	70.4	65.6	69.5	66.3
16:00:00	70.4	72.1	71.0	66.0
17:00:00	69.1	71.0	68.1	65.6
18:00:00	69.6	70.3	68.0	65.2
19:00:00	70.1	69.2	66.6	64.6
20:00:00	69.3	64.2	66.8	63.3
21:00:00	68.5	68.3	66.3	62.8
22:00:00	65.7	72.7	64.1	61.9
23:00:00	65.0	69.4	65.1	60.3
CNEL	72.8	76.4	72.7	68.2
Ldn	72.3	76.3	72.4	67.7
Leq,day	68.2	69.6	67.8	64.3
Leq,even	62.3	60.7	59.6	56.6
Leq,night	64.9	69.8	65.4	60.3

CNEL = The Community Noise Equivalent Level (average level with 5 dB penalty added between 7 pm and 10 pm and a 10 dB penalty added between 10 pm and 7 am)

Ldn = Day/Night Noise Equivalent Level (average level with a 10 dB penalty added between 10 pm and 7 am)

Leq,day = The Daytime averaged sound pressure level (averaged 7 am to 7 pm)

Leq,even = The Evening averaged sound pressure level (averaged 7 pm to 10 pm)

Leq,night = The Nighttime averaged sound pressure level (averaged 10 pm to 7 am)

4.3 Acoustical Noise Models

The Tesoro LA Refinery Project noise impact was determined by (**1**) developing three dimensional noise models of the Project, (**2**) predicting the Project noise levels at the selected community locations and (**3**) comparing the predicted the noise with the existing community ambient noise levels at the locations described in ***Section 4.2***.

The noise models were developed using the noise modeling software, SoundPLAN™. SoundPLAN™ is a standards based program with more than twenty national and international noise modeling guidelines. The following noise prediction standards were used during the performance of this project:

- ISO 9613-1,Acoustics - Attenuation of sound during propagation outdoors - Part 1: Calculation of the absorption of sound by the atmosphere

- ISO 9613, Acoustics -- Attenuation of sound during propagation outdoors - Part 2, Acoustics - Attenuation of Sound During Propagation Outdoors

The noise model geometry is presented in ***Figure 4-1*** through ***Figure 4-7***. The sides of the tanks, containers, buildings, etc. were modeled as reflective surfaces and also as diffractive bodies (the yellow and gray shaded surfaces). The Noise Sources are shown as red spheres (point sources) and red surfaces (area sources). A light blue line outlines the perimeter of each operation. The surrounding roads are displayed as grey surfaces. Most of the ground within the refinery and adjacent areas are covered with gravel, concrete or asphalt. Therefore, it was modeled as a hard reflective surface with an absorption coefficient of 0.25.

Construction Noise Model:

- The Project will include 23 construction activities scheduled over a 5 year period. The Construction Noise Model represents a worst case scenario by assuming that all construction activities are performed at the same time.

- The construction equipment noise emission levels were based upon FHWA Roadway Construction Noise Model (RCNM Manual).

- The construction equipment was modeled as a line of stationary point sources along the pipe-ways. The noise level predicted from each point source location and the maximum predicted was used for the noise impact assessment.

- During plant operation the construction activities were assumed to take place during a single twelve hour work shift (7 am to 7 pm). During project related shutdowns / turnarounds, the construction activities were assumed to be conducted during two twelve hour shifts (i.e., 24 hours per day).

Operational Noise Model:

- The operational noise model includes all new noise producing equipment.

- The sound power emission levels of the new equipment were estimated using the equipment dimensions (L x W x H) and a sound pressure level of 85 dBA at a distance of 3 foot. The equipment dimensions were provided by Tesoro engineers. Refineries in general are specifying an 85 dBA noise limit for all new equipment. The 85 dBA noise limit originates from the regulation set forth by the Occupational Safety Health Administration (OSHA).

The detailed noise model input data is presented in ***Section 5.0, Appendix A, Three Dimensional Noise Model Input Data***.

Figure 4-1 Model Geometry with Topo Data - 3D View Wilmington Operation from South

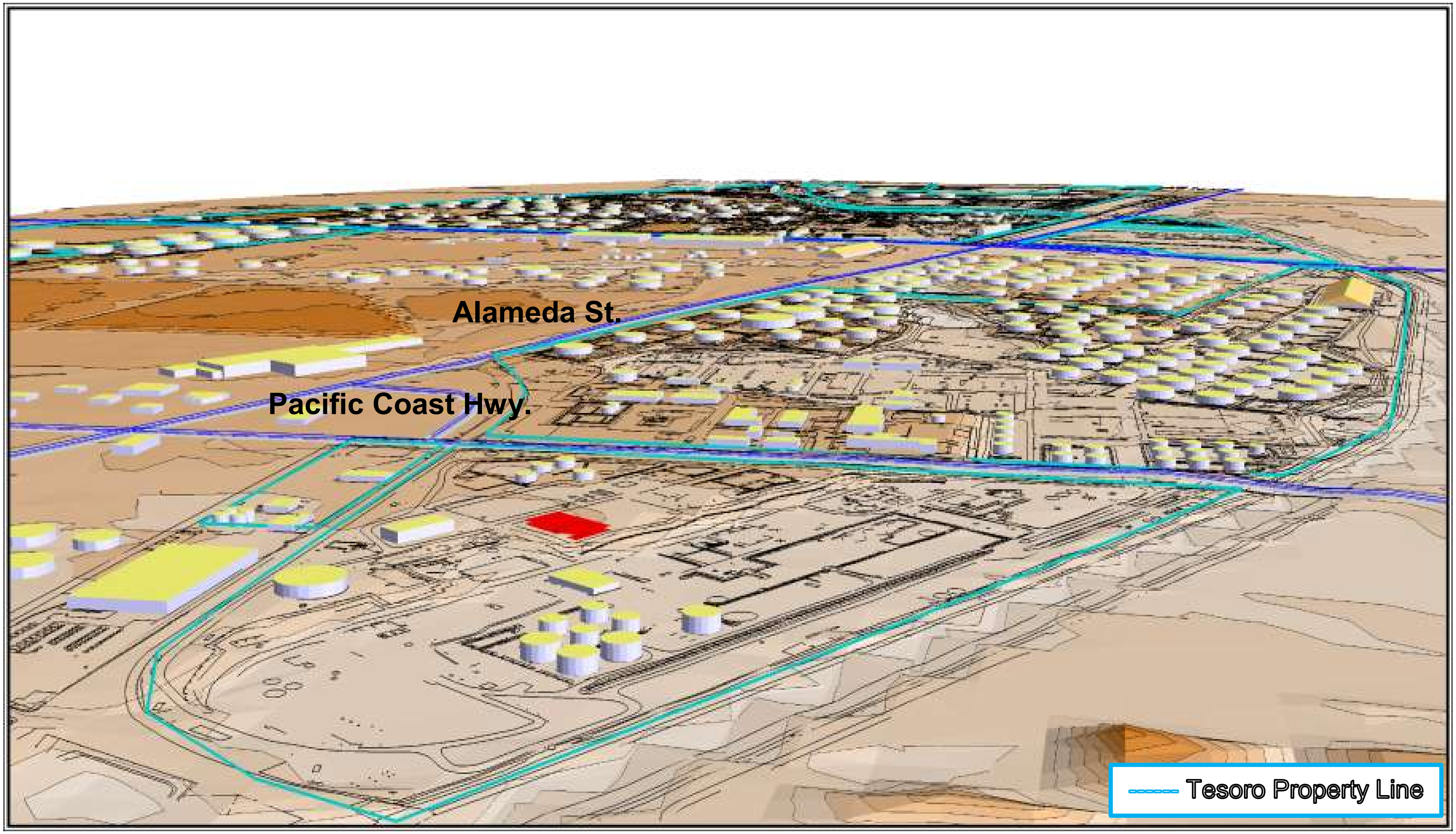


Figure 4-2 Model Geometry with Topo Data - 3D View Wilmington Operation from North

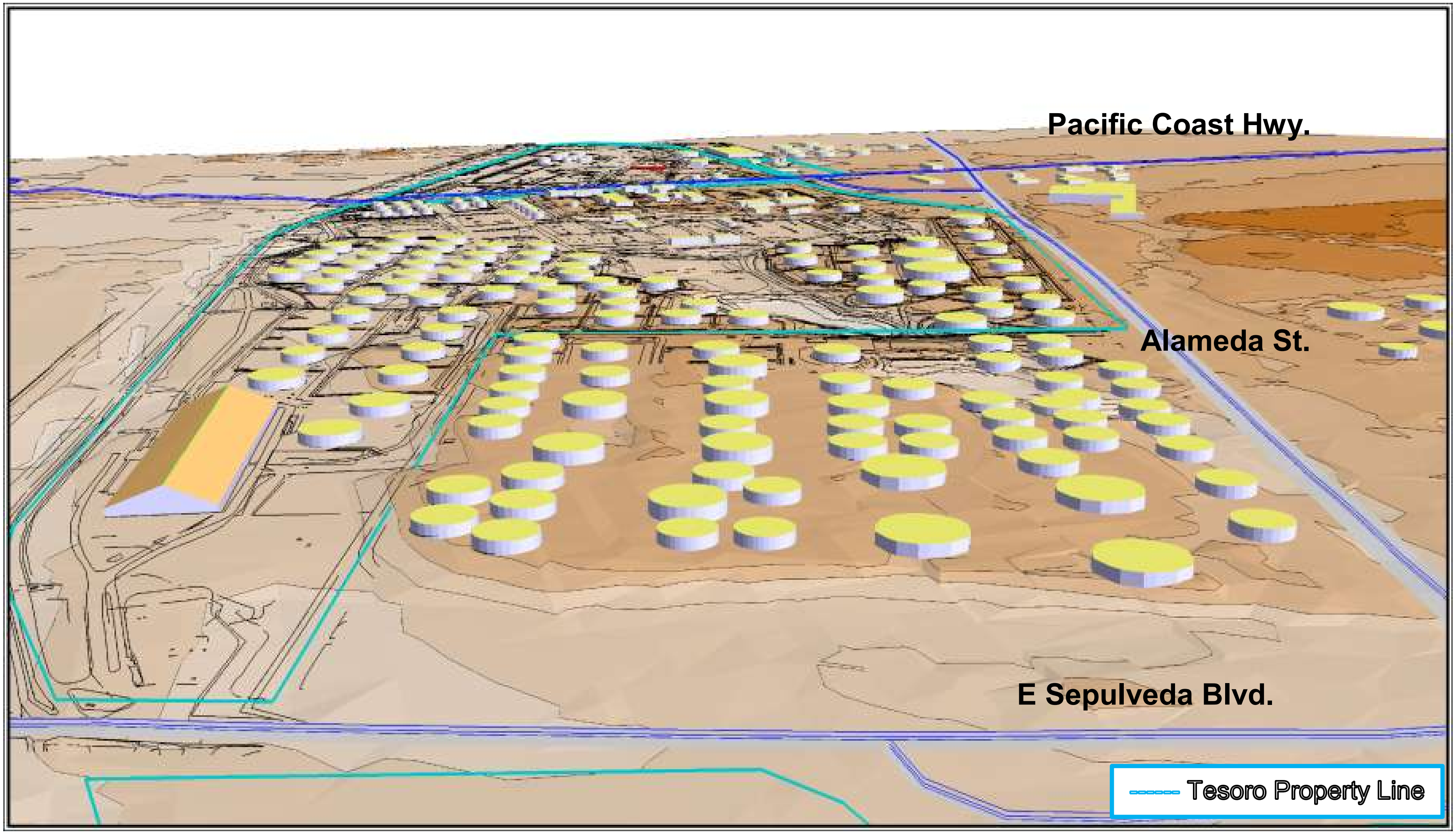


Figure 4-3 Model Geometry with Topo Data - 3D View Carson Operation from South West

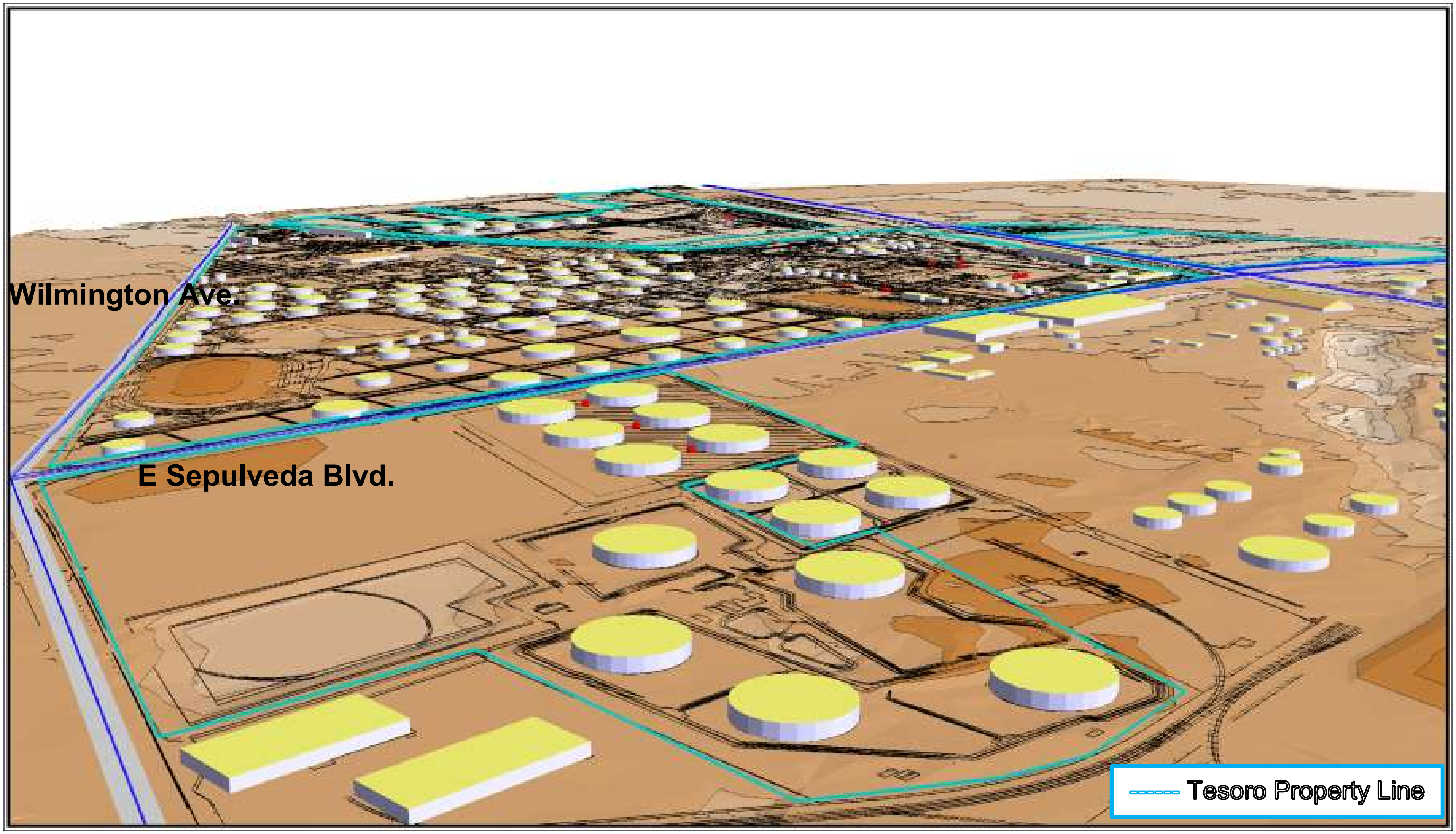


Figure 4-4 Model Geometry with Topo Data - 3D View Carson Operation from South East

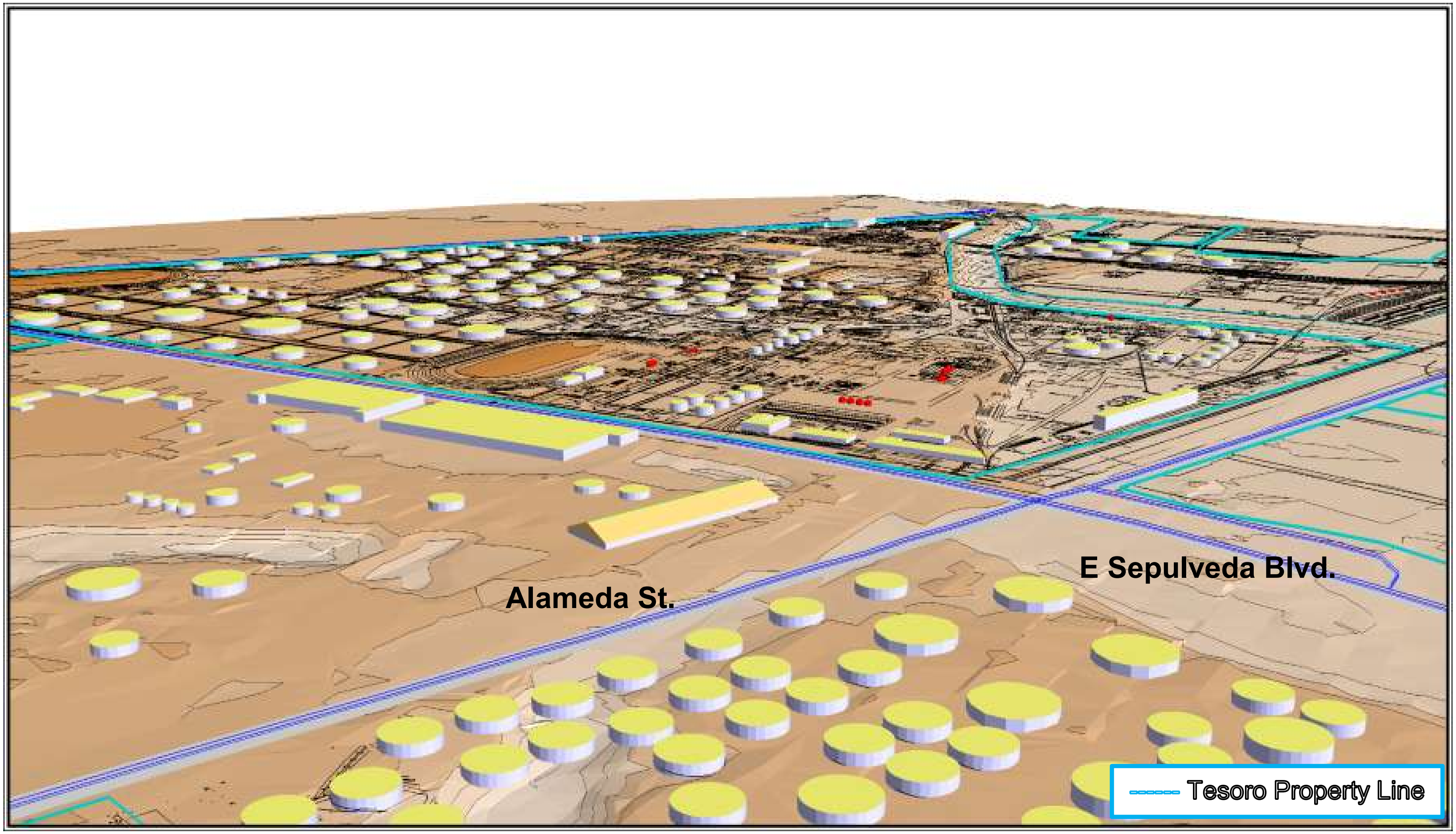


Figure 4-5 Model Geometry with Topo Data - 3D View Carson Operation from East

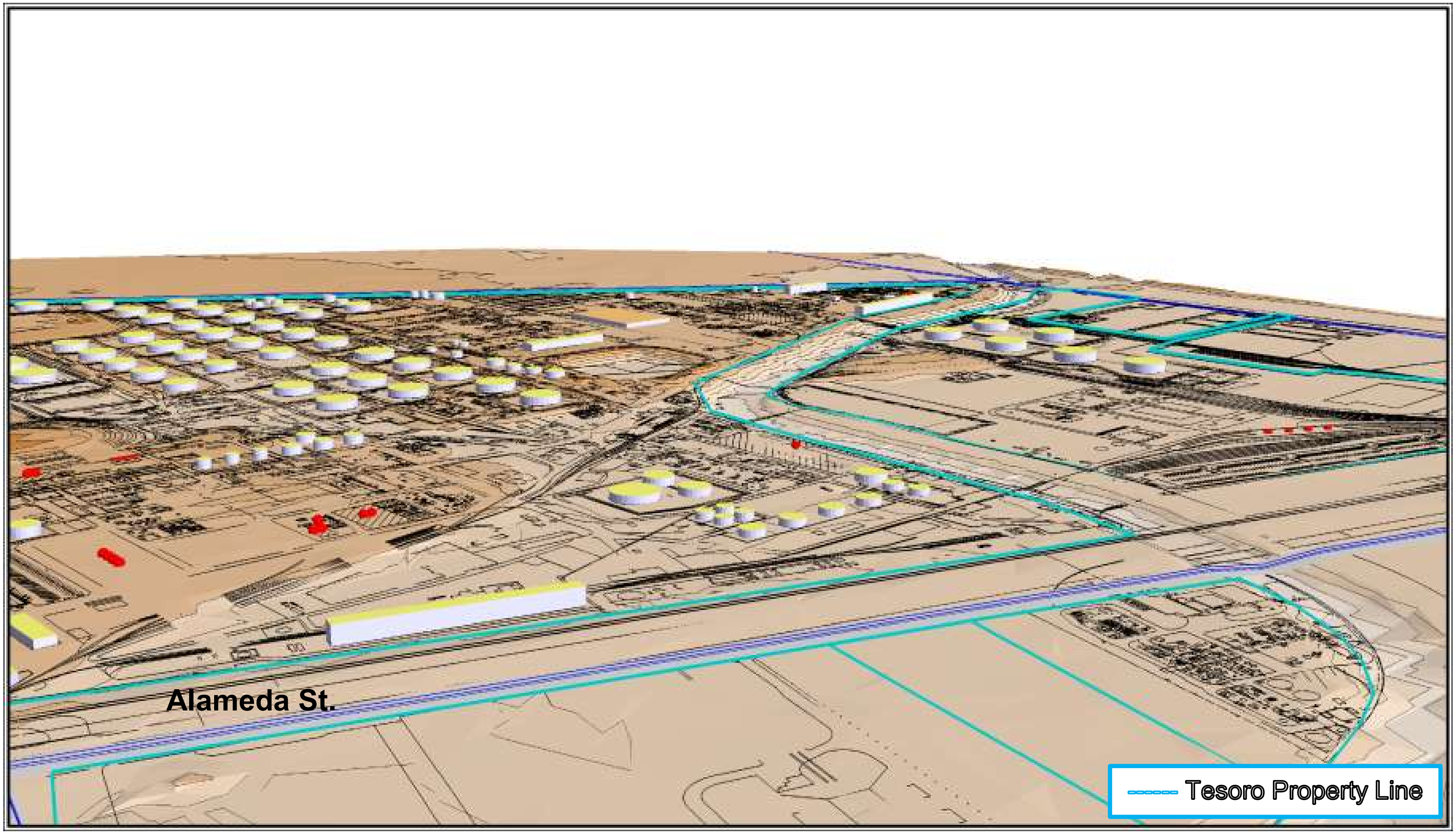


Figure 4-6 Model Geometry Construction Tesoro Refinery (Carson, Wilmington) - 2D View

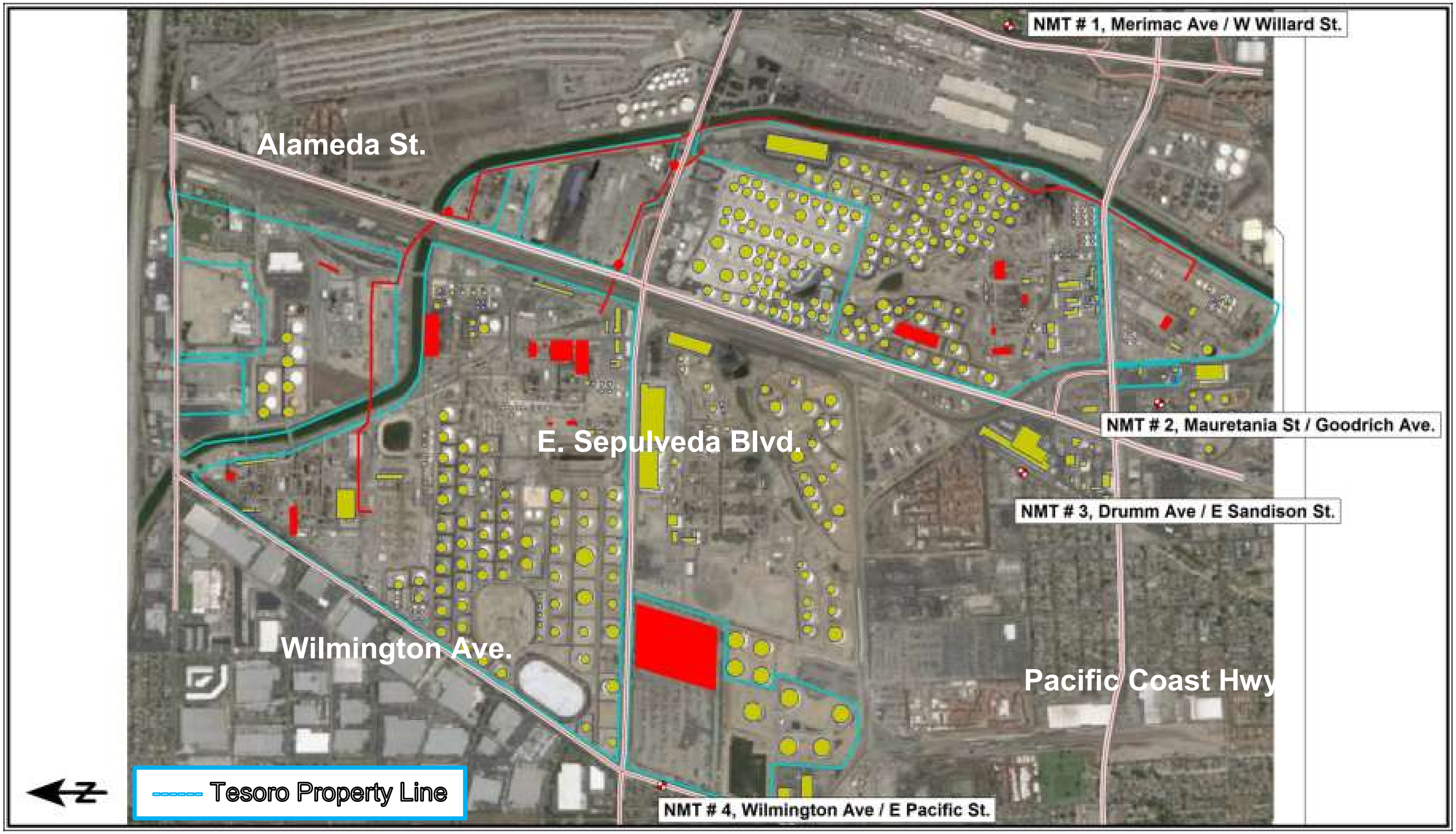
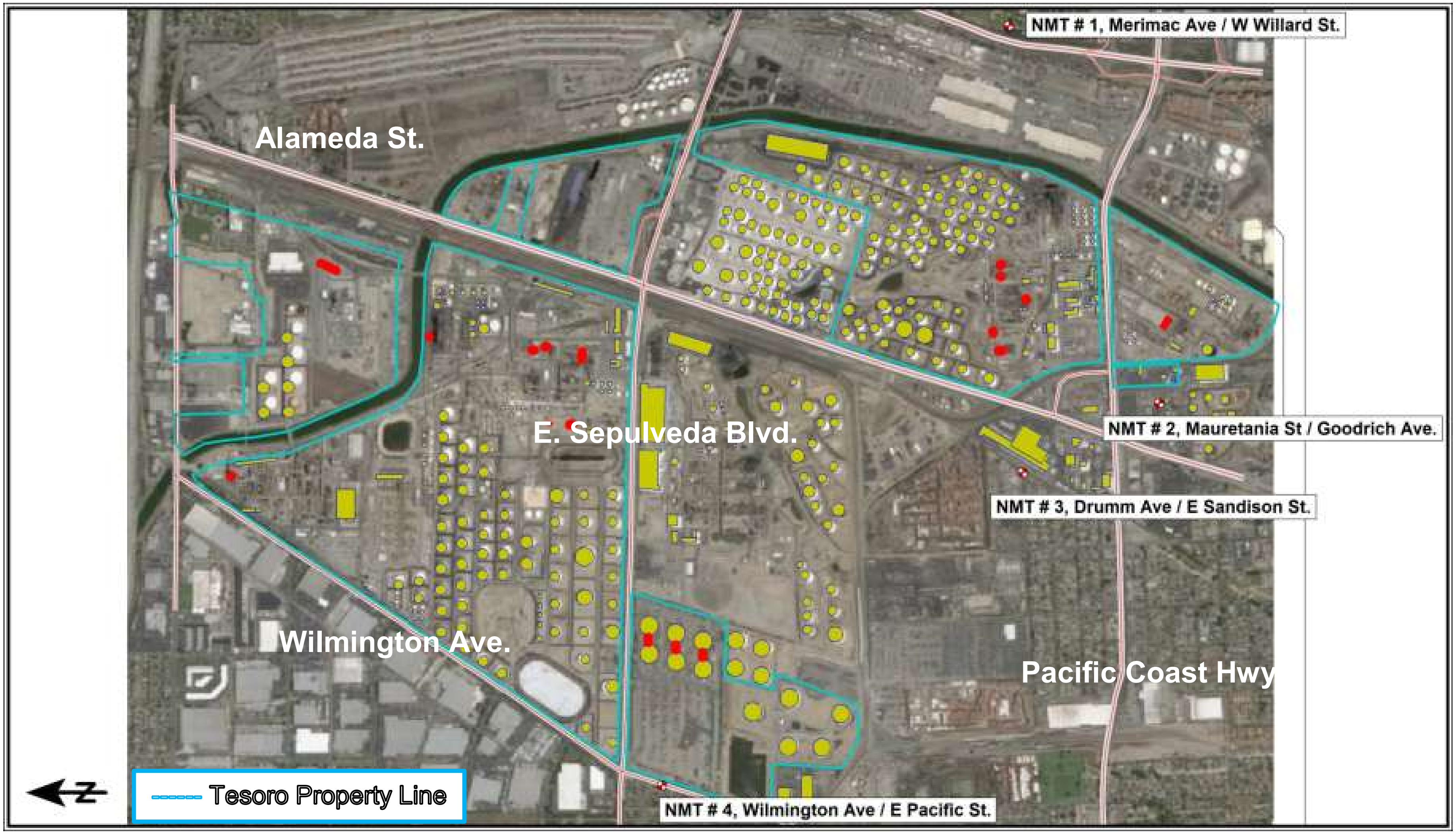


Figure 4-7 Model Geometry New Equipment Tesoro Refinery (Carson, Wilmington) - 2D View



4.4 Acoustical Noise Model Assessment

The 3D acoustical model was used to generate noise contour maps over the refinery property and adjacent residential communities.

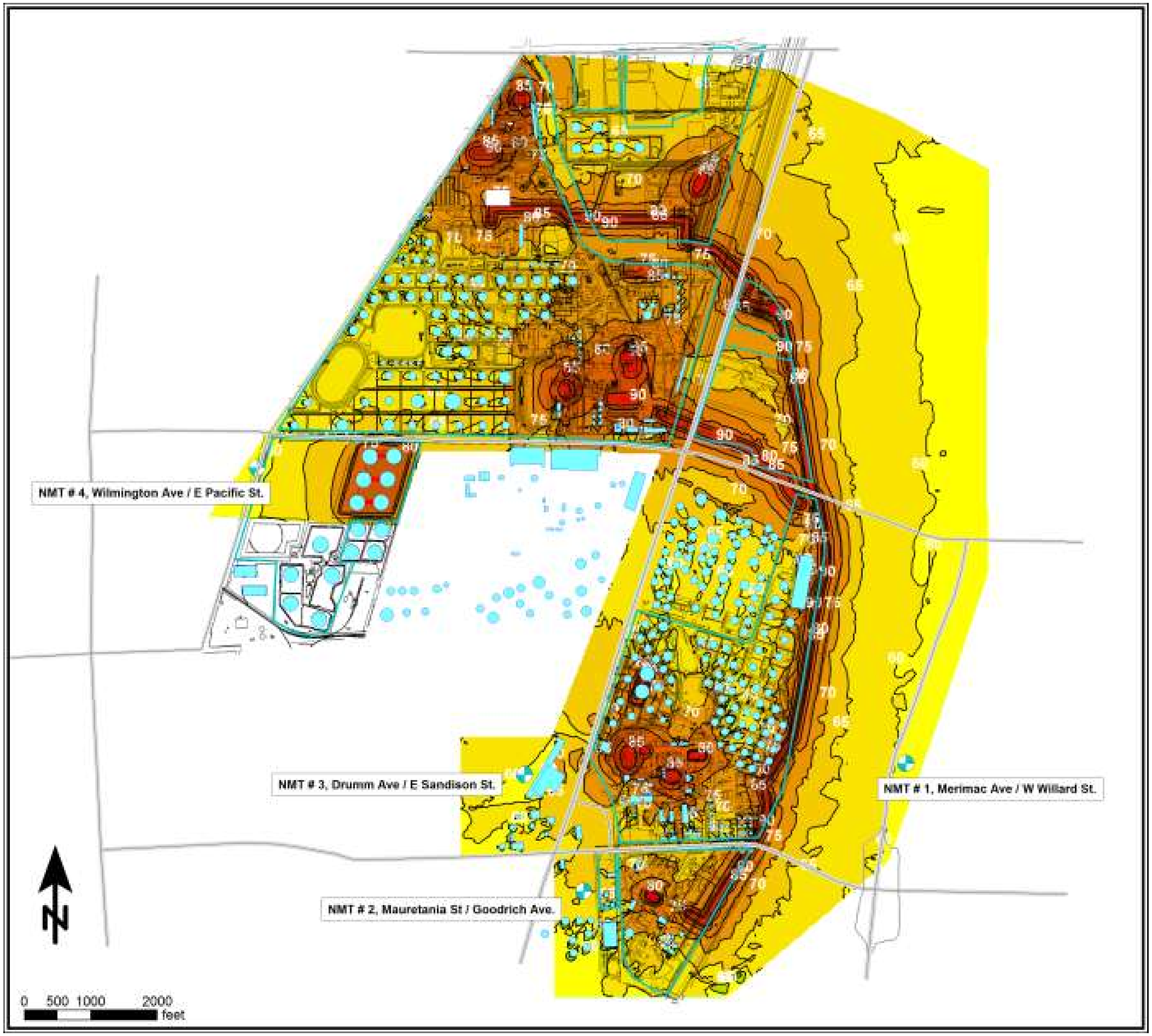
- The Plant Construction Noise contours are shown in ***Noise Map 4-1, Noise Map 4-2*** and ***Noise Map 4-3*** (CNEL, Leq,day, Leq,night respectively).
- The Plant Operational Noise contours are shown in ***Noise Map 4-4*** and ***Noise Map 4-5*** (CNEL and Leq,day/Leq,night respectively).

The 3D acoustical model was used to predict the noise level at the four sensitive receptor locations.

- The sensitive receptor locations are listed in ***Table 4-2***.
- The change in noise level predicted during the Plant Construction is listed in ***Table 4-3***.
- The change in noise level predicted during the Plant Operation is listed in ***Table 4-4***.

The noise level predictions indicate that the Tesoro LA Refinery Integration and Compliance Project are below all of the significance thresholds and do not exceed any of the significance thresholds.

Noise Map 4-1 Plant Construction CNEL Contours



TESORO
Los Angeles Refinery

Noise Contours
All Construction

Noise level
CNEL [dBA]

> 90
85 - 90
80 - 85
75 - 80
70 - 75
65 - 70
60 - 65
55 - 60
50 - 55
45 - 50
40 - 45
<= 40

Navcon Engineering Network
701 W. Las Palmas Dr.
Fullerton CA, 92835
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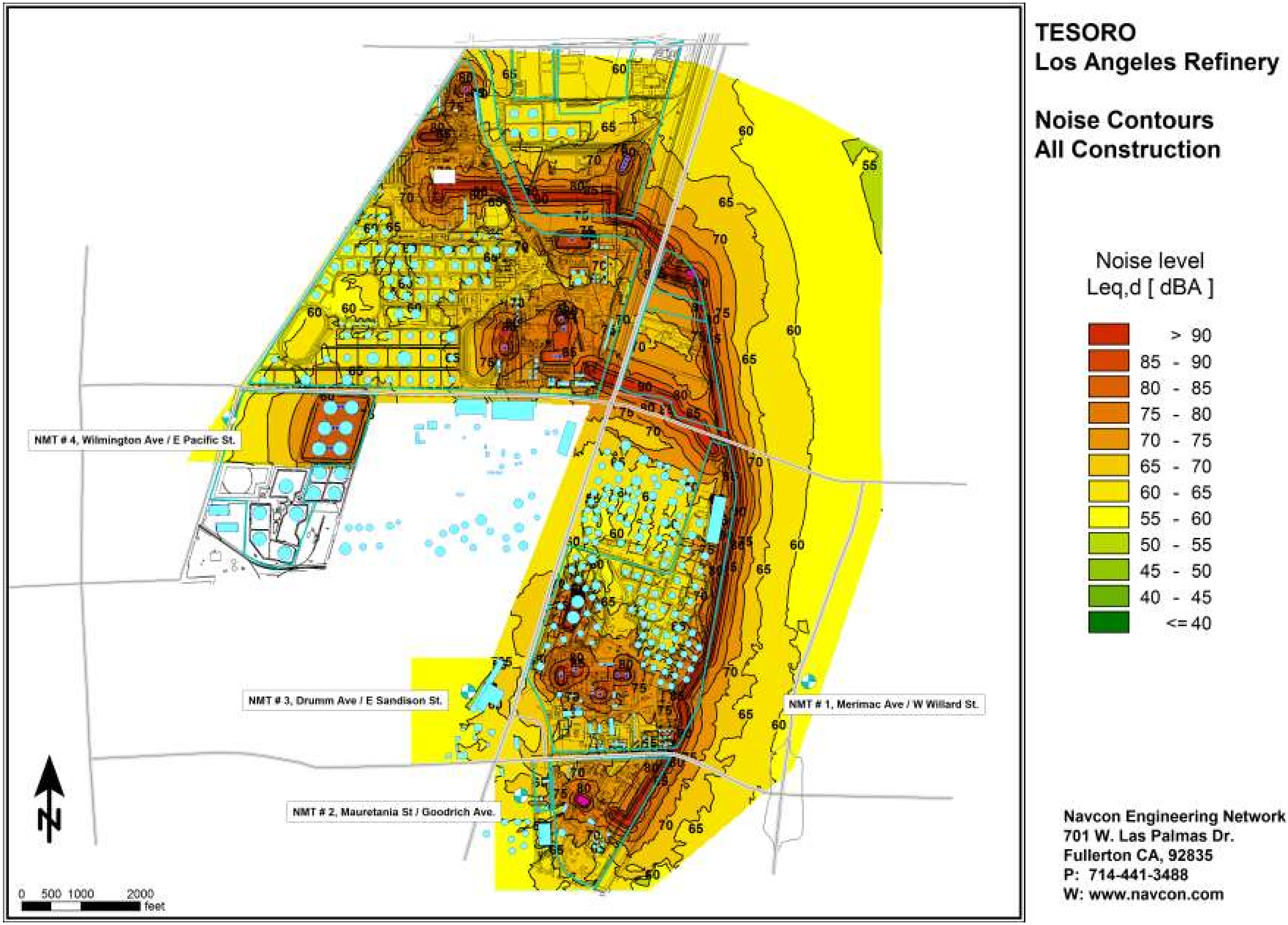
W: www.navcon.com

Noise Map 4-2 Plant Construction Leq,day Contours



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Noise Map 4-3 Plant Construction Leq,night Contours

TESORO
Los Angeles Refinery

Noise Contours
All Construction

Noise level
Leq,n [dBA]

> 90
85 - 90
80 - 85
75 - 80
70 - 75
65 - 70
60 - 65
55 - 60
50 - 55
45 - 50
40 - 45
<= 40

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Noise Map 4-4, Plant Operation CNEL Contours (New Equipment Only)

TESORO
Los Angeles Refinery

Noise Contours
Operation -
New Equipment

Noise level
CNEL [dBA]

> 90
85 - 90
80 - 85
75 - 80
70 - 75
65 - 70
60 - 65
55 - 60
50 - 55
45 - 50
40 - 45
<= 40

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Noise Map 4-5, Plant Operation Leq,day / Leq,night Contours (New Equipment Only)

TESORO
Los Angeles Refinery

Noise Contours
Operation -
New Equipment

Noise level
Leq,d/n [dBA]

> 90
85 - 90
80 - 85
75 - 80
70 - 75
65 - 70
60 - 65
55 - 60
50 - 55
45 - 50
40 - 45
<= 40

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Table 4-2, Project Sensitive Receptor Locations

NMT	Address	City, State
#1	Merrimac Ave. / W Willard St.	Long Beach, CA
#2	Mauretania St. / Goodrich Ave.	Los Angeles, CA
#3	Drumm Ave. / E Sandison St.	Los Angeles, CA
#4	Wilmington Ave. / E Pacific St.	Carson, CA

Table 4-3, NOI-1 Construction Noise CNEL (Baseline vs. Baseline & Construction)

	Baseline 2014			**Construction**			**Baseline & Construction**			**Overall Change**		
Receptor Location	**CNEL**	**Leq,d**	**Leq,n**	**CNEL**	**Leq,d**	**Leq,n**	**CNEL**	**Leq,d**	**Leq,n**	**CNEL**	**Leq,d**	**Leq,n**
NMT #1, Merrimac Ave. / W Willard St.	72.8	69.2	64.9	59.0	57.7	50.2	73.0	69.5	65.1	**0.2**	**0.3**	**0.1**
NMT #2, Mauretania St. / Goodrich Ave.	76.4	70.1	69.8	64.4	63.7	54.9	76.7	71.0	69.9	**0.3**	**0.9**	**0.1**
NMT #3, Drumm Ave. / E Sandison St.	72.7	68.4	65.4	58.6	57.2	50.0	72.9	68.7	65.6	**0.2**	**0.3**	**0.1**
NMT #4, Wilmington Ave. / E Pacific St.	68.2	65.0	60.3	59.0	58.2	49.6	68.7	65.8	60.6	**0.5**	**0.8**	**0.4**

Note: The noise level predictions indicate that the construction activities will have a negligible impact at the residential locations. The largest increase in the Community Noise Exposure Level (CNEL) is predicted to be 0.3 dBA. The largest daytime increase (Leq,day) is predicted at 0.9 dBA while the largest nighttime increase (Leq,night) is predicted at 0.4 dBA. The predicted change in noise level is less than the threshold of significance, 3 dB (refer to ***Section 4.1***).

Table 4-4, NOI-2 & NOI-3 New Equipment CNEL, Leq,d/n (Baseline vs. Baseline with Equip.)

	2014 Measured Baseline Levels			Predicted New Equipment Levels			2014 Baseline + New Equipment			Predicted Change (+ increase)		
Receptor Location	**CNEL**	**Leq,d**	**Leq,n**	**CNEL**	**Leq,d**	**Leq,n**	**CNEL**	**Leq,d**	**Leq,n**	**CNEL**	**Leq,d**	**Leq,n**
NMT #1, Merrimac Ave. / W Willard St.	72.8	69.2	64.9	45.5	38.8	38.8	72.8	69.2	64.9	**0.0**	**0.0**	**0.0**
NMT #2, Mauretania St. / Goodrich Ave.	76.4	70.1	69.8	58.9	52.2	52.2	76.5	70.2	69.9	**+ 0.1**	**+ 0.1**	**+ 0.1**
NMT #3, Drumm Ave. / E Sandison St.	72.7	68.4	65.4	45.2	38.6	38.6	72.7	68.4	65.4	**0.0**	**0.0**	**0.0**
NMT #4, Wilmington Ave. / E Pacific St.	68.2	65.0	60.3	42.4	35.8	35.8	68.2	65.0	60.3	**0.0**	**0.0**	**0.0**

Note: The noise level predictions indicate that the Plant operation will have a negligible impact at the residential locations. The largest increases in the Community Noise Exposure Level (CNEL), the daytime level (Leq,day) and the nighttime level (Leq,night) is predicted to be 0.1 dBA. The predicted change in noise level is less than the threshold of significance, 3 dB (refer to ***Section 4.1***).

5.0 APPENDIX A, THREE DIMENSIONAL NOISE MODEL INPUT DATA

Table 5-1, Noise Model Operational Data Proposed Project

No.	Plant	Equipment	Number of New Equipment	Lw, dBA
1	No. 51 Vacuum Unit Modifications (C)	Heat Exchanger	5	n/a
		Pumps (Electric)	3	102
		Coalescers	2	n/a
2	HCU (C)	Heat Exchanger	3	n/a
		Pumps (Electric)	2	106
		Knockout drum	1	n/a
3	Interconnecting Pipelines	Pumps (Electric)	2	n/a
4	HCU Modification (W)	Steam Generators	1	n/a
		Air Cooler	1	103
		Pumps (Electric)	2	100
5	Liquid Petroleum Gas (LPG) Rail Unloading (C)	Pumps (Electric)	4	102
		Ten additional rail cars		n/a
6	HTU-4 (W)	Pumps (Electric)	4	101
		Heat Exchanger	11	n/a
		Surge drum	1	n/a
		Salt dryer	1	n/a
		Coalescer	1	n/a

Table 5-2, Noise Model Operational Data Proposed Project (Cont'd)

No.	Plant	Equipment	Number of New Equipment	Lw, dBA
7	Naphtha HDS Unit Modification (C)	tower	1	n/a
		caustic scrubber	1	n/a
		K/O drums	2	n/a
		coalescer	1	n/a
		accumulator	1	n/a
		condensate pot	1	n/a
		heat exchnagers	14	n/a
		air cooler	1	108
		pumps (electric)	6	101
8	Naphtha Isomerization Unit Modifications (C)	Gas Treater	1	n/a
		Tower	1	n/a
		Flash drum	2	n/a
		Heat Exchanger	2	n/a
		Pumps (Electric)	4	101
9	Alkylation Modification (C)	Heat Exchanger	6	n/a
		Filter /Coalescer	1	n/a
		Truck loading rack	1	n/a
		Pumps (Electric)	2	101
10	Mid Barrel Distillate Treater	Piping		n/a

Table 5-3, Noise Model Operational Data Proposed Project (Cont'd)

No.	Plant	Equipment	Number of New Equipment	Lw, dBA
10	LHU Modifications (C)	Heat Exchanger	5	n/a
		Steam Nozzle	1	n/a
		Coalescer	1	n/a
		Salt Dryer		n/a
		Condensate pot	1	n/a
13	New Wet Jet Treater (C)	Pumps (Electric)	6	101
		Reactors	2	n/a
		Product Separators	2	n/a
		loading facility	1	n/a
14	New Crude Tankage (C)	Pumps (Electric)	5	105
15	PTSU (W)	Pumps (Electric)	4	101
		Absorbers		n/a
		Dryers		n/a
15	CRU-3 (W)	Heat Exchanger	3	n/a
		Pumps (Electric)	4	101
		Depropanizer tower	1	n/a
16	HTU-1 (W)	Heat Exchanger	5	n/a
		Pumps (Electric)	1	101
		Feed Surge Drum		n/a
16	HTU-2 (W)	Pumps (Electric)	2	101

Table 5-4, Noise Model Operational Data Proposed Project (Cont'd)

No.	Plant	Equipment	Number of New Equipment	Lw, dBA
17	Sulfuric Acid Regeneration Plant (W)	Pumps (Electric)	8	102
		Gas Fired Furnace	1	106
		Air Heater	1	n/a
		Steam Generator	1	107
		Blower	4	n/a
		Heat Exchanger	8	n/a
		Compressor	1	108
18, 19	SCAQMD Rule 1114 –Coker Venting(C)	Venturi	1	109
21	Wilmington Replacement Crude Tanks (W)	None		n/a

Table 5-5, Noise Model Input Data Construction Noise Emission Levels

Name	Shift (1/2)	Octave Band Sound Power Level [dBA] 63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	Sound Power Lw
No. 01 No 51 Vacuum Unit Mod Construction	2	92	108	118	118	120	118	112	104	125
No. 02 HCU Construction (C)	2	92	107	117	118	119	117	111	103	124
No. 03-11 Horiz. Drilling Equipment New Pipeline	1	82	97	107	108	109	107	101	93	114
No. 3 Interconnecting Pipe Construction	1	97	112	123	123	124	123	116	108	130
No. 04 HCU Modification Construction (W)	2	91	106	117	117	118	116	110	102	123
No. 05 Rail Car Unloading Construction	2	90	105	116	116	117	116	109	101	123
No. 06 HTU-4 Construction	2	92	107	118	118	119	118	111	103	125
No. 07 Alky Construction	2	92	107	118	118	119	118	111	103	125
No. 08 Naphtha Isomerization Construction	2	89	104	115	115	117	115	108	100	122
No. 09 Alkylation Construction	2	90	105	116	116	117	116	109	101	123
No. 10 LHU Modifications Construction	2	92	107	118	118	119	118	111	103	125
No. 13 New Wet Jet Treater Construction	1	92	107	118	118	119	118	111	103	125
No. 14 New Crude Tank Construction	1	95	110	121	121	122	120	114	106	127
No. 15 PSTU Construction	1	93	108	119	119	120	119	112	104	126
No. 16 HTU-1 Construction	1	93	108	118	119	120	118	112	104	125
No. 17 Sulfuric Acid Regeneration Plant	1	95	110	120	121	122	120	114	106	127
No. 18, 19 Coker Unit Construction	1	91	106	116	117	118	116	110	102	123
No. 20 Drilling Equipment New Electrical	1	93	109	119	119	121	119	113	105	126
No. 20 Electrical Line Construction	1	93	109	119	119	121	119	113	105	126
No. 21 Crude Tanks Equipment Construction	1	97	112	122	123	124	122	116	108	129
No. 22 Naphtha Isom Equipment	1	89	104	115	115	116	114	108	100	121

APPENDIX E

TRAFFIC IMPACT ANALYSIS

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Submitted by:

ITERIS

TESORO LOS ANGELES REFINERY INTEGRATION AND COMPLIANCE PROJECT

Traffic Impact Analysis

Draft Report

Submitted to:

South Coast Air Quality Management District

April 27, 2015

17J14-17B0

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1.0 INTRODUCTION

This report summarizes the methodology and results of a traffic impact analysis for the proposed Tesoro Refining & Marketing Company LLC (Tesoro) Los Angeles Refinery Integration and Compliance Project (proposed Project) located in the Cities of Los Angeles and Carson, California. This report follows guidelines provided by the South Coast Air Quality Management District, the California Department of Transportation, Los Angeles County and the Cities of Los Angeles and Carson.

The traffic study will look at several scenarios to describe baseline and future conditions without the project, during the construction of the project, and in the operational phase of the project. This includes analysis of baseline conditions, peak construction activities, and year 2021 traffic conditions which represent future traffic growth and operating conditions at study locations due to ambient growth, a cumulative interchange realignment project at I-405/Wilmington Avenue, and traffic generated by the proposed project. Therefore this analysis addresses the proposed project's contribution to cumulative traffic growth and congestion.

1.1 PROJECT DESCRIPTION

In June 2013, Tesoro purchased the BP West Coast Products LLC (BP) Carson Refinery, which will be further integrated with the adjacent Tesoro Los Angeles Refinery – Wilmington Operations to form the Tesoro Los Angeles Refinery (Refinery). The Refinery includes: (1) the Wilmington Operations located at 2101 East Pacific Coast Highway in the Wilmington District of the City of Los Angeles; and (2) the Carson Operations, which is the former BP Carson Refinery located at 2350 East 223rd Street in the City of Carson. The proposed project will be designed to better integrate the Tesoro Wilmington Operations and Tesoro Carson Operations.

The proposed project will occur at both the Wilmington and Carson Operations of the Tesoro Los Angeles Refinery. Tesoro will further integrate the recently purchased adjacent BP Carson Refinery (currently referred to as the Tesoro Los Angeles Refinery Carson Operations) with the existing Tesoro Los Angeles Refinery (currently referred to as the Tesoro Los Angeles Refinery Wilmington Operations). Together, the Wilmington and Carson Operations comprise the complete Tesoro Los Angeles Refinery (the Refinery).

The Tesoro Los Angeles Refinery is approximately 950 contiguous acres in size and operates within the Cities of Los Angeles and Carson. The Tesoro Wilmington Operations is located within Wilmington, a community under the jurisdiction of the City of Los Angeles, at 2101 East Pacific Coast Highway, Wilmington, Los Angeles County, California 90744. The Tesoro Carson Operations is located at 2350 East 223rd Street, Carson, California, 90745.

As part of the proposed project, both new and modified equipment, as well as connecting piping, will be located within portions of the Refinery under both the City of Carson jurisdiction and the City of Los Angeles jurisdiction.

The Wilmington Operations are bounded to the north by Sepulveda Boulevard, to the west by Alameda Street, to the south by railroad tracks, and to the east by the Dominguez Channel. The Wilmington Operations are bisected by Pacific Coast Highway, with the larger portion of the Wilmington Operations to the north of Pacific Coast Highway and the smaller portion to the south. The Refinery and all adjacent areas in the Cities of Carson and Los Angeles are zoned for heavy industrial use.

The Carson Operations are bounded by Wilmington Avenue to the west, 223rd Avenue to the north, Alameda Street to the east, and Sepulveda Boulevard to the south. The Dominguez Channel flows through the Carson Operations, dividing the property into two sections: Northeastern and Southern. Several industrial/commercial facilities and the 405 Freeway border the Carson Operations to the north. The Alameda Corridor and other industrial facilities, including the Tesoro Coke Barn, the Air Products Hydrogen Plant, and the Tesoro Sulfur Recovery Plant (SRP), are located to the east of the Carson Operations. Commercial and residential areas are located to the west of the Carson Operations. The Phillips 66 Refinery and tank farms occupy the area located to the south of the Tesoro Carson Operations. Additionally, the SRP (considered to be a portion of the Tesoro Wilmington Operations) is located at 23208 South Alameda Street in the City of Carson.

Construction activities for the proposed Project are expected to begin in third quarter of 2015 and are expected to be completed by first quarter of 2021, based on preliminary project engineering. The preliminary construction schedule for each component of the proposed project varies. The construction activities for most of the components are expected to overlap from about December 2015 to February 2017. Construction work shifts are expected to last about ten hours per day during most portions of the construction schedule. During normal construction periods, one work shift per day is expected.

Construction period employee trips will access the proposed Project site at three parking lots: parking for 550 workers will be provided from 223rd street at the northern portion of the proposed Project site, parking for 200 workers will be provided off of Alameda Street to the immediate north of Sepulveda Boulevard, and parking for 200 workers will be provided from Sepulveda Boulevard to the east of Alameda Street.

Completion of the proposed Project will result in the permanent addition of approximately ten daily truck roundtrips from the proposed Project site:

- There will be no increase in workers as compared to baseline conditions following completion of the construction phase
- Eight trucks per day will transport spent sulfuric acid from the Carson Plant to the new Sulfuric Acid Plant at Wilmington
- One truck per day will transport other materials and supplies to or from the Refinery

The project site location as well as the location of the construction worker parking lots is shown in **Figure 1**.

1.2 STUDY AREA

The following thirteen (13) intersections were identified for inclusion in the traffic impact analysis:

1. Wilmington Avenue/I-405 Northbound Ramps;
2. Wilmington Avenue/I-405 Southbound Ramps;
3. Wilmington Avenue/223rd Street;
4. Alameda Street/I-405 Northbound Ramps;
5. Alameda Street/223rd Street (along Alameda Street);
6. Alameda Street/223rd Street (along 223rd Street);
7. Alameda Street/Sepulveda Boulevard (along Alameda Street);
8. Alameda Street/Sepulveda Boulevard (along Sepulveda Boulevard);
9. I-405 Southbound Ramps/223rd Street;
10. Terminal Island Freeway (SR-103)/Sepulveda Boulevard;
11. Santa Fe Avenue/Sepulveda Boulevard;
12. SR-710 SB Ramps/Willow Street; and
13. SR-710 NB Ramps/Willow Street.

Figure 2 illustrates the study area including the locations of the study intersections analyzed in this report. The existing lane configurations of the study intersections are illustrated in **Figure 3**.

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FIGURE 1
Proposed Project Site Plan

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FIGURE 2
Study Intersection Locations

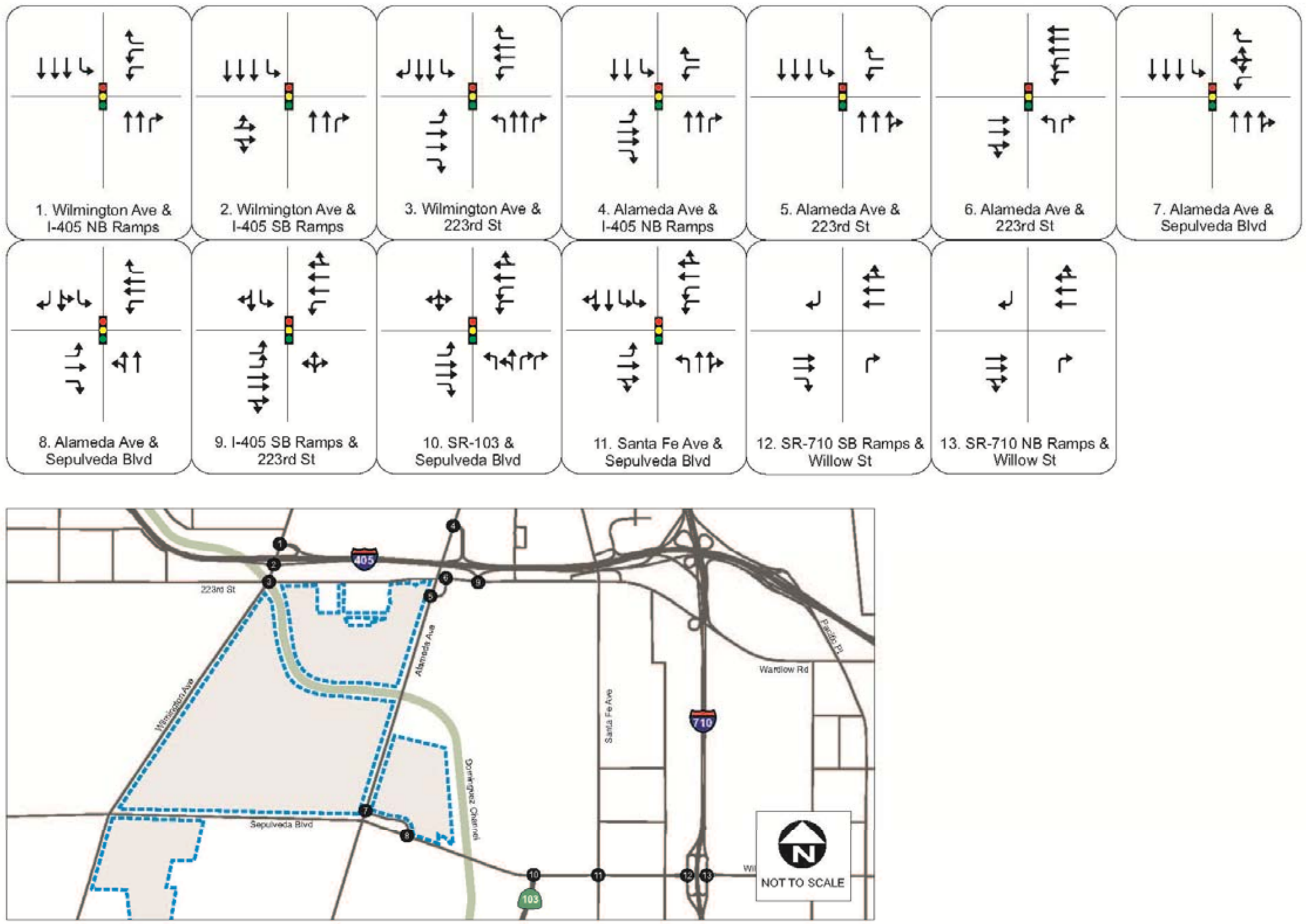

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FIGURE 3
Baseline Intersection Lane Configurations

1.3 STUDY ANALYSIS PERIODS

Traffic Operations are evaluated for each of the following scenarios during the weekday a.m. peak hour and the p.m. peak hour:

- Baseline (Existing) Conditions
- Baseline Conditions Plus Construction Conditions (2015)
- Year 2021 Without Project
- Year 2021 With Project Operations

Baseline (existing) conditions are obtained from turning movement traffic counts taken in August 2014 during the peak hours of operations (6:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m.) as well as existing roadway signal and geometric conditions. These conditions include the trips to and from the proposed Project site and the parking lots to be used for the construction trips associated with the proposed Project. Based on traffic counts of those driveways, there are a total of 1,312 daily trips generated by these parking areas in the baseline conditions: 135 daily trips from the 223rd Street parking lot, 912 daily trips from the Alameda Street parking lot, and 265 daily trips from the Sepulveda Boulevard parking lot.

The trips associated with the construction of the proposed Project were added to the baseline traffic counts to evaluate construction conditions. The proposed Project will have several phases requiring a variable number of construction-related trips. For this analysis, the peak number of trips to be generated over the two-year construction period was used to determine the potential for significant impacts at the study locations[1]. It was assumed the trips associated with current operations on the proposed Project site would occur at the same rate as in the baseline conditions.

The I-405/Wilmington Avenue Interchange began a major improvement project in November 2013 which is expected to be completed by late 2015 or early 2016. The geometrics at the study locations associated with the interchange are assumed to be the pre-construction configuration in the near-term construction period analysis—the construction activities prior to the traffic counts did not change the number of lanes or connections provided by the interchange. The I-405/Wilmington Avenue Interchange construction involves periodic closures and openings of geometric and operational improvements on a constant (daily, weekly, and monthly) but inconsistent basis over the course of its construction period, and while these many iterations of the I-405/Wilmington Avenue interchange construction period conditions were not specifically analyzed in this study, it is recommended that the construction schedule of the Interchange be integrated into the traffic management planning and scheduling for trips associated with the proposed Project for the duration of the overlapping construction periods.

Ambient (background traffic) Year 2021 Conditions were forecasted based on the annualized ambient growth as determined from the Southern California Association of Governments (SCAG) regional travel

[1] As explained in more detail in *Section 3.0 Construction Conditions*, below, during the majority of the construction period, only one work shift per day is expected. However, during peak construction activities, the project is expected to require two shifts per day, a day and night shift.

demand model. The proposed Project area annualized growth was calculated based on the growth between the two analysis years of the travel demand model (2012 to 2035) along Wilmington Avenue and Alameda Street from 223rd to Sepulveda Boulevard and along Sepulveda Boulevard and 223rd Street from Wilmington Avenue to Alameda Street. The annualized growth rate was calculated to be 0.4 percent per year. The completion of the I-405/Wilmington Avenue Interchange improvement project is assumed in the 2021 Project Operations scenario. The proposed Project operations are estimated to not increase the number of on-site workers after the opening of the proposed project, however approximately ten additional truck round-trips per work day would result from the proposed Project to support its operations.

2.0 BASELINE CONDITIONS

This section presents an overview of the existing roadway system and transit operations within the study area and the methodology used to determine existing traffic volumes.

2.1 Roadway Configurations

The existing configurations of the roadways within the study area are described as follows:

Wilmington Avenue, oriented in a north-south direction, is a four-lane roadway with a raised median. Wilmington Avenue provides access to the project site as well as regional access through its connection to the I-405 freeway. On-street parking is prohibited along Wilmington Avenue in the study area.

Alameda Street, oriented in a north-south direction, consists of two lanes in each direction. On-street parking is prohibited along Alameda Street in the study area. Alameda Street bisects and provides direct access to the project site.

Santa Fe Avenue, oriented in a north-south direction, consists of two lanes in each direction with a raised median and on-street parking permitted in the study area. Santa Fe Avenue runs parallel to the I-710 freeway and consists of multiple bus routes.

223rd Street, oriented in an east-west direction, consists of two lanes in each direction with on-street parking allowed in some sections of the study area. 223rd Street provides access to the project site. East of the project site, 223rd Street transitions to Wardlow Road.

Sepulveda Boulevard, oriented in an east-west direction, consists of two lanes in each direction. On-street parking is prohibited along Sepulveda Boulevard in the study area. East of the I-710 freeway, Sepulveda Boulevard transitions to Willow Street.

2.2 Baseline Transit Operations

The Los Angeles County Metropolitan Transportation Authority (Metro) and the Long Beach Transit (LBT) operate bus lines within the area of the project site. A description of the transit service follows:

Metro Line 202 – This line operates between Wilmington and Watts. Within the study area, this line travels north and south along Alameda Street Service is provided at 60 minute headways during weekday peak periods, late night, and owl service. Weekend and holiday service is not provided.

Long Beach Line 191/192 – These lines operate between Downtown Long Beach and Lakewood. Within the study area, the lines travel north and south along Santa Fe Avenue. Service is provided on weekdays, weekends, and holidays. They currently provide 20 minute headways during peak periods.

Long Beach Line 101/102/103/104 – These lines operate between Wilmington and Long Beach. Within the study area, the lines travel east and west along Sepulveda Boulevard beginning at Santa Fe Avenue. Service is provided at 20 minute headways during weekday peak periods. Weekend and holiday service is limited.

2.3 Baseline Traffic Volumes

Vehicle turning movement counts at the study intersections were collected in August 2014 during the a.m. (6:00a.m. to 9:00 a.m.) and p.m. (4:00p.m. and 6:00 p.m.) peak periods. The traffic counts are a reasonable estimate of conditions during the baseline period. Detailed traffic count sheets are provided in **Appendix A**. **Figure 4** shows the existing peak hour volumes at the study intersections.

2.4 Traffic Operations Analysis Methodology

The efficiency of traffic operations on a facility can be described in terms of Level of Service (LOS). The level of service concept is a measure of average operating conditions at an intersection during an hour. Levels range from ‘A’ to ‘F’, with ‘A’ representing excellent (free-flow) conditions and ‘F’ representing a roadway operating at its design capacity.

Traffic operating conditions in the vicinity of the project were evaluated using methodologies described in each project area agencies’ traffic analysis guidelines. The non-freeway ramp study intersections are analyzed using the Intersection Capacity Utilization (ICU) methodology for intersection analysis. ICU methodology defines the LOS by the volume-to-capacity (V/C) ratio for the turning movements and intersection characteristics at the signalized intersections. The ICU value is determined by summing the V/C ratio of the critical movements, plus a factor for a yellow signal time. Intersections located in the City of Los Angeles are also analyzed with the Circular 212 methodology which calculates the delay of critical movements in the intersection—those results are similar to the ICU calculation and are included in the appendix. The Caltrans ramp intersections are under Caltrans’ jurisdiction and are analyzed using the Highway Capacity Manual (HCM) methodology. HCM methodology defines the LOS by the average vehicle delay experienced by all vehicles traveling through the intersection. **Table 1** presents the both the V/C ratio and average delay associated with each LOS grade as well as a qualitative description of intersection operations at that grade.

TABLE 1: INTERSECTION LEVEL OF SERVICE DEFINITIONS

Level of Service	Description	Signalized Intersection Volume-to-Capacity Ratio (V/C)	Signalized Intersection Delay (seconds)
A	Free flowing, virtually no delay. Minimal Traffic.	< 0.600	< 10
B	Free flow and choice of lanes. Delays are minimal. All cars clear intersection easily.	>0.600 to 0.699	>10 and < 20
C	Good operation. Delays starting to become a factor but still within acceptable limits.	>0.700 to 0.799	>20 and < 35
D	Approaching unstable flow. Queues at intersection are quite long but most cars clear intersection on their green signal. Occasionally, several vehicles must wait for a second green signal. Congestion is moderate.	>0.800 to 0.899	>35 and < 55
E	Severe Congestion and delay. Most of the available capacity is used. Many cars must wait through a complete signal cycle to clear the intersection.	>0.900 to 0.999	>55 and < 80
F	Excessive delay and congestion. Most cars must wait through more than one on one signal cycle. Queues are very long and drivers are obviously irritated.	> 1.000	> 80

Study location significance criteria are based on the location of each analyzed facility. The Cities in the study area consider LOS D to be the minimum acceptable LOS. The threshold of significance is considered to be a Project-related change in V/C ratio of 0.02 or greater if the final LOS is 'E' or 'F'.[2]

The City of Los Angeles has a sliding scale of acceptable effects for service levels 'C', 'D', 'E' and 'F'[3]. For example, a greater effect is allowed under LOS 'C' than LOS 'D' before being considered significant. Thus, a project would have a significant impact on transportation/circulation during construction if it would increase an intersection's V/C ratio in accordance with the following guidelines:

- V/C ratio increase greater than or equal to 0.040 if final LOS is 'C',
- V/C ratio increase greater than or equal to 0.020 if final LOS is 'D', or
- V/C ratio increase greater than or equal to 0.010 if final LOS is 'E' or 'F'.

However since the analysis intersection located in the City of Los Angeles is forecasted to operate at no worse than LOS 'B' in any of the analysis scenarios, there is no impact determined at the intersection of Alameda Street Ramp at 223rd Street in the City of Los Angeles.

[2] City of Carson General Plan Update Transportation and Infrastructure Element, October 11, 2004, City of Long Beach General Plan Transportation Element, 1991 based on Los Angeles County Congestion Management Program Guidelines.
[3] City of Los Angeles Department of Transportation Traffic Study Policies and Procedures, August 2014

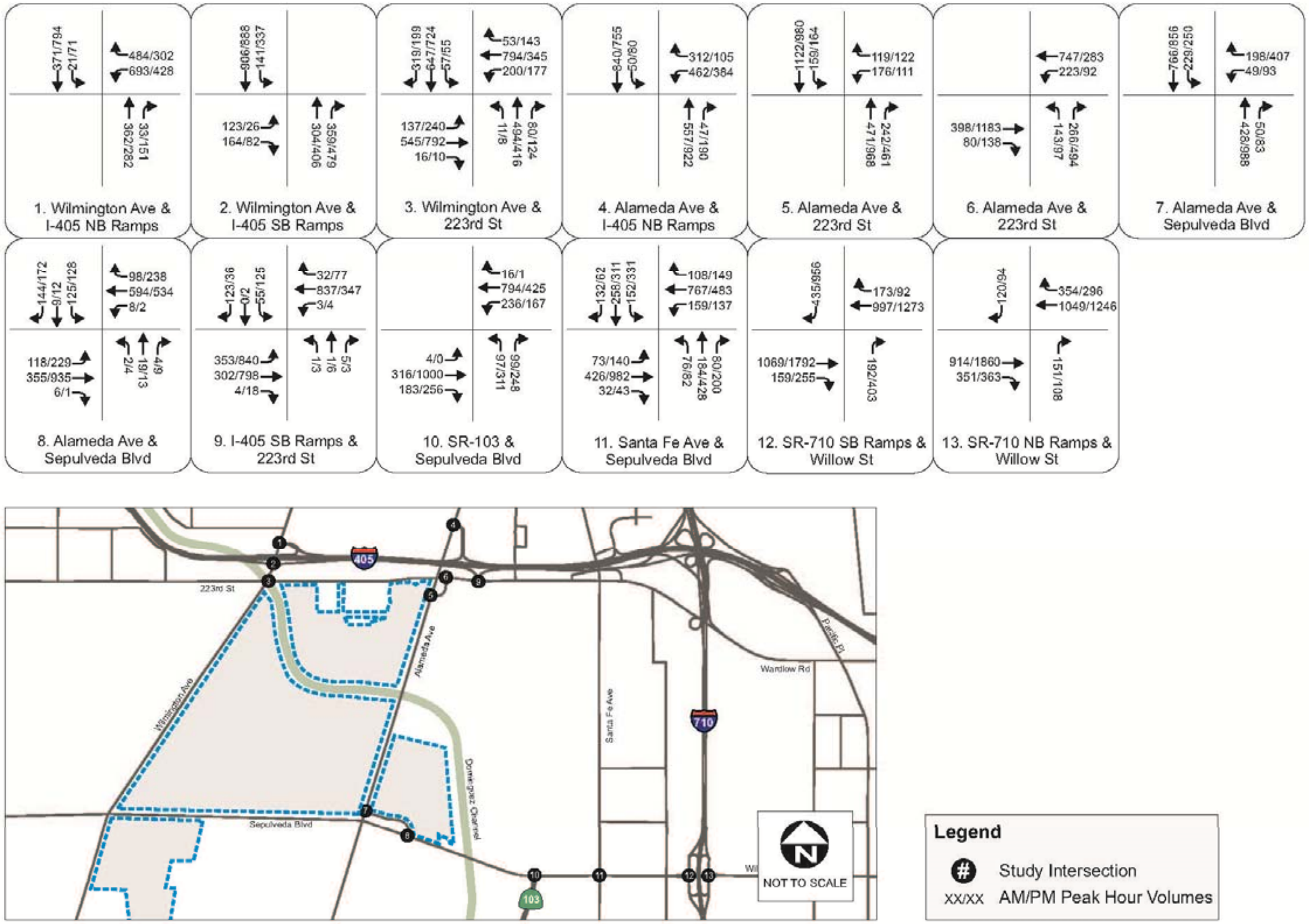

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FIGURE 4
Baseline Intersection Volumes

Caltrans has not adopted specific thresholds of significance for determining whether an impact is significant and relies on the local-defined County and City standards for significance thresholds. The transportation/traffic questions on the CEQA checklist XVI: Transportation/Traffic a) and b) state:

a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?

b) Conflict with an applicable congestion management program including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?

Therefore the Caltrans CEQA Checklist defers to locally defined thresholds. For the purposes of this analysis, intersection locations under the jurisdiction of Caltrans will use the significance threshold of the City in which it is located.

2.5 Baseline Intersection Levels of Service

LOS analysis was conducted to evaluate existing intersection operations during the a.m. and p.m. peak hours. **Table 2** summarizes the existing level of service at the study intersections. LOS calculation worksheets are included in **Appendix B**.

TABLE 2: BASELINE EXISTING CONDITIONS (2014) INTERSECTION LEVELS OF SERVICE

Intersection		Agency / LOS Methodology	AM Peak Hour			PM Peak Hour		
			V/C Ratio	Delay (sec)	LOS	V/C Ratio	Delay (sec)	LOS
1	Wilmington Ave/I-405 NB Ramps	Caltrans / HCM	0.499	21.4	C	0.395	18.5	B
2	Wilmington Ave/I-405 SB Ramps	Caltrans / HCM	0.355	44.2	D	0.629	15.7	B
3	Wilmington Ave/223rd St	Carson / ICU	0.643	-	B	0.690	-	B
4	Alameda St/I-405 NB Ramps	Caltrans / HCM	0.690	21.2	C	0.665	23.2	C
5	Alameda St/223rd St (along Alameda St)	Carson / ICU	0.460	-	A	0.570	-	A
6	Alameda St/223rd St (along 223rd St)	LA / ICU	0.349	-	A	0.634	-	B
7	Alameda St/Sepulveda Blvd (along Alameda St)	Carson / ICU	0.374	-	A	0.537	-	A
8	Alameda St/Sepulveda Blvd (along Sepulveda Blvd)	Carson / ICU	0.415	-	A	0.742	-	C
9	I-405 SB Ramps/223rd St	Caltrans / HCM	0.472	23.4	C	0.327	24.3	C
10	Terminal Island Fwy (SR-103)/Sepulveda Blvd	Long Beach / ICU	0.390	-	A	0.579	-	A
11	Santa Fe Ave/Sepulveda Blvd	Long Beach / ICU	0.624	-	C	0.781	-	C
12	I-710 SB Ramps/Willow St	Uncontrolled Intersection						
13	I-710 NB Ramps/Willow St	Uncontrolled Intersection						

Notes:
V/C = Volume to Capacity Ratio, LOS = Level of Service, Delay = Average Vehicle Delay (Seconds)

As shown in **Table 2**, the study intersections are currently operating at LOS D or better.

3.0 CONSTRUCTION CONDITIONS

Construction activities for the proposed Project are expected to begin in fourth quarter of 2015 and are expected to be completed by fourth quarter, 2019, based on preliminary project engineering. The preliminary construction schedule for each component of the proposed project varies. The construction activities for most of the components are expected to overlap from about December 2015 to February 2017. Construction work shifts are expected to last about ten hours per day during most portions of the construction schedule. During normal construction periods, one work shift per day is expected. However, during peak construction activities, the proposed project is expected to require two work shifts – one day and one night shift.

Due to the temporary nature of construction trips, in general construction-related traffic is considered less than significant; however detailed analysis of construction period conditions were conducted due to several factors. First, the proposed Project is expected to involve a large number of workers and therefore generate a large number of worker trips as compared to typical development projects in southern California. Second, a cumulative construction event at the I-405/Wilmington interchange will overlap with the first phases of the proposed Project construction. Since the I-405/Wilmington interchange is expected to be utilized by many of the proposed Project construction trips, construction period analysis of the proposed Project include analysis at the beginning of the construction of the I-405/Wilmington Interchange (baseline conditions) in its pre-construction geometry. For these reasons detailed analysis of construction period conditions for the peak construction period (2015) was conducted to identify potential significant impacts and recommend construction period traffic management strategies to mitigate those impacts.

3.1 Project Construction Trip Generation and Distribution

Construction conditions are analyzed for the construction phase with the maximum number of construction trips during the two-year construction period. The peak construction period trip generation is shown below in **Table 3**. In total 950 workers will travel to and from the proposed Project site during the highest trip-generation phase of construction of the proposed project. These include 875 day shift workers and 75 night shift workers. In addition to worker trips, 120 truck trips would be generated during the peak trip-generating construction phase throughout the work day.

Table 3: Construction Period Daily Trip Generation

Type	Work Shift	Total Round Trips	Total One-Way Trips
Supervisors	6 am – 5:30 pm	40	80
Dayshift Workers	7:00 am – 5:30 pm	835	1,670
Nightshift Workers	7:00 pm – 7:00 am	75	150
Trucks	Throughout the day	120	240
Total		1,070	2,140

In converting daily trip generation values into peak hour analysis periods, two adjustments were made. First, it was assumed that auto trips had a 10 percent carpool rate. Second, given the work shift hours for each type of worker, not all project trips are expected to occur within the peak hour for overall traffic volume in the study area and the following peak hour project trip generation assumptions were made:

- Supervisors would arrive before the a.m. peak hour and 50 percent would leave in the p.m. peak hour
- 50 percent of day shift workers would arrive during the a.m. peak hour and 50 percent would leave in the p.m. peak hour
- 50 percent of night shift workers would leave in the a.m. peak hour and 50 percent would arrive in the p.m. peak hour
- Truck trips are distributed evenly throughout the ten hour work day with 12 inbound and 12 outbound trips per peak hour. A passenger car equivalency (PCE) factor of 2.0 is applied to the truck trips to account for their larger size and slower turning speeds at intersections.

Of the 2,140 total daily construction-related trips shown in **Table 3**, PCE trips occurring in the peak hours are forecasted to be 454 PCE in the a.m. peak hour and 472 PCE trips in the p.m. peak hour as shown in **Table 4**.

TABLE 4: CONSTRUCTION PERIOD PEAK HOUR TRIP GENERATION

Type	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Auto	376	34	410	34	394	428
Truck (PCE)	24	24	48	24	24	48
Total	400	58	458	58	418	476

Trip distribution assumptions were used to determine the origin and destination of new vehicle trips associated with the project. Trip distribution for the employee trips of the proposed Project was developed using the weighted distribution of workers, from the 2010 United States Census, in Los Angeles, Orange, Riverside, and San Bernardino Counties via the arterial network to Cities near the study area (e.g. Carson, Compton, Long Beach, portions of Los Angeles, and Torrance) and the regional freeway network for Cities more than two miles from the proposed Project site. As shown in **Figure 5**, distribution of employee trips was approximately 30 percent from I-405 north of the proposed Project site, 25 percent from I-405 south of the proposed Project site, 30 percent from I-710 north of the proposed Project site and 15 percent from local access along arterials. Truck trip distribution was assumed to occur to/from the north along I-710. The assignment of project-related trips shown in **Figure 6** is based on the trip distribution percentages.

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FIGURE 5
Proposed Project Construction Trip Distribution

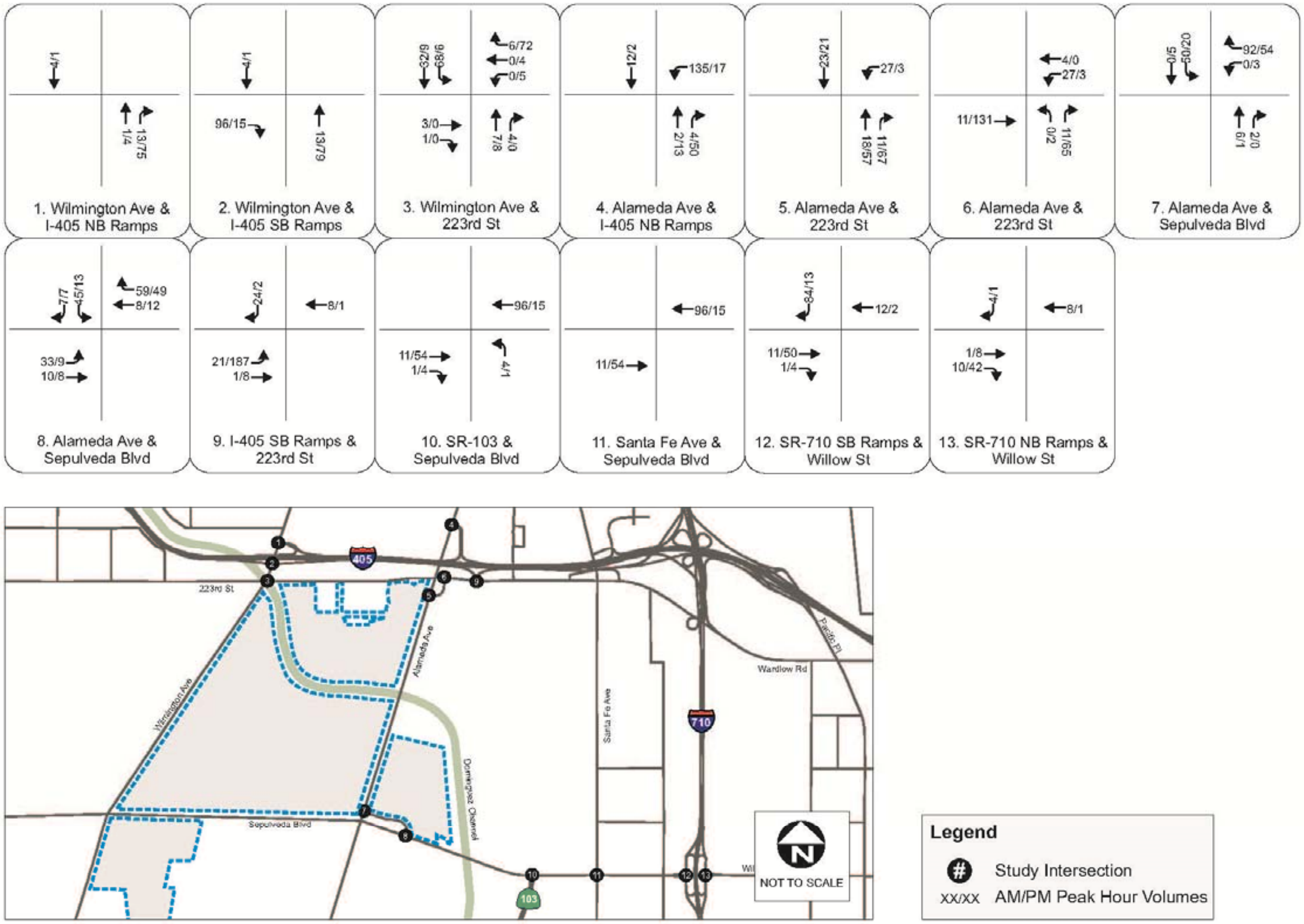

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FIGURE 6
Proposed Project Construction Trip Assignment

3.2 CONSTRUCTION PERIOD INTERSECTION LEVELS OF SERVICE

LOS analysis was conducted to evaluate existing plus construction intersection operations during the a.m. and p.m. peak hours. **Figure 7** shows the baseline plus construction peak hour volumes at the study intersections. **Table 5** summarizes the LOS at the study intersections as compared to baseline LOS to determine if a threshold of significance was exceeded. LOS calculation worksheets are included in **Appendix B**.

Caltrans has undertaken a major construction project to modify the I-405/Wilmington interchange starting November 2013. The interchange construction is expected to finish in late 2015 or early 2016—potentially overlapping with the construction period of the proposed Project. The project will reconfigure existing on- and off-ramps from northbound and southbound I-405, construct a new on-ramp to southbound I-405, reconstruct Wilmington Avenue and Lenardo Drive, and construct a new bridge over the Torrance Lateral Channel.

The construction of the I-405/Wilmington Interchange will have periodic lane and ramp closures that, while temporary, have the potential to effect the proposed Project–related construction trips' interaction with the roadway network and demand placed on study intersections. While the Year 2015 With Project Construction Conditions (Pre- I-405/Wilmington Interchange) does not account for each possible iteration of lane closures[4], it does include the construction period analysis of the proposed Project at the beginning of the construction of the I-405/Wilmington Interchange (baseline conditions) in its pre-construction geometry. These conditions are shown in **Table 5.** Further the Year 2021 scenarios assume the completion of the interchange in its post-construction configuration. .

[4] The I-405/Wilmington Avenue Interchange construction involves periodic closures and openings of geometric and operational improvements on a constant (daily, weekly, and monthly) but inconsistent basis over the course of its construction period

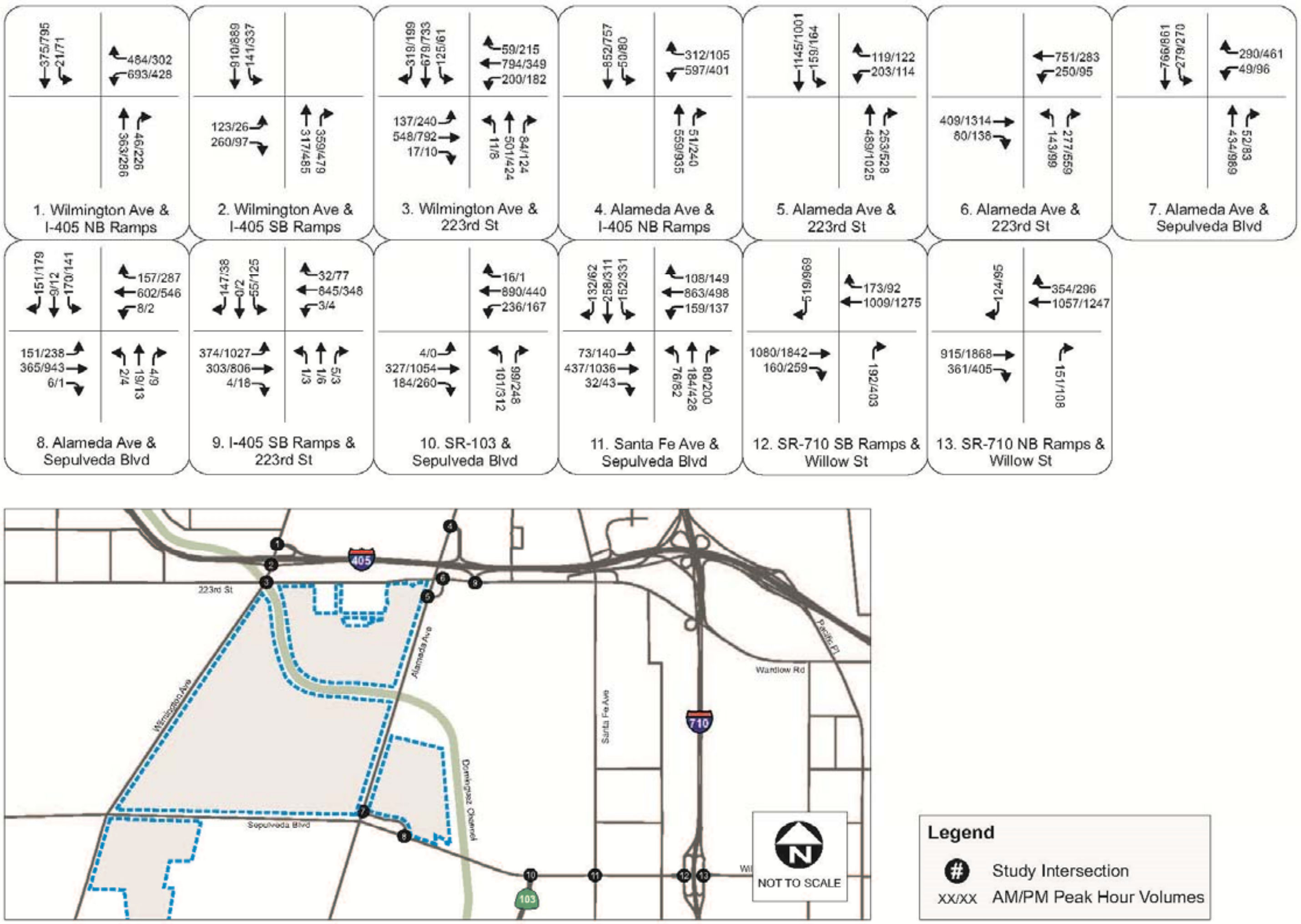

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FIGURE 7
Proposed Project Construction Period Intersection Volumes

TABLE 5: BASELINE EXISTING CONDITIONS PLUS PROJECT CONSTRUCTION CONDITIONS (PRE- I-405/WILMINGTON INTERCHANGE) INTERSECTION LOS

	Intersection	Existing Conditions						Existing Plus Construction Conditions						a.m. Change in V/C or Delay	p.m. Change in V/C or Delay	Significant Impact?
		a.m. Peak Hour			p.m. Peak Hour			a.m. Peak Hour			p.m. Peak Hour					
		V/C Ratio	Delay (sec)	LOS	V/C Ratio	Delay (sec)	LOS	V/C Ratio	Delay (sec)	LOS	V/C Ratio	Delay (sec)	LOS			
1	Wilmington Ave/I-405 NB Ramps	0.499	21.4	C	0.395	18.5	B	0.500	21.5	C	0.395	18.6	B	0.1 s	0.1 s	No
2	Wilmington Ave/I-405 SB Ramps	0.355	44.2	D	0.629	15.7	B	0.439	57.9	E	0.641	16.5	B	13.7 s	0.8 s	**Yes[1]**
3	Wilmington Ave/223rd St	0.643	-	B	0.690	-	B	0.653	-	B	0.696	-	B	0.010	0.006	No
4	Alameda St/I-405 NB Ramps	0.690	21.2	C	0.665	23.2	C	0.807	25.6	C	0.683	23.8	C	4.4 s	0.6 s	No
5	Alameda St/223rd St (along Alameda St)	0.460	-	A	0.570	-	A	0.484	-	A	0.604	-	B	0.024	0.034	No
6	Alameda St/223rd St (along 223rd St)	0.349	-	A	0.634	-	B	0.358	-	A	0.696	-	B	0.009	0.062	No
7	Alameda St/Sepulveda Blvd (along Alameda St)	0.374	-	A	0.537	-	A	0.406	-	A	0.552	-	A	0.032	0.015	No
8	Alameda St/Sepulveda Blvd (along Sepulveda Blvd)	0.415	-	A	0.742	-	C	0.452	-	A	0.751	-	C	0.037	0.009	No
9	I-405 SB Ramps/223rd St	0.472	23.4	C	0.327	24.3	C	0.502	24.6	C	0.395	23.7	C	1.2 s	-0.6 s	No
10	Terminal Island Fwy (SR-103)/Sepulveda Blvd	0.390	-	A	0.579	-	A	0.421	-	A	0.595	-	A	0.031	0.016	No
11	Santa Fe Ave/Sepulveda Blvd	0.624	-	C	0.781	-	C	0.654	-	C	0.798	-	C	0.030	0.017	No
12	I-710 SB Ramps/Willow St	Uncontrolled Intersection														No
13	I-710 NB Ramps/Willow St	Uncontrolled Intersection														No

1 = Significant temporary impact based on LOS E operation with the addition of construction-related trips.
Notes:
V/C = Volume to Capacity Ratio, LOS = Level of Service, Delay = Average Vehicle Delay (Seconds), s = seconds

As shown in **Table 5**, construction-related trips are forecast to result in a significant impact during construction conditions at the Wilmington Ave/I-405 Southbound Ramps under their pre-construction configuration. This is due to the large number of project-related trips utilizing the Southbound ramp to access the proposed Project site in the a.m. peak hour.

It should be emphasized that this exceedance of the threshold of significance is temporary in nature and does not represent a significant impact that would require permanent mitigation by the applicant. However, it does indicate that inbound trips to the proposed Project during the construction period should avoid the I-405/Wilmington interchange while it is under construction

In order to reduce the proposed Project's construction-related trips on the Wilmington Avenue/I-405 Southbound Ramps intersection prior to the completion of the I-405/Wilmington Avenue Interchange Modification Project, it is recommended that proposed Project workers be advised of the construction schedule and potential restrictions and closures associated with the Interchange Modification Project. It is recommended that the Project workers be encouraged to avoid the Wilmington Avenue/I-405 Southbound Ramps intersection during morning peak travel periods by traveling either outside of the morning peak travel time or along alternative routes. The operational conditions of all other study locations, operating at LOS C or better during peak hours, demonstrate the adequacy of several alternative routes for proposed Project construction period trips.

The I-405/Wilmington Avenue Interchange Modification Project maintains several sources of information about current construction conditions through a web site (http://i405wilmington.com), a bilingual, toll-free hotline (887) 481-0004 and an email notification system.

The protocols for the dissemination of information to proposed Project workers and potential alternative schedules or routing during construction activities for the proposed project should be provided in the form of a construction staging and/or traffic management plan, to be approved by the Cities of Carson and Los Angeles.

4.0 YEAR 2021 CONDITIONS

Year 2021 conditions were forecasted by applying ambient growth from year 2014 with the 0.4 percent per year growth as calculated from the SCAG travel demand model. The proposed Project operations are estimated to not increase the number of on-site workers after the construction phase, however approximately ten additional truck round-trips per work day would result from the proposed Project to support its operations. The peak hour estimates of these project-related trips were used to develop a year 2021 with proposed Project scenario that was compared against the year 2021 conditions without the proposed Project to determine if any significant impacts would occur due to the operation of the proposed Project.

4.1 YEAR 2021 WITHOUT PROJECT INTERSECTION LEVELS OF SERVICE

Figure 8 shows the year 2021 without project peak hour volumes at the study intersections. A level of service analysis was conducted to evaluate year 2021 without project intersection operations during the a.m. and p.m. peak hours. **Table 6** summarizes the year 2021 without project LOS at the study intersections. LOS calculation worksheets are included in **Appendix B**.

TABLE 6: YEAR 2021 WITHOUT PROJECT CONDITIONS INTERSECTION LOS

Intersection		Agency / LOS Methodology	a.m. Peak Hour			p.m. Peak Hour		
			V/C Ratio	Delay (sec)	LOS	V/C Ratio	Delay (sec)	LOS
1	Wilmington Ave/I-405 NB Ramps	Caltrans / HCM	0.512	21.7	C	0.420	18.4	B
2	Wilmington Ave/I-405 SB Ramps	Caltrans / HCM	0.364	21.8	C	0.362	15.7	B
3	Wilmington Ave/223rd St	Carson / ICU	0.656	-	B	0.703	-	C
4	Alameda St/I-405 NB Ramps	Caltrans / HCM	0.687	23.4	C	0.681	23.5	C
5	Alameda St/223rd St (along Alameda St)	Carson / ICU	0.470	-	A	0.581	-	A
6	Alameda St/223rd St (along 223rd St)	LA / ICU	0.355	-	A	0.647	-	B
7	Alameda St/Sepulveda Blvd (along Alameda St)	Carson / ICU	0.380	-	A	0.548	-	A
8	Alameda St/Sepulveda Blvd (along Sepulveda Blvd)	Carson / ICU	0.422	-	A	0.758	-	C
9	I-405 SB Ramps/223rd St	Caltrans / HCM	0.484	23.5	C	0.514	19.1	B
10	Terminal Island Fwy (SR-103)/Sepulveda Blvd	Long Beach / ICU	0.396	-	A	0.590	-	A
11	Santa Fe Ave/Sepulveda Blvd	Long Beach / ICU	0.636	-	B	0.798	-	C
12	I-710 SB Ramps/Willow St	Uncontrolled Intersection						
13	I-710 NB Ramps/Willow St	Uncontrolled Intersection						

Notes:
V/C = Volume to Capacity Ratio, LOS = Level of Service, Delay = Average Vehicle Delay (Seconds)

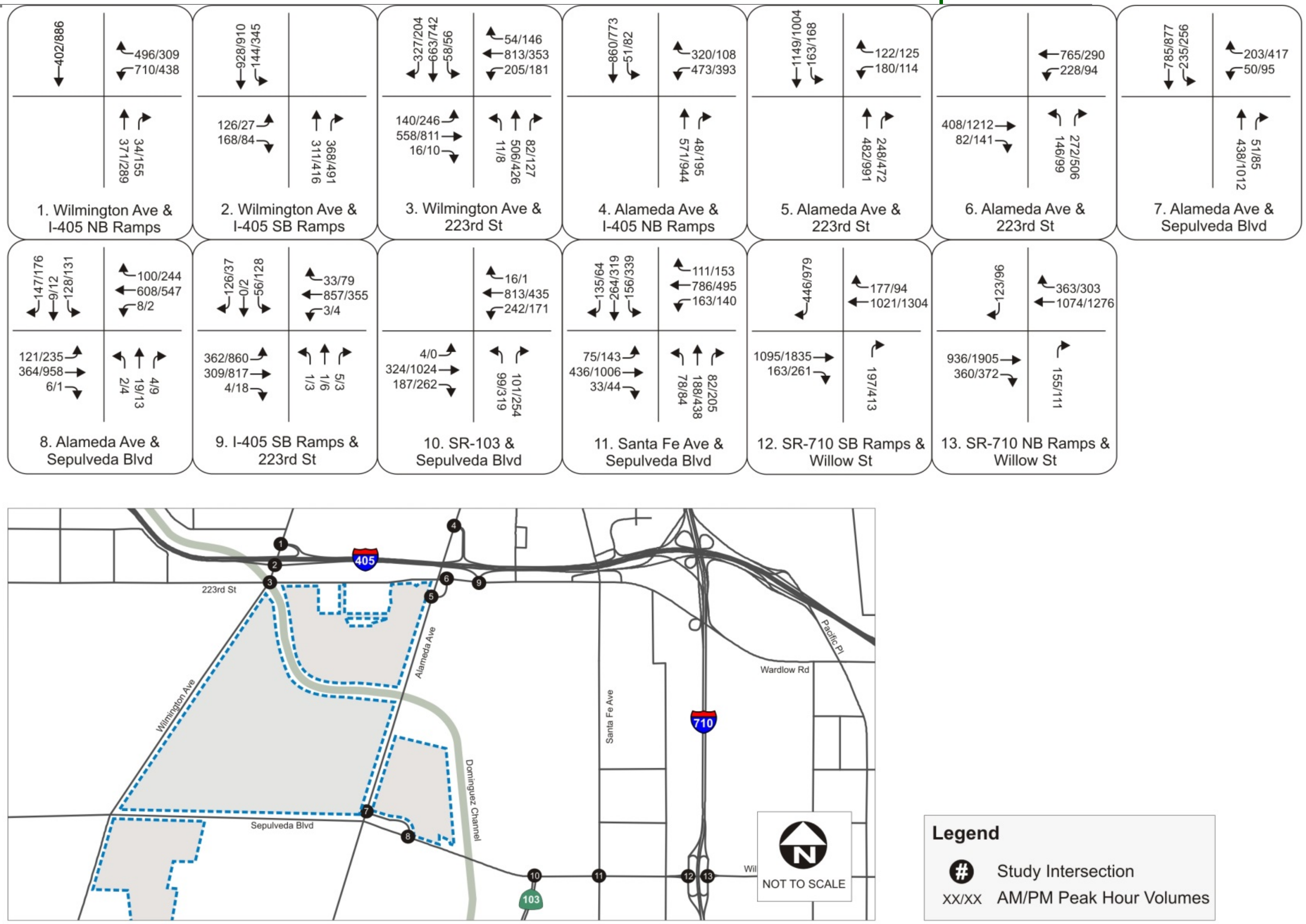

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FIGURE 8
Year 2021 Without Proposed Project Intersection Volumes

4.2 Year 2021 With Project Intersection Levels of Service

A level of service analysis was conducted to evaluate year 2021 with project conditions during the a.m. and p.m. peak hours. The following trip generation assumptions for the operation of the proposed Project were made:

- There will be no increase in workers as compared to baseline conditions following completion of the construction phase
- Eight trucks per day will transport spent sulfuric acid from the Carson Plant to the new Sulfuric Acid Plant at Wilmington
- One truck per day will transport other materials and supplies to or from the Refinery

Overall ten truck roundtrips over 10 daytime hours are estimated to occur with the completion of the proposed Project. Based on the above assumptions, the estimated worst-case a.m. and p.m. trips were estimated: two inbound and two outbound truck trips in each peak hour, resulting in four inbound and four outbound PCE trips per peak hour as shown in **Table 7**.

Table 7: Proposed Project Operation Peak Hour Trips

Type	a.m. Peak Hour		p.m. Peak Hour	
	In	Out	In	Out
Auto	0	0	0	0
Truck (PCE)	4	4	4	4
Total	4	4	4	4

Trip distribution assumptions were used to determine the origin and destination of vehicle trips associated with the operation of the proposed Project. As shown in **Figure 9**, distribution of proposed Project trips was 25 percent from I-405 north of the proposed Project site, 25 percent from I-405 south of the proposed Project site, 25 percent from I-710 north of the proposed Project site and 25 percent from local access along Willow Street east of the proposed Project site based on the equitable distribution of trips to major destinations outside of the study area. The assignment of project-related trips shown in **Figure 10** is based on the trip distribution percentages.

The resulting year 2021 peak hour traffic volumes at the study intersections with the proposed project are shown in **Figure 11**. **Table 8** summarizes the year 2021 with project LOS compared to without project conditions at the study intersections. LOS calculation worksheets are included in **Appendix B**.

As shown in **Table 8**, the proposed Project is not forecasted to cause a study location to exceed a threshold of significance and therefore the project would have a less than significant impact on area roadway facilities.

It should be noted that an Existing Conditions plus Project Operations was not conducted in addition to the Year 2021 Plus Project Operations scenario since the Year 2021 Plus Project Operations scenario was developed in this study as an existing conditions plus ambient growth to Year 2021 plus Project Operations. If levels of significance are not exceeded under the Year 2021 levels of ambient traffic, they will not be under lower levels of existing traffic.

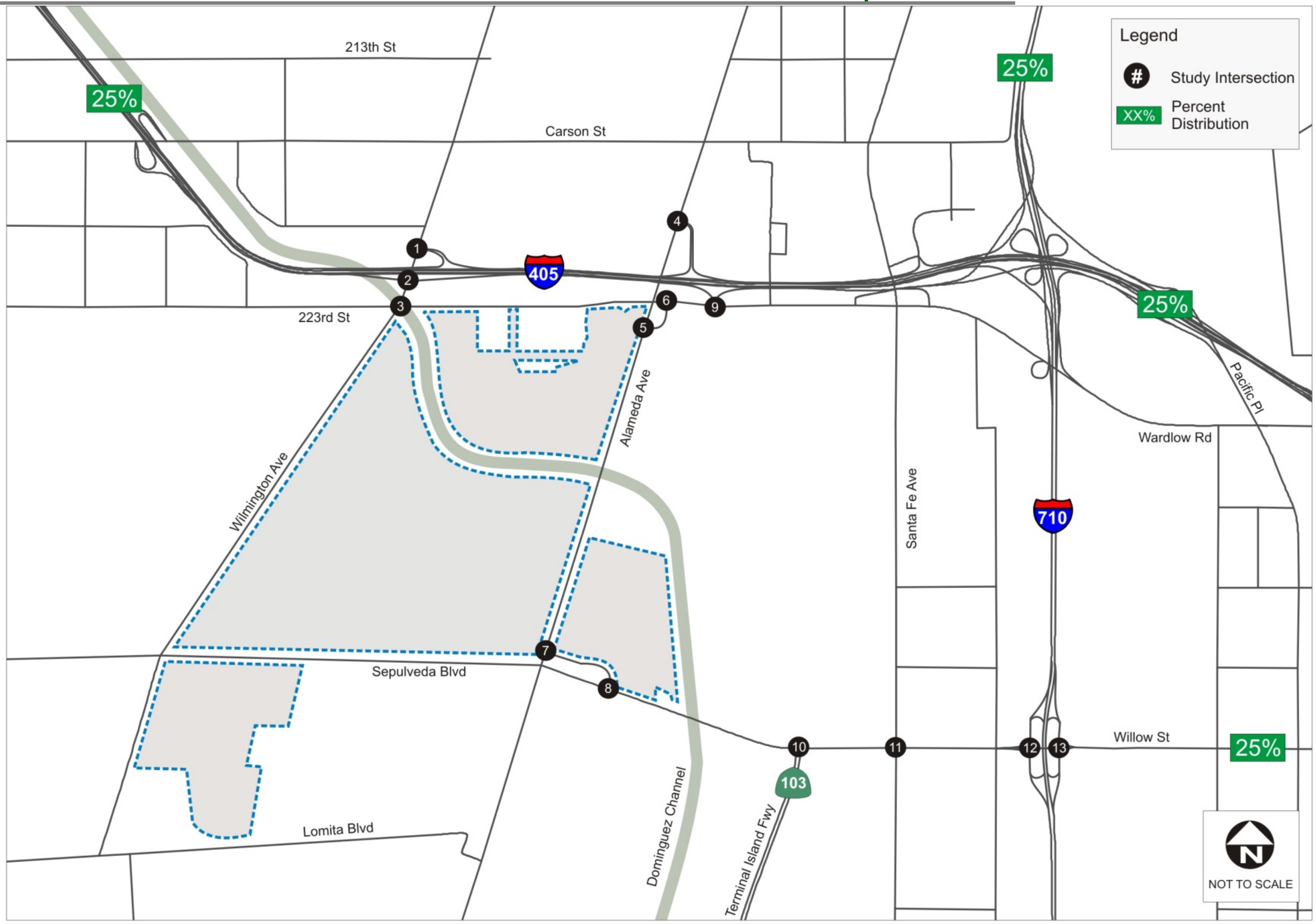

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FIGURE 9
Proposed Project Operations Distribution

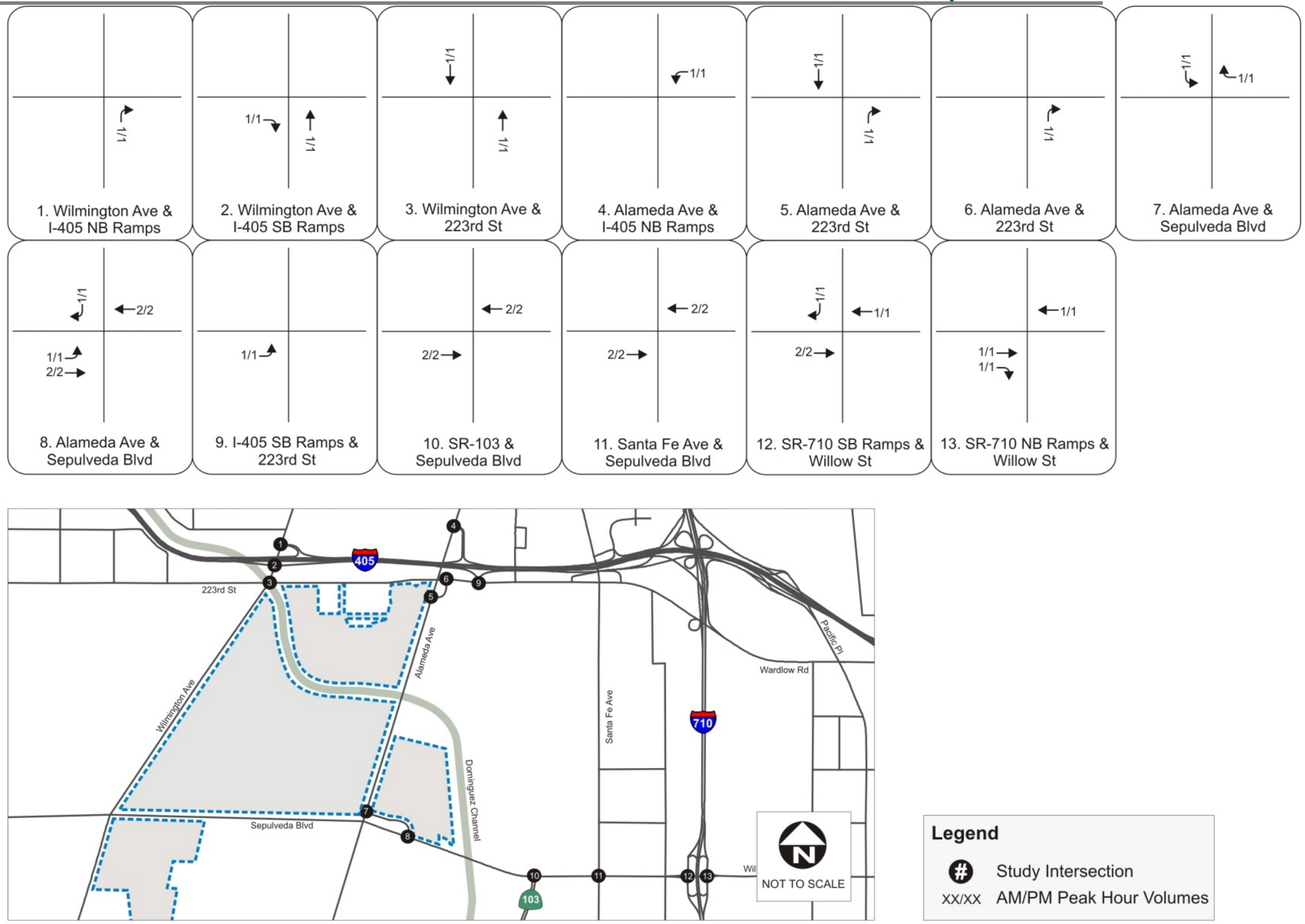

FIGURE 10
Proposed Project Operations Trip Assignment

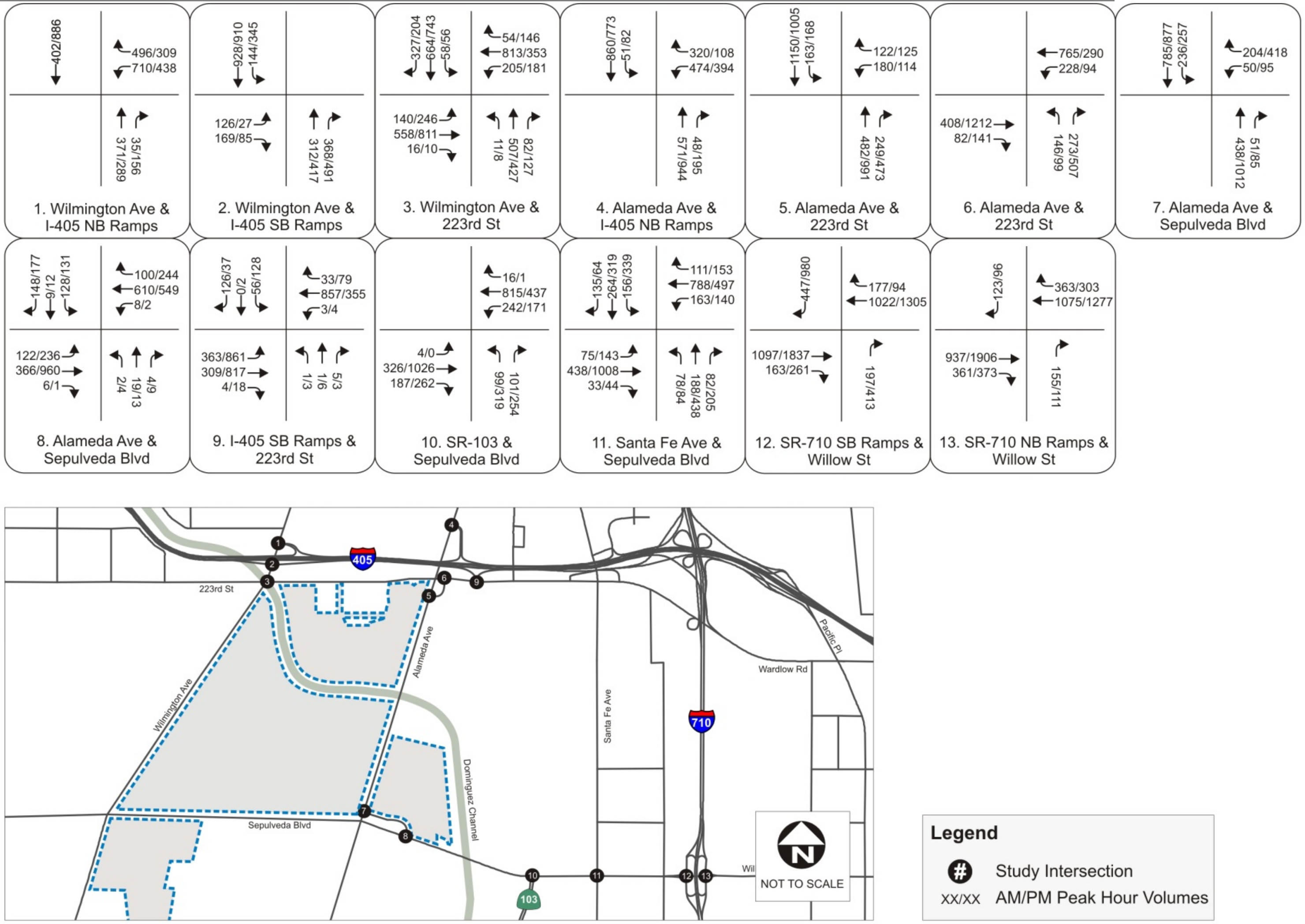

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FIGURE 11
Year 2021 With Proposed Project Operations Intersection Volumes

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South Coast AQMD
1576303

TABLE 8: YEAR 2021 WITH PROJECT INTERSECTION LOS

	Intersection	Year 2021 Without Project						Year 2021 With Project Operations						a.m. Change in V/C or Delay	p.m. Change in V/C or Delay	Significant Impact?
		a.m. Peak Hour			p.m. Peak Hour			a.m. Peak Hour			p.m. Peak Hour					
		V/C Ratio	Delay (sec)	LOS	V/C Ratio	Delay (sec)	LOS	V/C Ratio	Delay (sec)	LOS	V/C Ratio	Delay (sec)	LOS			
1	Wilmington Ave/I-405 NB Ramps	0.512	21.7	C	0.420	18.4	B	0.512	21.7	C	0.420	18.4	B	0 s	0 s	No
2	Wilmington Ave/I-405 SB Ramps	0.364	21.8	C	0.362	15.7	B	0.365	21.8	C	0.363	15.8	B	0 s	0.1 s	No
3	Wilmington Ave/223rd St	0.656	-	B	0.703	-	C	0.657	-	B	0.703	-	C	0.001	0	No
4	Alameda St/I-405 NB Ramps	0.687	23.4	C	0.681	23.5	C	0.687	23.4	C	0.682	23.6	C	0 s	0.1 s	No
5	Alameda St/223rd St (along Alameda St)	0.470	-	A	0.581	-	A	0.471	-	A	0.581	-	A	0.001	0	No
6	Alameda St/223rd St (along 223rd St)	0.355	-	A	0.647	-	B	0.355	-	A	0.647	-	B	0	0	No
7	Alameda St/Sepulveda Blvd (along Alameda St)	0.380	-	A	0.548	-	A	0.381	-	A	0.549	-	A	0.001	0.001	No
8	Alameda St/Sepulveda Blvd (along Sepulveda Blvd)	0.422	-	A	0.758	-	C	0.423	-	A	0.759	-	C	0.001	0.001	No
9	I-405 SB Ramps/223rd St	0.484	23.5	C	0.514	19.1	B	0.484	23.5	C	0.514	19.1	B	0 s	0s	No
10	Terminal Island Fwy (SR-103)/Sepulveda Blvd	0.396	-	A	0.590	-	A	0.397	-	A	0.591	-	A	0.001	0.001	No
11	Santa Fe Ave/Sepulveda Blvd	0.636	-	B	0.798	-	C	0.637	-	B	0.799	-	C	0.001	0.001	No
12	I-710 SB Ramps/Willow St	Uncontrolled Intersection														-
13	I-710 NB Ramps/Willow St	Uncontrolled Intersection														-

Notes:
V/C = Volume to Capacity Ratio, LOS = Level of Service, Delay = Average Vehicle Delay (Seconds)

5.0 CONCLUSIONS

As shown in **Table 5**, under the Baseline Existing Conditions (2014) Plus Project Construction Conditions scenario, temporary construction-related trips are forecast to result in a potentially significant impact at the Wilmington Ave/I-405 Southbound Ramps under the I-405/Wilmington Interchange pre-construction configuration. This is due to the large number of temporary project-related trips utilizing the southbound ramp to access the proposed Project site in the a.m. peak hour.

It should be emphasized that this exceedance of the threshold of significance is temporary in nature and does not represent a significant impact that would require permanent mitigation by the applicant. However, it does indicate that inbound trips to the proposed Project during the construction period should avoid the I-405/Wilmington interchange while it is under construction.

In order to reduce the proposed Project's construction-related trips on the Wilmington Avenue/I-405 Southbound Ramps intersection prior to the completion of the I-405/Wilmington Avenue Interchange Modification Project, it is recommended that proposed Project workers be advised of the construction schedule and potential restrictions and closures associated with the Interchange Modification Project. Workers should be encouraged to avoid the Wilmington Avenue/I-405 Southbound Ramps intersection during morning peak travel periods by traveling either outside of the morning peak travel time or along alternative routes. The operational conditions of all other study locations, operating at LOS C or better during peak hours, demonstrate the adequacy of several alternative routes for proposed Project construction period trips.

The protocols for the dissemination of information to proposed Project workers and potential alternative schedules or routing during construction activities for the proposed project should be provided in the form of a construction staging and/or traffic management plan, to be approved by the Cities of Carson and Los Angeles.

As shown in **Table 12**, the proposed Project is not forecasted to cause a study location to exceed a threshold of significance in year 2021 and therefore the project would have a less than significant impact on area roadway facilities.

It should be noted that an Existing Conditions plus Project Operations was not conducted in addition to the Year 2021 Plus Project Operations scenario since the Year 2021 Plus Project Operations scenario was developed in this study as an existing conditions plus ambient growth to Year 2021 plus Project Operations. If levels of significance are not exceeded under the Year 2021 levels of ambient traffic, they will not be under lower levels of existing traffic.

APPENDIX A: TRAFFIC COUNTS

CITY TRAFFIC COUNTERS

626.991.7522
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File Name : Wilmington_405NBRamps
Site Code : 00000000
Start Date : 8/20/2014
Page No : 1

Groups Printed- Unshifted

	Wilmington Ave Southbound			405 NB Ramps Westbound			Wilmimgton Ave Northbound			Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
06:00 AM	10	78	0	159	0	78	0	46	24	0	0	0	395
06:15 AM	6	84	0	174	0	85	0	44	9	0	0	0	402
06:30 AM	1	80	0	172	0	94	0	96	14	0	0	0	457
06:45 AM	7	95	0	180	0	137	0	124	5	0	0	0	548
Total	24	337	0	685	0	394	0	310	52	0	0	0	1802
07:00 AM	4	75	0	187	0	111	0	71	10	0	0	0	458
07:15 AM	6	94	0	161	0	108	0	90	13	0	0	0	472
07:30 AM	4	107	0	165	0	128	0	77	5	0	0	0	486
07:45 AM	3	98	0	130	0	148	0	99	13	0	0	0	491
Total	17	374	0	643	0	495	0	337	41	0	0	0	1907
08:00 AM	3	105	0	161	0	109	0	95	18	0	0	0	491
08:15 AM	5	86	0	146	0	125	0	80	9	0	0	0	451
08:30 AM	7	105	0	118	0	110	0	80	14	0	0	0	434
08:45 AM	4	99	0	115	0	99	0	63	14	0	0	0	394
Total	19	395	0	540	0	443	0	318	55	0	0	0	1770
04:00 PM	18	195	0	99	0	71	0	59	24	0	0	0	466
04:15 PM	15	166	0	100	0	59	0	60	26	0	0	0	426
04:30 PM	16	190	0	105	0	78	0	67	39	0	0	0	495
04:45 PM	21	201	0	108	0	76	0	82	46	0	0	0	534
Total	70	752	0	412	0	284	0	268	135	0	0	0	1921
05:00 PM	20	190	0	111	0	76	0	61	32	0	0	0	490
05:15 PM	14	213	0	104	0	72	0	72	34	0	0	0	509
05:30 PM	9	174	0	102	0	66	0	74	33	0	0	0	458
05:45 PM	13	176	0	109	0	104	0	62	40	0	0	0	504
Total	56	753	0	426	0	318	0	269	139	0	0	0	1961
Grand Total	186	2611	0	2706	0	1934	0	1502	422	0	0	0	9361
Apprch %	6.6	93.4	0	58.3	0	41.7	0	78.1	21.9	0	0	0	
Total %	2	27.9	0	28.9	0	20.7	0	16	4.5	0	0	0	

File Name : Wilmington_405NBRamps
Site Code : 00000000
Start Date : 8/20/2014
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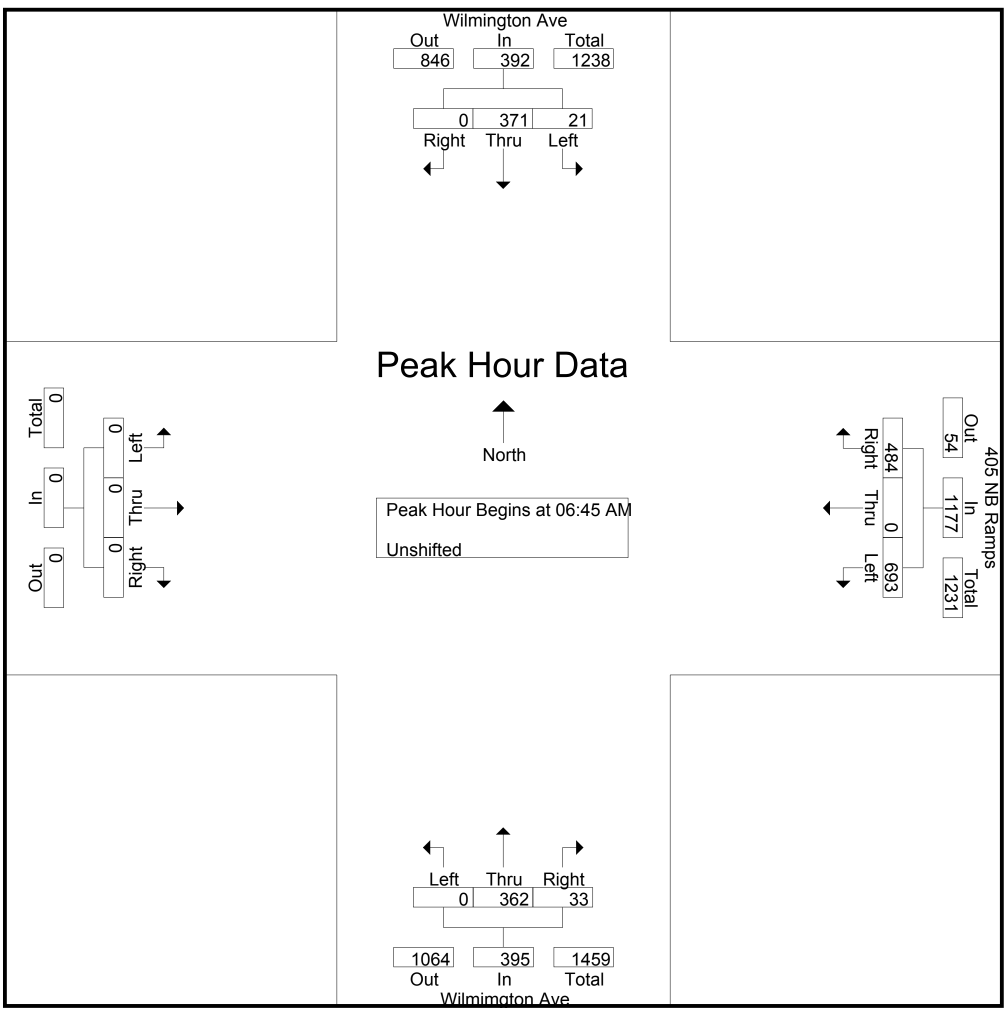
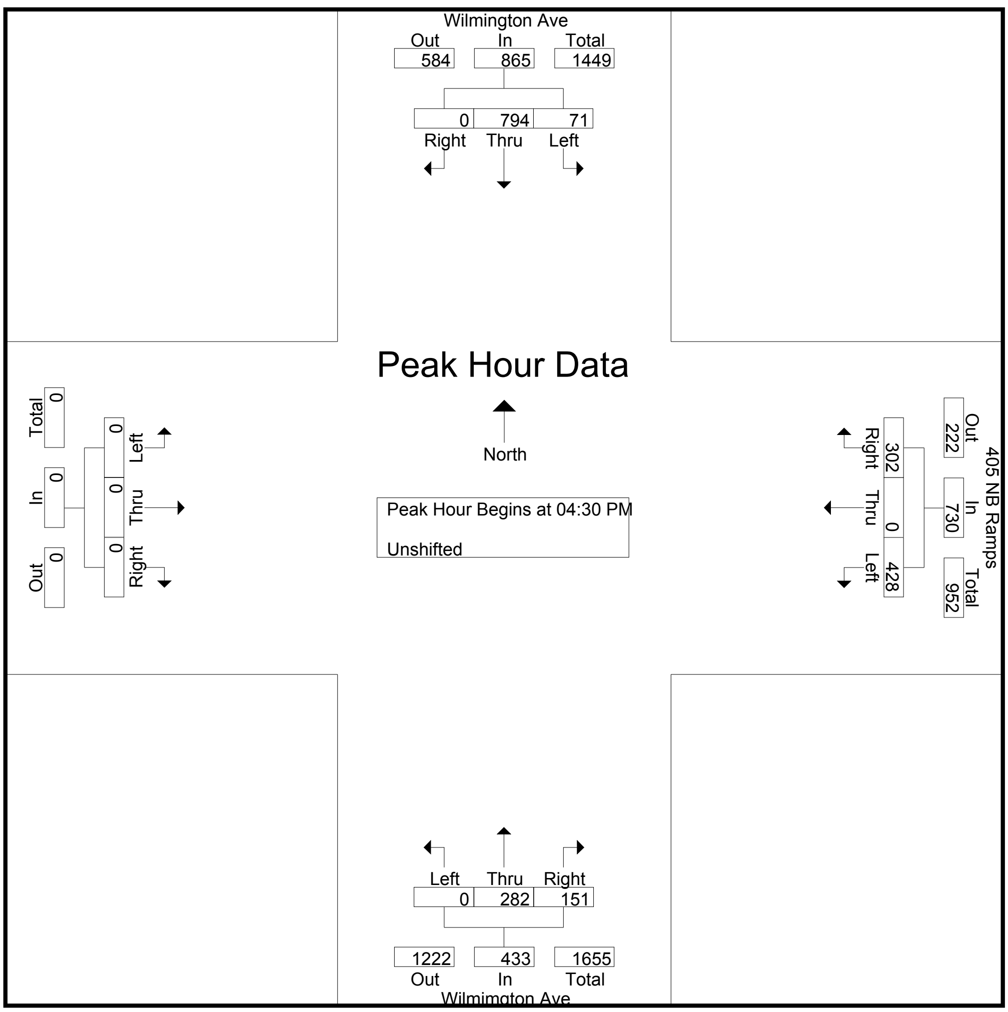
	Wilmington Ave Southbound				**405 NB Ramps Westbound**				**Wilmimgton Ave Northbound**				**Eastbound**				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 06:45 AM																	
06:45 AM	**7**	95	0	102	180	0	**137**	**317**	0	**124**	5	**129**	0	0	0	0	**548**
07:00 AM	4	75	0	79	**187**	0	111	298	0	71	10	81	0	0	0	0	458
07:15 AM	6	94	0	100	161	0	108	269	0	90	**13**	103	0	0	0	0	472
07:30 AM	4	**107**	0	**111**	165	0	128	293	0	77	5	82	0	0	0	0	486
Total Volume	21	371	0	392	693	0	484	1177	0	362	33	395	0	0	0	0	1964
% App. Total	5.4	94.6	0		58.9	0	41.1		0	91.6	8.4		0	0	0		
PHF	.750	.867	.000	.883	.926	.000	.883	.928	.000	.730	.635	.766	.000	.000	.000	.000	.896



File Name : Wilmington_405NBRamps
Site Code : 00000000
Start Date : 8/20/2014
Page No : 3

	Wilmington Ave Southbound				405 NB Ramps Westbound				Wilmimgton Ave Northbound				Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	16	190	0	206	105	0	**78**	183	0	67	39	106	0	0	0	0	495
04:45 PM	**21**	201	0	222	108	0	76	184	0	**82**	**46**	**128**	0	0	0	0	**534**
05:00 PM	20	190	0	210	**111**	0	76	**187**	0	61	32	93	0	0	0	0	490
05:15 PM	14	**213**	0	**227**	104	0	72	176	0	72	34	106	0	0	0	0	509
Total Volume	71	794	0	865	428	0	302	730	0	282	151	433	0	0	0	0	2028
% App. Total	8.2	91.8	0		58.6	0	41.4		0	65.1	34.9		0	0	0		
PHF	.845	.932	.000	.953	.964	.000	.968	.976	.000	.860	.821	.846	.000	.000	.000	.000	.949



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Site Code : 00000000
Start Date : 8/20/2014
Page No : 1

Groups Printed- Unshifted

	Wilmington Ave Southbound			**405 SB Ramp Westbound**			**Wilmington Ave Northbound**			**405 SB Ramp Eastbound**			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
06:00 AM	38	198	0	0	0	0	0	53	100	15	0	31	435
06:15 AM	40	211	0	0	0	0	0	41	107	12	0	34	445
06:30 AM	35	227	0	0	0	0	0	84	98	27	0	43	514
06:45 AM	43	222	0	0	0	0	0	78	89	50	0	46	528
Total	156	858	0	0	0	0	0	256	394	104	0	154	1922
07:00 AM	25	240	0	0	0	0	0	62	81	19	0	35	462
07:15 AM	38	217	0	0	0	0	0	80	91	27	0	40	493
07:30 AM	46	217	0	0	0	0	0	64	79	18	0	37	461
07:45 AM	24	212	0	0	0	0	0	85	94	27	0	63	505
Total	133	886	0	0	0	0	0	291	345	91	0	175	1921
08:00 AM	48	210	0	0	0	0	0	98	103	23	0	47	529
08:15 AM	43	187	1	0	0	0	0	92	83	24	0	47	477
08:30 AM	46	181	0	0	0	0	0	66	79	27	0	51	450
08:45 AM	26	191	0	0	0	0	0	70	90	24	0	42	443
Total	163	769	1	0	0	0	0	326	355	98	0	187	1899
04:00 PM	86	212	0	0	0	0	0	81	117	10	0	19	525
04:15 PM	77	190	0	0	0	0	0	81	125	6	0	25	504
04:30 PM	79	218	0	0	0	0	0	98	142	6	0	17	560
04:45 PM	88	220	0	0	0	0	0	119	110	11	0	15	563
Total	330	840	0	0	0	0	0	379	494	33	0	76	2152
05:00 PM	83	220	0	0	0	0	0	84	105	7	0	29	528
05:15 PM	87	230	0	0	0	0	0	105	122	2	0	21	567
05:30 PM	75	203	0	0	0	0	0	97	125	11	0	10	521
05:45 PM	78	203	0	0	0	0	0	93	126	6	0	12	518
Total	323	856	0	0	0	0	0	379	478	26	0	72	2134
Grand Total	1105	4209	1	0	0	0	0	1631	2066	352	0	664	10028
Apprch %	20.8	79.2	0	0	0	0	0	44.1	55.9	34.6	0	65.4	
Total %	11	42	0	0	0	0	0	16.3	20.6	3.5	0	6.6	

File Name : Wilmington_405SBRamps
Site Code : 00000000
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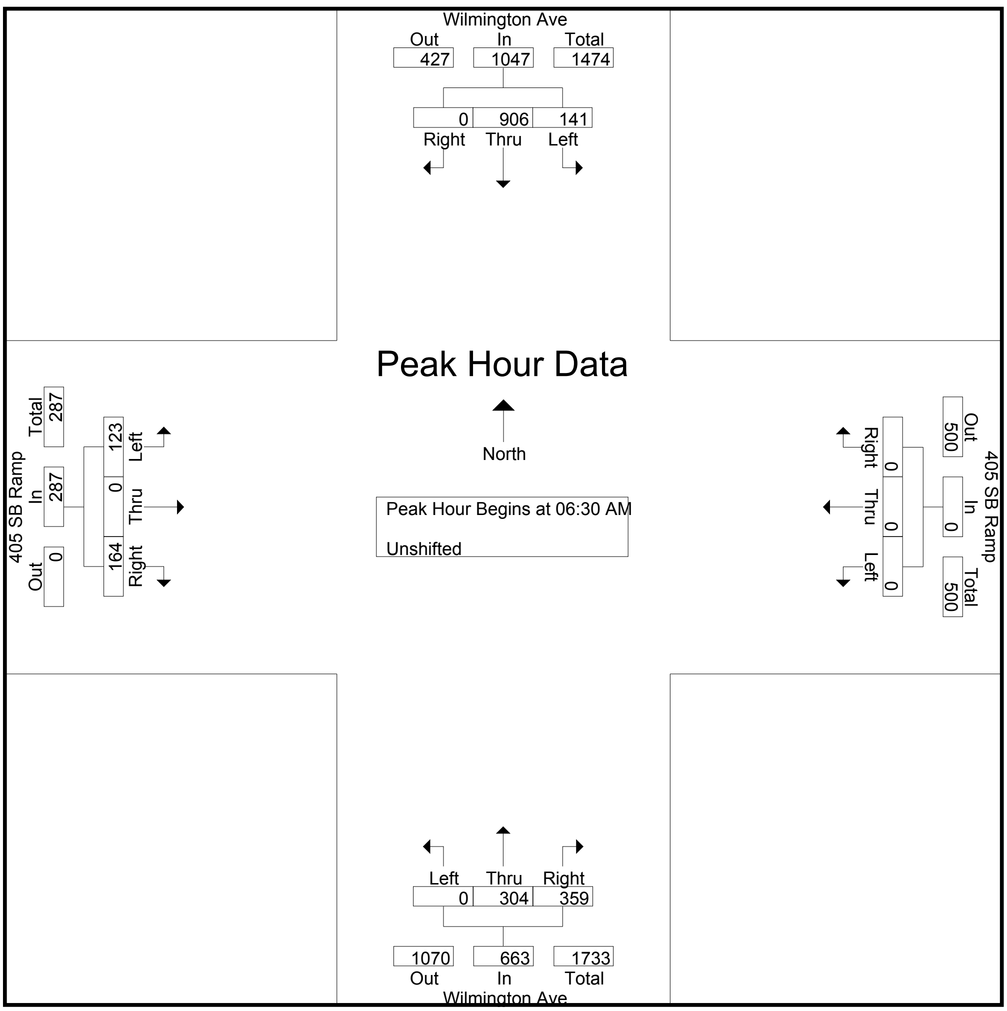
	Wilmington Ave Southbound				405 SB Ramp Westbound				Wilmington Ave Northbound				405 SB Ramp Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 06:30 AM																	
06:30 AM	35	227	0	262	0	0	0	0	0	**84**	**98**	**182**	27	0	43	70	514
06:45 AM	**43**	222	0	**265**	0	0	0	0	0	78	89	167	**50**	0	**46**	**96**	**528**
07:00 AM	25	**240**	0	265	0	0	0	0	0	62	81	143	19	0	35	54	462
07:15 AM	38	217	0	255	0	0	0	0	0	80	91	171	27	0	40	67	493
Total Volume	141	906	0	1047	0	0	0	0	0	304	359	663	123	0	164	287	1997
% App. Total	13.5	86.5	0		0	0	0		0	45.9	54.1		42.9	0	57.1		
PHF	.820	.944	.000	.988	.000	.000	.000	.000	.000	.905	.916	.911	.615	.000	.891	.747	.946



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Site Code : 00000000
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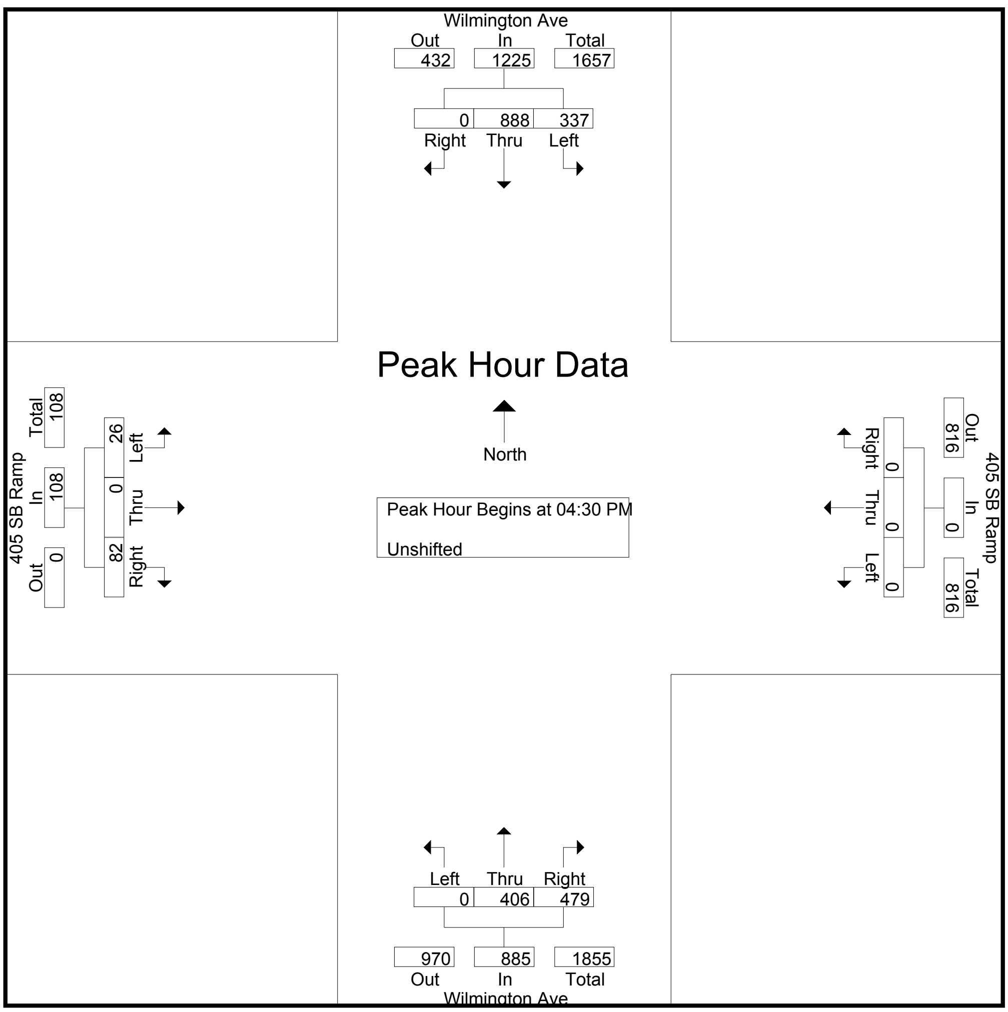
	Wilmington Ave Southbound				405 SB Ramp Westbound				Wilmington Ave Northbound				405 SB Ramp Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	79	218	0	297	0	0	0	0	0	98	**142**	**240**	6	0	17	23	560
04:45 PM	**88**	220	0	308	0	0	0	0	0	**119**	110	229	**11**	0	15	26	563
05:00 PM	83	220	0	303	0	0	0	0	0	84	105	189	7	0	**29**	**36**	528
05:15 PM	87	**230**	0	**317**	0	0	0	0	0	105	122	227	2	0	21	23	**567**
Total Volume	337	888	0	1225	0	0	0	0	0	406	479	885	26	0	82	108	2218
% App. Total	27.5	72.5	0		0	0	0		0	45.9	54.1		24.1	0	75.9		
PHF	.957	.965	.000	.966	.000	.000	.000	.000	.000	.853	.843	.922	.591	.000	.707	.750	.978



File Name : Wilmington_223rd
Site Code : 00000000
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Groups Printed- Unshifted

	Wilmington Ave Southbound			223rd St Westbound			Wilmington Ave Northbound			223rd St Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
06:00 AM	11	152	49	35	33	15	3	125	7	28	36	0	494
06:15 AM	6	169	69	36	56	11	1	117	3	26	52	3	549
06:30 AM	6	185	74	42	148	12	3	138	4	33	64	0	709
06:45 AM	12	183	77	50	130	10	2	119	22	38	66	3	712
Total	35	689	269	163	367	48	9	499	36	125	218	6	2464
07:00 AM	13	169	82	51	132	12	7	109	8	27	99	7	716
07:15 AM	9	161	75	55	231	13	3	114	21	32	112	5	831
07:30 AM	22	148	90	54	235	12	3	117	14	33	140	5	873
07:45 AM	12	177	78	38	178	13	1	143	17	32	149	2	840
Total	56	655	325	198	776	50	14	483	60	124	500	19	3260
08:00 AM	14	161	76	53	150	15	4	120	28	40	144	4	809
08:15 AM	16	155	73	45	128	15	6	97	15	27	102	0	679
08:30 AM	14	149	58	34	102	12	3	108	23	42	78	5	628
08:45 AM	12	152	71	32	103	8	2	112	16	19	68	6	601
Total	56	617	278	164	483	50	15	437	82	128	392	15	2717
04:00 PM	18	166	47	25	62	21	1	109	23	69	213	5	759
04:15 PM	14	173	36	40	68	23	3	112	24	63	210	4	770
04:30 PM	8	167	58	43	87	64	4	86	20	70	184	4	795
04:45 PM	14	178	49	40	70	35	1	126	40	59	185	2	799
Total	54	684	190	148	287	143	9	433	107	261	792	15	3123
05:00 PM	20	190	42	50	101	28	1	83	38	48	191	1	793
05:15 PM	13	189	50	44	87	16	2	121	26	63	232	3	846
05:30 PM	16	148	51	22	56	26	2	126	35	63	226	5	776
05:45 PM	14	162	44	25	49	26	4	136	40	55	184	7	746
Total	63	689	187	141	293	96	9	466	139	229	833	16	3161
Grand Total	264	3334	1249	814	2206	387	56	2318	424	867	2735	71	14725
Apprch %	5.4	68.8	25.8	23.9	64.7	11.4	2	82.8	15.2	23.6	74.5	1.9	
Total %	1.8	22.6	8.5	5.5	15	2.6	0.4	15.7	2.9	5.9	18.6	0.5	

File Name : Wilmington_223rd
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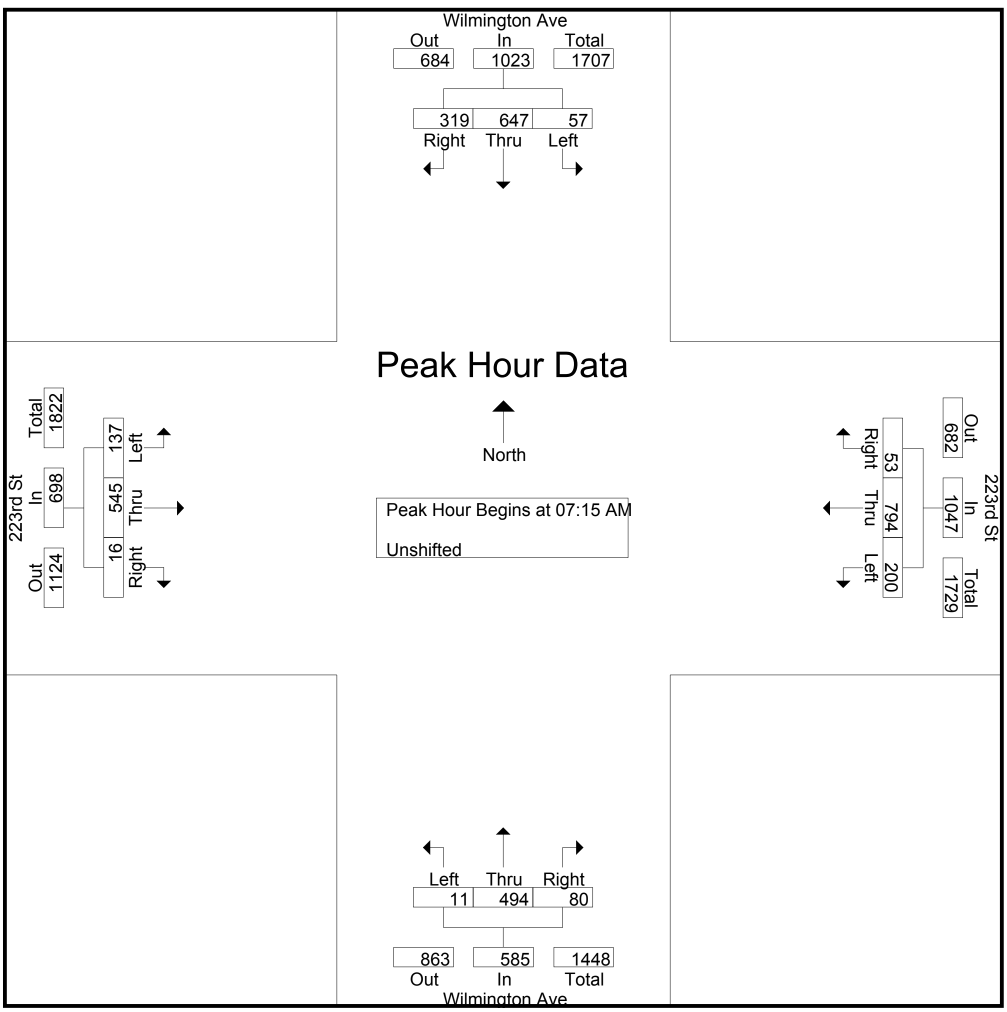
	Wilmington Ave Southbound				223rd St Westbound				Wilmington Ave Northbound				223rd St Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	9	161	75	245	**55**	231	13	299	3	114	21	138	32	112	**5**	149	831
07:30 AM	**22**	148	**90**	260	54	**235**	12	**301**	3	117	14	134	33	140	5	178	**873**
07:45 AM	12	**177**	78	**267**	38	178	13	229	1	**143**	17	**161**	32	**149**	2	183	840
08:00 AM	14	161	76	251	53	150	**15**	218	**4**	120	**28**	152	**40**	144	4	**188**	809
Total Volume	57	647	319	1023	200	794	53	1047	11	494	80	585	137	545	16	698	3353
% App. Total	5.6	63.2	31.2		19.1	75.8	5.1		1.9	84.4	13.7		19.6	78.1	2.3		
PHF	.648	.914	.886	.958	.909	.845	.883	.870	.688	.864	.714	.908	.856	.914	.800	.928	.960



File Name : Wilmington_223rd
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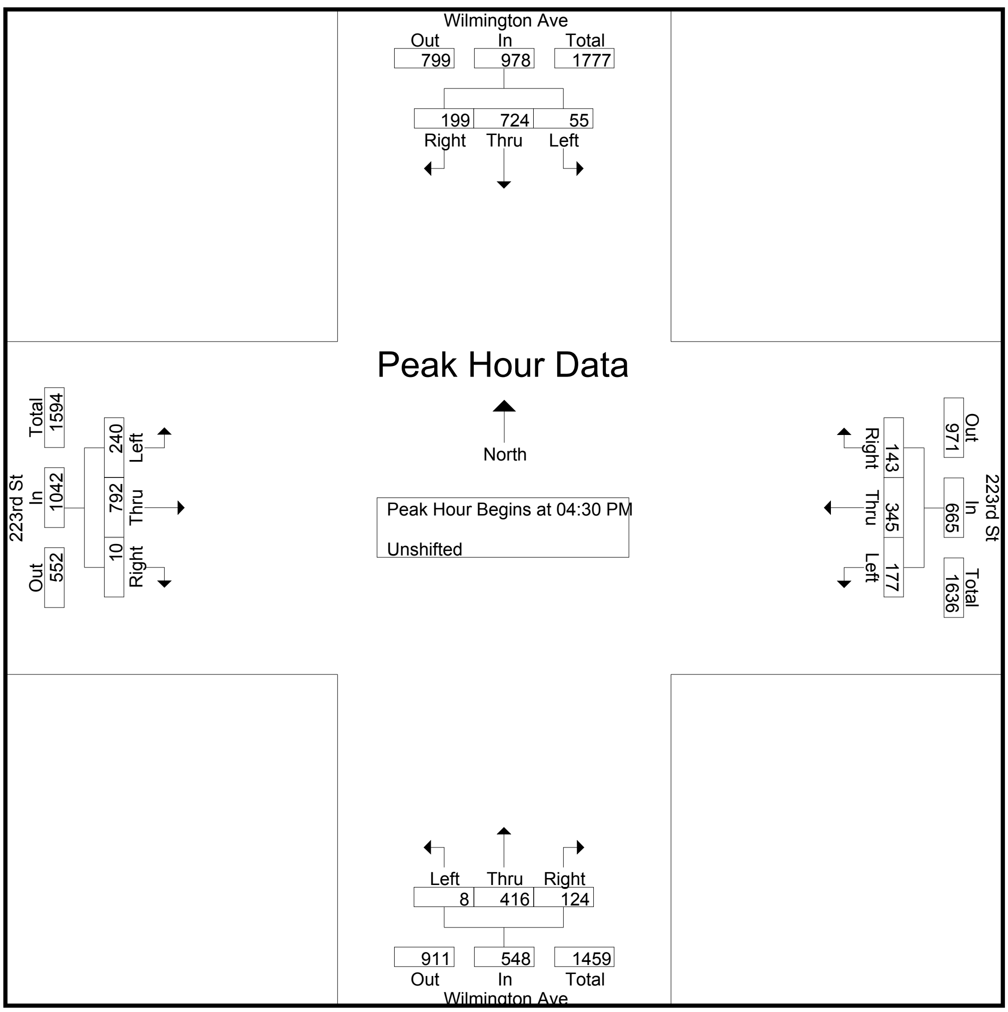
	Wilmington Ave Southbound				223rd St Westbound				Wilmington Ave Northbound				223rd St Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	8	167	**58**	233	43	87	**64**	**194**	**4**	86	20	110	**70**	184	**4**	258	795
04:45 PM	14	178	49	241	40	70	35	145	1	**126**	**40**	**167**	59	185	2	246	799
05:00 PM	**20**	**190**	42	**252**	**50**	**101**	28	179	1	83	38	122	48	191	1	240	793
05:15 PM	13	189	50	252	44	87	16	147	2	121	26	149	63	**232**	3	**298**	**846**
Total Volume	55	724	199	978	177	345	143	665	8	416	124	548	240	792	10	1042	3233
% App. Total	5.6	74	20.3		26.6	51.9	21.5		1.5	75.9	22.6		23	76	1		
PHF	.688	.953	.858	.970	.885	.854	.559	.857	.500	.825	.775	.820	.857	.853	.625	.874	.955



File Name : Alameda_405NBRamps
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Groups Printed- Unshifted

	Alameda Ave Southbound			405 NB Ramps Westbound			Alameda Ave Northbound			405 NB Ramps Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
06:00 AM	18	93	0	138	0	30	0	69	20	0	0	0	368
06:15 AM	8	133	0	144	0	31	0	65	13	0	0	0	394
06:30 AM	11	164	0	153	0	64	0	105	14	0	0	0	511
06:45 AM	17	137	0	132	0	51	0	99	15	0	0	0	451
Total	54	527	0	567	0	176	0	338	62	0	0	0	1724
07:00 AM	19	200	0	123	0	63	0	120	13	0	0	0	538
07:15 AM	12	207	0	104	0	64	0	124	13	0	0	0	524
07:30 AM	7	219	0	117	0	88	0	165	14	0	0	0	610
07:45 AM	12	214	0	118	0	97	0	148	7	0	0	0	596
Total	50	840	0	462	0	312	0	557	47	0	0	0	2268
08:00 AM	12	185	0	95	0	59	0	123	16	0	0	0	490
08:15 AM	8	133	0	84	0	61	0	111	13	0	0	0	410
08:30 AM	7	155	0	83	0	41	0	79	10	0	0	0	375
08:45 AM	6	146	0	92	0	37	0	85	14	0	0	0	380
Total	33	619	0	354	0	198	0	398	53	0	0	0	1655
04:00 PM	19	156	0	111	0	40	0	189	39	0	0	0	554
04:15 PM	21	179	0	121	0	32	0	198	37	0	0	0	588
04:30 PM	19	188	0	110	0	29	0	224	58	0	0	0	628
04:45 PM	17	175	0	106	0	28	0	255	53	0	0	0	634
Total	76	698	0	448	0	129	0	866	187	0	0	0	2404
05:00 PM	26	188	0	84	0	13	0	221	49	0	0	0	581
05:15 PM	18	204	0	84	0	35	0	222	30	0	0	0	593
05:30 PM	19	212	0	89	0	26	0	196	29	0	0	0	571
05:45 PM	10	141	0	105	0	37	0	157	39	0	0	0	489
Total	73	745	0	362	0	111	0	796	147	0	0	0	2234
Grand Total	286	3429	0	2193	0	926	0	2955	496	0	0	0	10285
Apprch %	7.7	92.3	0	70.3	0	29.7	0	85.6	14.4	0	0	0	
Total %	2.8	33.3	0	21.3	0	9	0	28.7	4.8	0	0	0	

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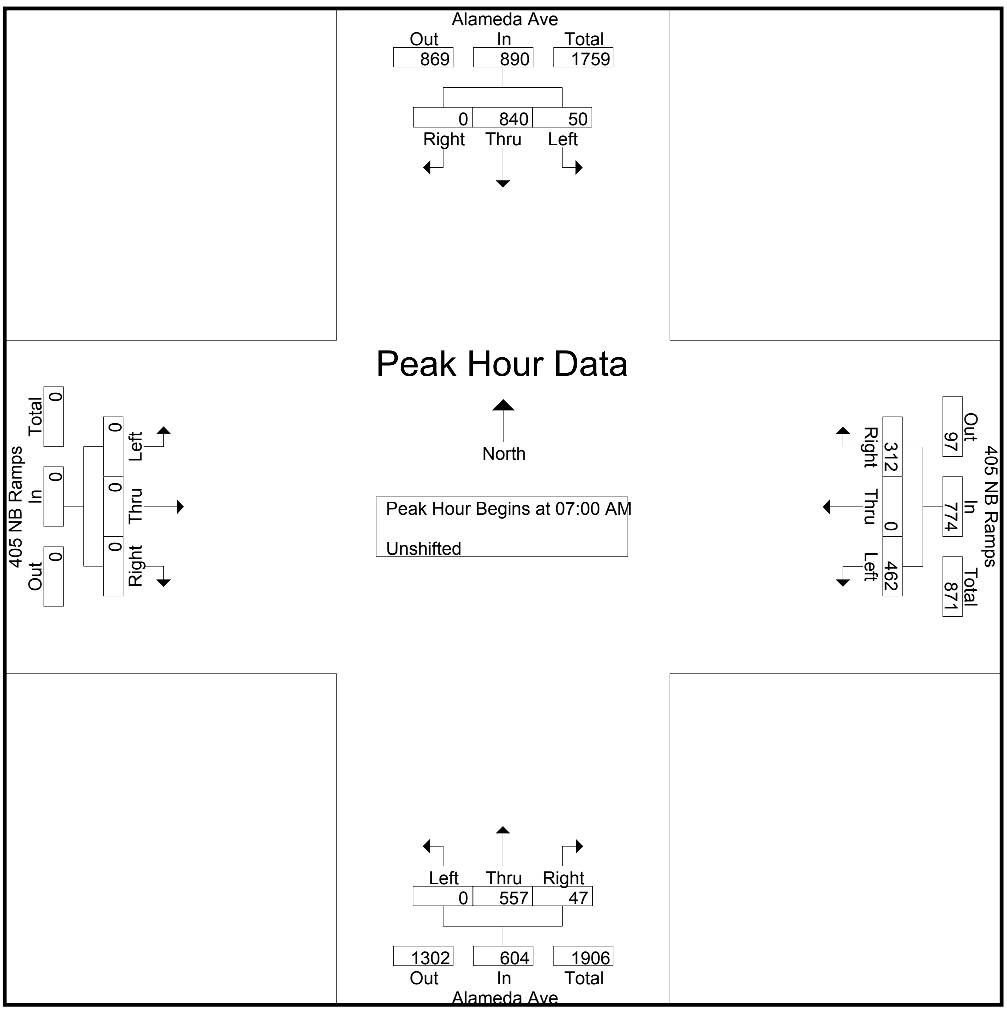
	Alameda Ave Southbound				405 NB Ramps Westbound				Alameda Ave Northbound				405 NB Ramps Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	**19**	200	0	219	**123**	0	63	186	0	120	13	133	0	0	0	0	538
07:15 AM	12	207	0	219	104	0	64	168	0	124	13	137	0	0	0	0	524
07:30 AM	7	**219**	0	**226**	117	0	88	205	0	**165**	**14**	**179**	0	0	0	0	**610**
07:45 AM	12	214	0	226	118	0	**97**	**215**	0	148	7	155	0	0	0	0	596
Total Volume	50	840	0	890	462	0	312	774	0	557	47	604	0	0	0	0	2268
% App. Total	5.6	94.4	0		59.7	0	40.3		0	92.2	7.8		0	0	0		
PHF	.658	.959	.000	.985	.939	.000	.804	.900	.000	.844	.839	.844	.000	.000	.000	.000	.930



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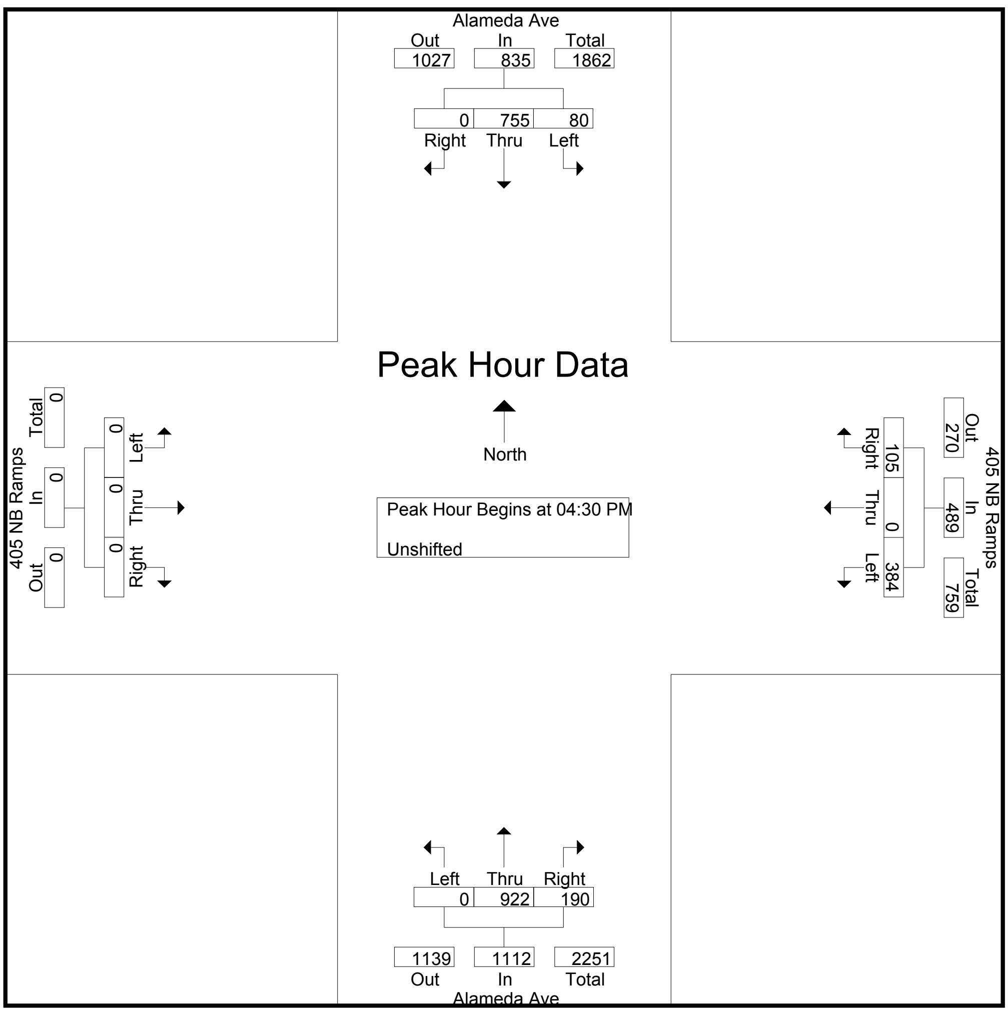
	Alameda Ave Southbound				405 NB Ramps Westbound				Alameda Ave Northbound				405 NB Ramps Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	19	188	0	207	**110**	0	29	**139**	0	224	**58**	282	0	0	0	0	628
04:45 PM	17	175	0	192	106	0	28	134	0	**255**	53	**308**	0	0	0	0	**634**
05:00 PM	**26**	188	0	214	84	0	13	97	0	221	49	270	0	0	0	0	581
05:15 PM	18	**204**	0	**222**	84	0	**35**	119	0	222	30	252	0	0	0	0	593
Total Volume	80	755	0	835	384	0	105	489	0	922	190	1112	0	0	0	0	2436
% App. Total	9.6	90.4	0		78.5	0	21.5		0	82.9	17.1		0	0	0		
PHF	.769	.925	.000	.940	.873	.000	.750	.879	.000	.904	.819	.903	.000	.000	.000	.000	.961



File Name : 223rd_Alameda_onAlameda
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Groups Printed- Unshifted

	Alameda St Southbound			223rd St Westbound			Alameda St Northbound			Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
06:00 AM	30	195	0	31	0	12	0	63	38	0	0	0	369
06:15 AM	34	239	0	50	0	11	0	68	33	0	0	0	435
06:30 AM	30	277	0	43	0	21	0	92	50	0	0	0	513
06:45 AM	32	243	0	39	0	20	0	95	55	0	0	0	484
Total	126	954	0	163	0	64	0	318	176	0	0	0	1801
07:00 AM	31	290	0	39	0	28	0	99	62	0	0	0	549
07:15 AM	35	273	0	41	0	27	0	102	65	0	0	0	543
07:30 AM	42	280	0	47	0	31	0	145	63	0	0	0	608
07:45 AM	51	279	0	49	0	33	0	125	52	0	0	0	589
Total	159	1122	0	176	0	119	0	471	242	0	0	0	2289
08:00 AM	40	251	0	42	0	28	0	120	26	0	0	0	507
08:15 AM	33	181	0	37	0	32	0	92	23	0	0	0	398
08:30 AM	32	203	0	40	0	26	0	81	12	0	0	0	394
08:45 AM	26	207	0	27	0	26	0	77	18	0	0	0	381
Total	131	842	0	146	0	112	0	370	79	0	0	0	1680
04:00 PM	47	212	0	25	0	24	0	198	108	0	0	0	614
04:15 PM	25	240	0	27	0	17	0	212	107	0	0	0	628
04:30 PM	39	259	0	35	0	38	0	237	108	0	0	0	716
04:45 PM	39	235	0	27	0	26	0	277	112	0	0	0	716
Total	150	946	0	114	0	105	0	924	435	0	0	0	2674
05:00 PM	41	239	0	21	0	34	0	229	118	0	0	0	682
05:15 PM	45	247	0	28	0	24	0	225	123	0	0	0	692
05:30 PM	41	251	0	17	0	18	0	205	98	0	0	0	630
05:45 PM	28	209	0	16	0	21	0	177	95	0	0	0	546
Total	155	946	0	82	0	97	0	836	434	0	0	0	2550
Grand Total	721	4810	0	681	0	497	0	2919	1366	0	0	0	10994
Apprch %	13	87	0	57.8	0	42.2	0	68.1	31.9	0	0	0	
Total %	6.6	43.8	0	6.2	0	4.5	0	26.6	12.4	0	0	0	

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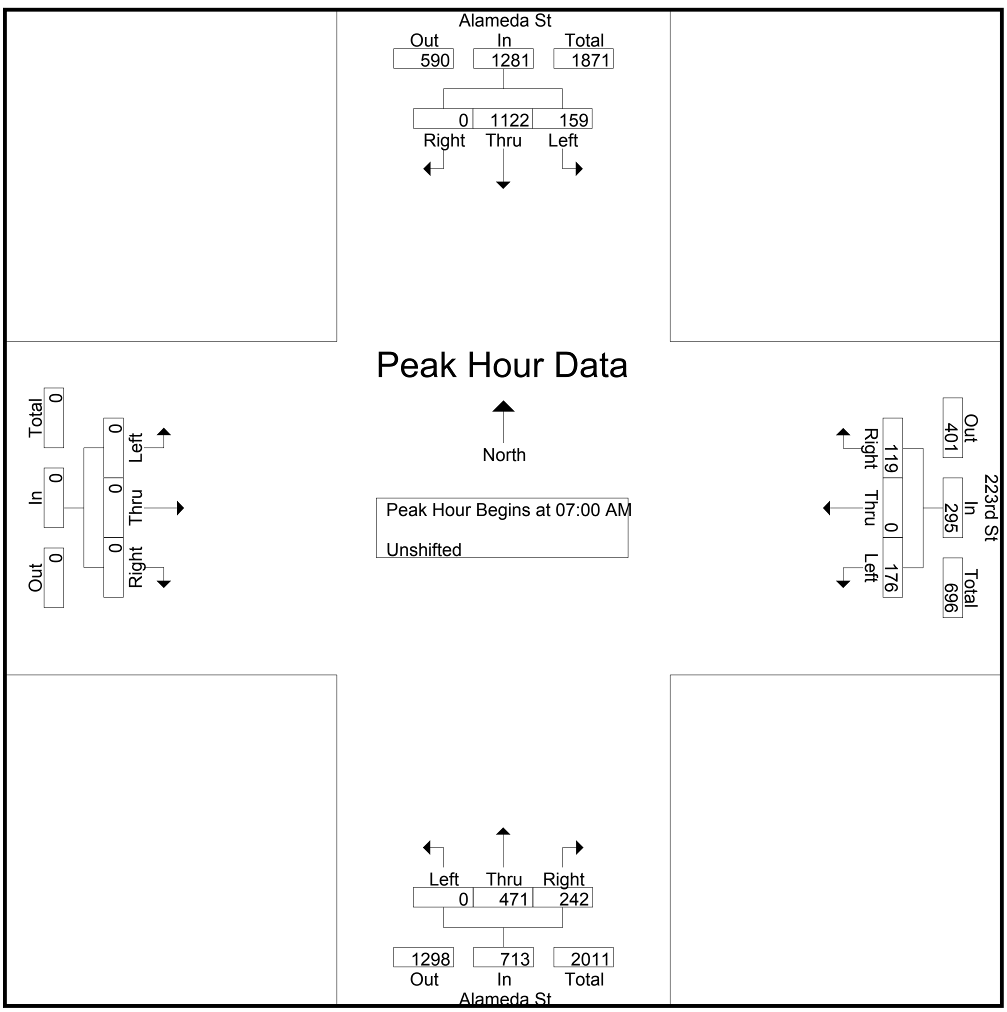
	Alameda St Southbound				223rd St Westbound				Alameda St Northbound				Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	31	**290**	0	321	39	0	28	67	0	99	62	161	0	0	0	0	549
07:15 AM	35	273	0	308	41	0	27	68	0	102	**65**	167	0	0	0	0	543
07:30 AM	42	280	0	322	47	0	31	78	0	**145**	63	**208**	0	0	0	0	**608**
07:45 AM	**51**	279	0	**330**	**49**	0	**33**	**82**	0	125	52	177	0	0	0	0	589
Total Volume	159	1122	0	1281	176	0	119	295	0	471	242	713	0	0	0	0	2289
% App. Total	12.4	87.6	0		59.7	0	40.3		0	66.1	33.9		0	0	0		
PHF	.779	.967	.000	.970	.898	.000	.902	.899	.000	.812	.931	.857	.000	.000	.000	.000	.941



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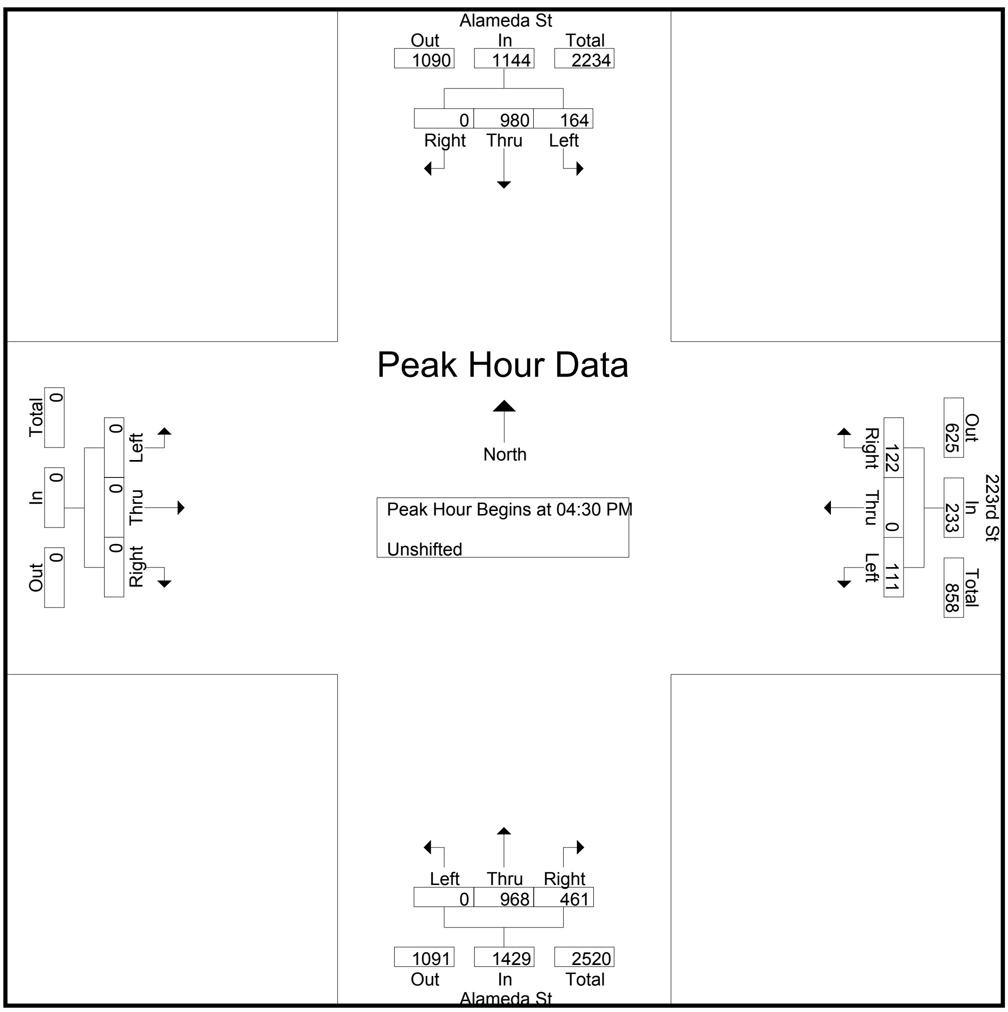
	Alameda St Southbound				223rd St Westbound				Alameda St Northbound				Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	39	**259**	0	**298**	**35**	0	**38**	**73**	0	237	108	345	0	0	0	0	**716**
04:45 PM	39	235	0	274	27	0	26	53	0	**277**	112	**389**	0	0	0	0	716
05:00 PM	41	239	0	280	21	0	34	55	0	229	118	347	0	0	0	0	682
05:15 PM	**45**	247	0	292	28	0	24	52	0	225	**123**	348	0	0	0	0	692
Total Volume	164	980	0	1144	111	0	122	233	0	968	461	1429	0	0	0	0	2806
% App. Total	14.3	85.7	0		47.6	0	52.4		0	67.7	32.3		0	0	0		
PHF	.911	.946	.000	.960	.793	.000	.803	.798	.000	.874	.937	.918	.000	.000	.000	.000	.980



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Groups Printed- Unshifted

		Southbound			223rd St Westbound			Alameda St Northbound			223rd St Eastbound		
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
06:00 AM	0	0	0	34	78	0	18	0	49	0	53	10	242
06:15 AM	0	0	0	37	107	0	18	0	50	0	57	20	289
06:30 AM	0	0	0	40	158	0	29	0	50	0	57	19	353
06:45 AM	0	0	0	40	169	0	33	0	54	0	77	19	392
Total	0	0	0	151	512	0	98	0	203	0	244	68	1276
07:00 AM	0	0	0	53	179	0	35	0	59	0	79	16	421
07:15 AM	0	0	0	51	180	0	41	0	63	0	102	18	455
07:30 AM	0	0	0	63	207	0	40	0	67	0	110	19	506
07:45 AM	0	0	0	56	181	0	27	0	77	0	107	27	475
Total	0	0	0	223	747	0	143	0	266	0	398	80	1857
08:00 AM	0	0	0	48	148	0	28	0	39	0	120	26	409
08:15 AM	0	0	0	45	132	0	33	0	55	0	118	24	407
08:30 AM	0	0	0	41	106	0	28	0	28	0	105	24	332
08:45 AM	0	0	0	36	110	0	20	0	22	0	123	20	331
Total	0	0	0	170	496	0	109	0	144	0	466	94	1479
04:00 PM	0	0	0	22	62	0	32	0	124	0	268	20	528
04:15 PM	0	0	0	24	69	0	19	0	116	0	304	21	553
04:30 PM	0	0	0	27	45	0	30	0	112	0	307	48	569
04:45 PM	0	0	0	21	81	0	24	0	128	0	290	34	578
Total	0	0	0	94	257	0	105	0	480	0	1169	123	2228
05:00 PM	0	0	0	20	88	0	24	0	138	0	282	35	587
05:15 PM	0	0	0	26	74	0	24	0	144	0	248	27	543
05:30 PM	0	0	0	16	67	0	22	0	112	0	282	20	519
05:45 PM	0	0	0	19	65	0	15	0	111	0	274	20	504
Total	0	0	0	81	294	0	85	0	505	0	1086	102	2153
Grand Total	0	0	0	719	2306	0	540	0	1598	0	3363	467	8993
Apprch %	0	0	0	23.8	76.2	0	25.3	0	74.7	0	87.8	12.2	
Total %	0	0	0	8	25.6	0	6	0	17.8	0	37.4	5.2	

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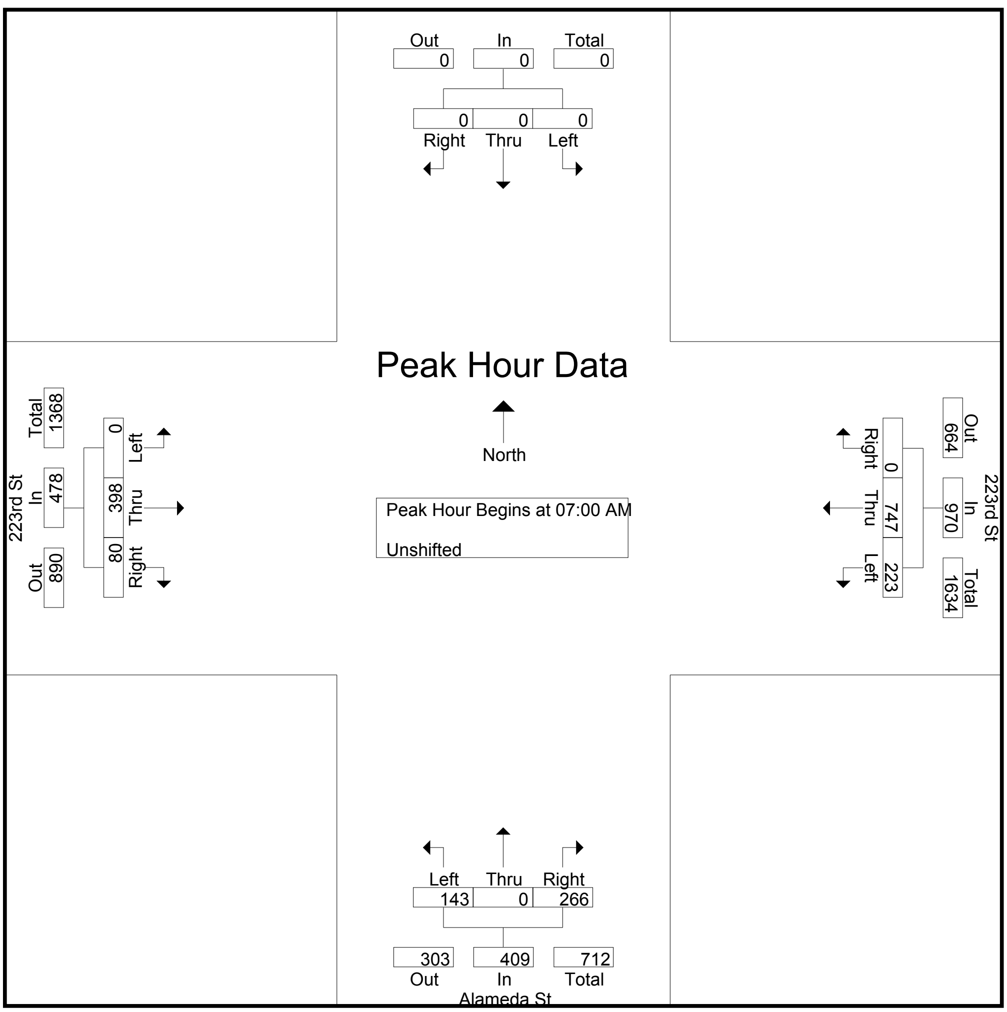
	Southbound				223rd St Westbound				Alameda St Northbound				223rd St Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	0	0	0	0	53	179	0	232	35	0	59	94	0	79	16	95	421
07:15 AM	0	0	0	0	51	180	0	231	**41**	0	63	104	0	102	18	120	455
07:30 AM	0	0	0	0	**63**	**207**	0	**270**	40	0	67	**107**	0	**110**	19	129	**506**
07:45 AM	0	0	0	0	56	181	0	237	27	0	**77**	104	0	107	**27**	**134**	475
Total Volume	0	0	0	0	223	747	0	970	143	0	266	409	0	398	80	478	1857
% App. Total	0	0	0		23	77	0		35	0	65		0	83.3	16.7		
PHF	.000	.000	.000	.000	.885	.902	.000	.898	.872	.000	.864	.956	.000	.905	.741	.892	.917



File Name : 223rd_Alameda_on223rd
Site Code : 00000000
Start Date : 8/20/2014
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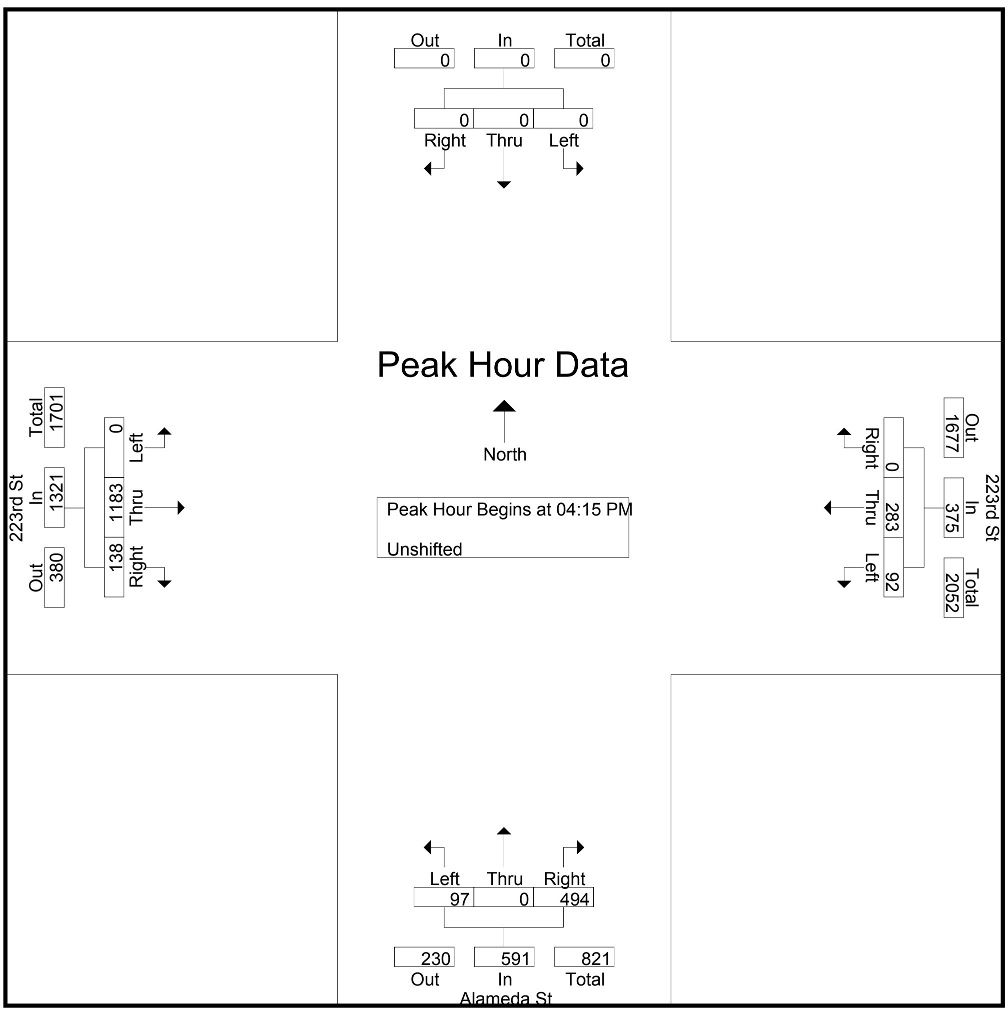
	Southbound				223rd St Westbound				Alameda St Northbound				223rd St Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	0	0	0	0	24	69	0	93	19	0	116	135	0	304	21	325	553
04:30 PM	0	0	0	0	**27**	45	0	72	**30**	0	112	142	0	**307**	**48**	**355**	569
04:45 PM	0	0	0	0	21	81	0	102	24	0	128	152	0	290	34	324	578
05:00 PM	0	0	0	0	20	**88**	0	**108**	24	0	**138**	**162**	0	282	35	317	**587**
Total Volume	0	0	0	0	92	283	0	375	97	0	494	591	0	1183	138	1321	2287
% App. Total	0	0	0		24.5	75.5	0		16.4	0	83.6		0	89.6	10.4		
PHF	.000	.000	.000	.000	.852	.804	.000	.868	.808	.000	.895	.912	.000	.963	.719	.930	.974



File Name : Sepulveda_Alameda_onAlameda
Site Code : 00000000
Start Date : 8/20/2014
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Groups Printed- Unshifted

	Alameda St Southbound			Sepulveda Blvd Westbound			Alameda St Northbound			Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
06:00 AM	49	174	0	2	0	20	0	68	16	0	0	0	329
06:15 AM	52	181	0	6	0	31	0	80	10	0	0	0	360
06:30 AM	74	210	0	13	0	36	0	87	12	0	0	0	432
06:45 AM	60	212	0	15	0	53	0	103	7	0	0	0	450
Total	235	777	0	36	0	140	0	338	45	0	0	0	1571
07:00 AM	51	217	0	12	0	48	0	100	12	0	0	0	440
07:15 AM	50	184	0	11	0	46	0	86	15	0	0	0	392
07:30 AM	60	196	0	11	0	46	0	105	16	0	0	0	434
07:45 AM	62	196	0	14	0	49	0	117	11	0	0	0	449
Total	223	793	0	48	0	189	0	408	54	0	0	0	1715
08:00 AM	61	201	0	9	0	54	0	104	9	0	0	0	438
08:15 AM	46	173	0	15	0	49	0	102	14	0	0	0	399
08:30 AM	51	151	0	11	0	43	0	87	12	0	0	0	355
08:45 AM	50	142	0	13	0	39	0	92	13	0	0	0	349
Total	208	667	0	48	0	185	0	385	48	0	0	0	1541
04:00 PM	49	252	0	18	0	101	0	196	17	0	0	0	633
04:15 PM	59	218	0	27	0	98	0	144	14	0	0	0	560
04:30 PM	57	226	0	27	0	113	0	267	28	0	0	0	718
04:45 PM	54	211	0	26	0	112	0	240	21	0	0	0	664
Total	219	907	0	98	0	424	0	847	80	0	0	0	2575
05:00 PM	57	197	0	22	0	108	0	255	18	0	0	0	657
05:15 PM	82	222	0	18	0	74	0	226	16	0	0	0	638
05:30 PM	41	184	0	27	0	92	0	209	16	0	0	0	569
05:45 PM	59	177	0	18	0	58	0	147	20	0	0	0	479
Total	239	780	0	85	0	332	0	837	70	0	0	0	2343
Grand Total	1124	3924	0	315	0	1270	0	2815	297	0	0	0	9745
Apprch %	22.3	77.7	0	19.9	0	80.1	0	90.5	9.5	0	0	0	
Total %	11.5	40.3	0	3.2	0	13	0	28.9	3	0	0	0	

File Name : Sepulveda_Alameda_onAlameda
Site Code : 00000000
Start Date : 8/20/2014
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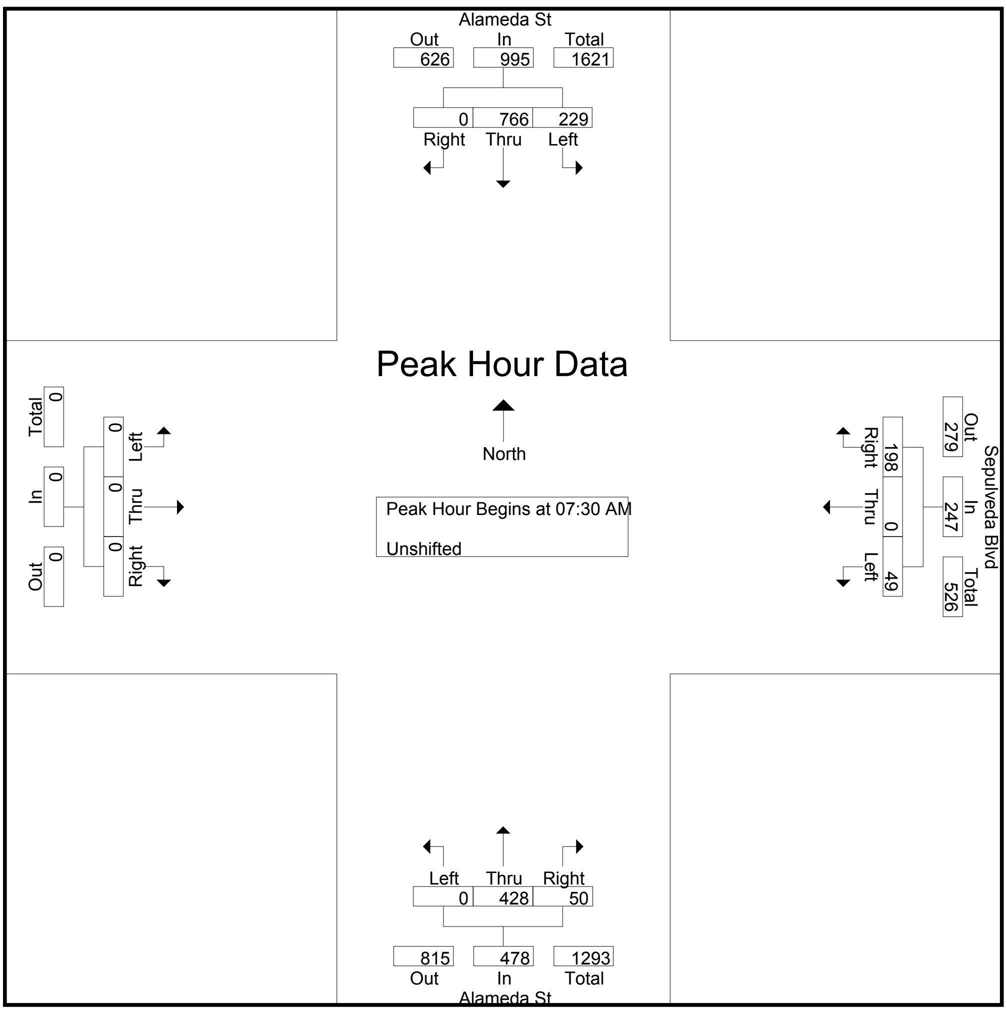
	Alameda St Southbound				**Sepulveda Blvd Westbound**				**Alameda St Northbound**				**Eastbound**				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	60	196	0	256	11	0	46	57	0	105	**16**	121	0	0	0	0	434
07:45 AM	**62**	196	0	258	14	0	49	63	0	**117**	11	**128**	0	0	0	0	**449**
08:00 AM	61	**201**	0	**262**	9	0	**54**	63	0	104	9	113	0	0	0	0	438
08:15 AM	46	173	0	219	**15**	0	49	**64**	0	102	14	116	0	0	0	0	399
Total Volume	229	766	0	995	49	0	198	247	0	428	50	478	0	0	0	0	1720
% App. Total	23	77	0		19.8	0	80.2		0	89.5	10.5		0	0	0		
PHF	.923	.953	.000	.949	.817	.000	.917	.965	.000	.915	.781	.934	.000	.000	.000	.000	.958



File Name : Sepulveda_Alameda_onAlameda
Site Code : 00000000
Start Date : 8/20/2014
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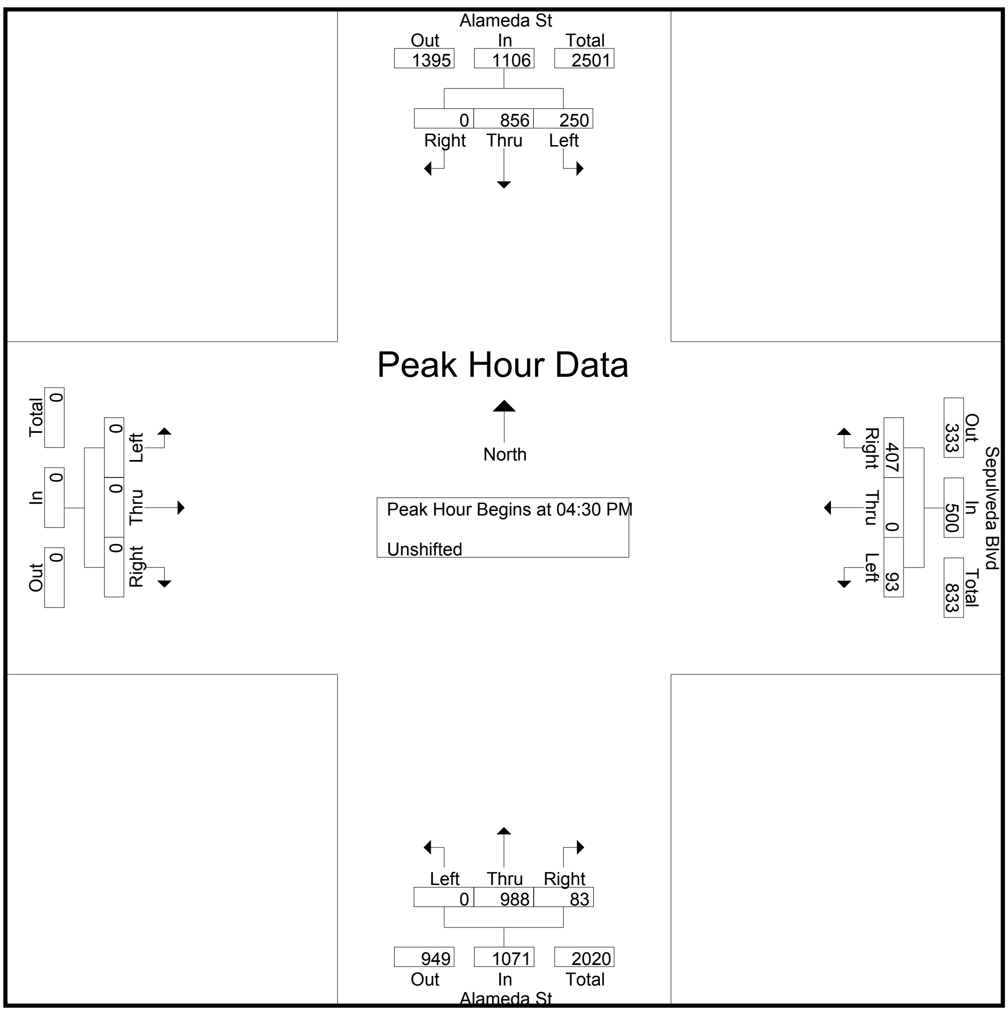
	Alameda St Southbound				Sepulveda Blvd Westbound				Alameda St Northbound				Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	57	**226**	0	283	**27**	0	**113**	**140**	0	**267**	**28**	**295**	0	0	0	0	**718**
04:45 PM	54	211	0	265	26	0	112	138	0	240	21	261	0	0	0	0	664
05:00 PM	57	197	0	254	22	0	108	130	0	255	18	273	0	0	0	0	657
05:15 PM	**82**	222	0	**304**	18	0	74	92	0	226	16	242	0	0	0	0	638
Total Volume	250	856	0	1106	93	0	407	500	0	988	83	1071	0	0	0	0	2677
% App. Total	22.6	77.4	0		18.6	0	81.4		0	92.3	7.7		0	0	0		
PHF	.762	.947	.000	.910	.861	.000	.900	.893	.000	.925	.741	.908	.000	.000	.000	.000	.932



File Name : Sepulveda_Alameda_onSepulveda
Site Code : 00000000
Start Date : 8/20/2014
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Groups Printed- Unshifted

	Alameda St Southbound			Sepulveda Blvd Westbound			Alameda St Northbound			Sepulveda Blvd Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
06:00 AM	21	8	34	4	66	14	0	1	0	9	36	0	193
06:15 AM	20	6	34	3	108	15	1	5	0	15	45	0	252
06:30 AM	34	7	44	0	154	30	0	3	0	16	67	1	356
06:45 AM	29	4	33	0	158	30	0	6	0	33	77	0	370
Total	104	25	145	7	486	89	1	15	0	73	225	1	1171
07:00 AM	33	2	26	1	125	26	0	2	1	29	88	1	334
07:15 AM	26	4	36	1	164	27	1	5	1	24	85	2	376
07:30 AM	38	2	33	2	152	26	0	3	1	28	83	3	371
07:45 AM	32	1	39	3	148	25	0	5	2	31	89	1	376
Total	129	9	134	7	589	104	1	15	5	112	345	7	1457
08:00 AM	29	2	36	2	130	20	1	6	0	35	98	0	359
08:15 AM	29	3	28	2	119	22	2	6	4	30	83	0	328
08:30 AM	39	3	23	1	103	30	0	2	0	24	83	0	308
08:45 AM	25	4	37	0	107	30	1	1	0	18	75	1	299
Total	122	12	124	5	459	102	4	15	4	107	339	1	1294
04:00 PM	32	4	28	1	101	68	2	5	2	46	186	1	476
04:15 PM	46	4	23	0	112	71	1	4	4	52	213	0	530
04:30 PM	44	1	39	1	103	69	1	6	5	64	247	0	580
04:45 PM	34	5	33	1	120	70	1	6	3	62	219	0	554
Total	156	14	123	3	436	278	5	21	14	224	865	1	2140
05:00 PM	32	4	40	0	130	69	2	2	3	59	243	0	584
05:15 PM	35	2	60	1	151	51	0	2	2	42	210	0	556
05:30 PM	27	1	39	0	133	48	1	3	1	66	263	1	583
05:45 PM	40	5	32	0	103	30	0	2	3	44	224	0	483
Total	134	12	171	1	517	198	3	9	9	211	940	1	2206
Grand Total	645	72	697	23	2487	771	14	75	32	727	2714	11	8268
Apprch %	45.6	5.1	49.3	0.7	75.8	23.5	11.6	62	26.4	21.1	78.6	0.3	
Total %	7.8	0.9	8.4	0.3	30.1	9.3	0.2	0.9	0.4	8.8	32.8	0.1	

File Name : Sepulveda_Alameda_onSepulveda
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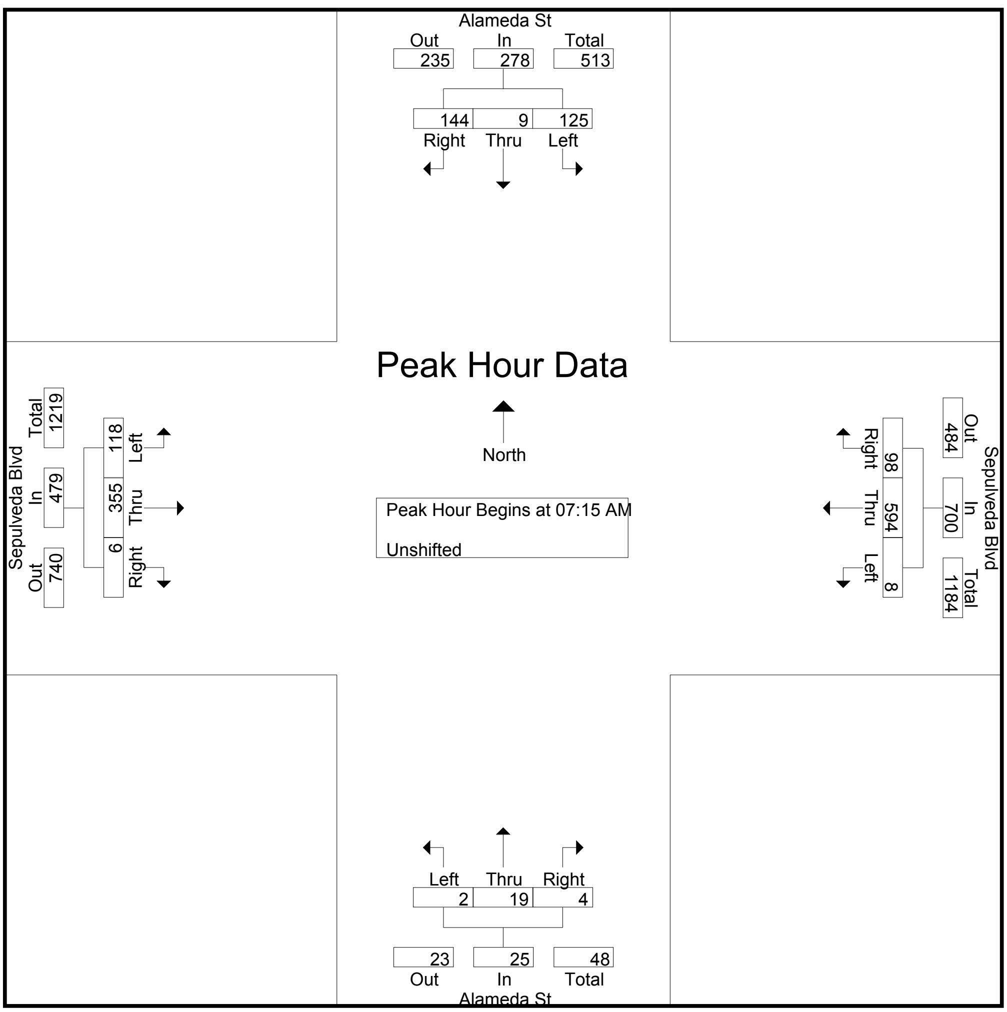
	Alameda St Southbound				Sepulveda Blvd Westbound				Alameda St Northbound				Sepulveda Blvd Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	26	**4**	36	66	1	**164**	**27**	**192**	**1**	5	1	**7**	24	85	2	111	**376**
07:30 AM	**38**	2	33	**73**	2	152	26	180	0	3	1	4	28	83	**3**	114	371
07:45 AM	32	1	**39**	72	**3**	148	25	176	0	5	**2**	7	31	89	1	121	376
08:00 AM	29	2	36	67	2	130	20	152	1	**6**	0	7	**35**	**98**	0	**133**	359
Total Volume	125	9	144	278	8	594	98	700	2	19	4	25	118	355	6	479	1482
% App. Total	45	3.2	51.8		1.1	84.9	14		8	76	16		24.6	74.1	1.3		
PHF	.822	.563	.923	.952	.667	.905	.907	.911	.500	.792	.500	.893	.843	.906	.500	.900	.985



File Name : Sepulveda_Alameda_onSepulveda
Site Code : 00000000
Start Date : 8/20/2014
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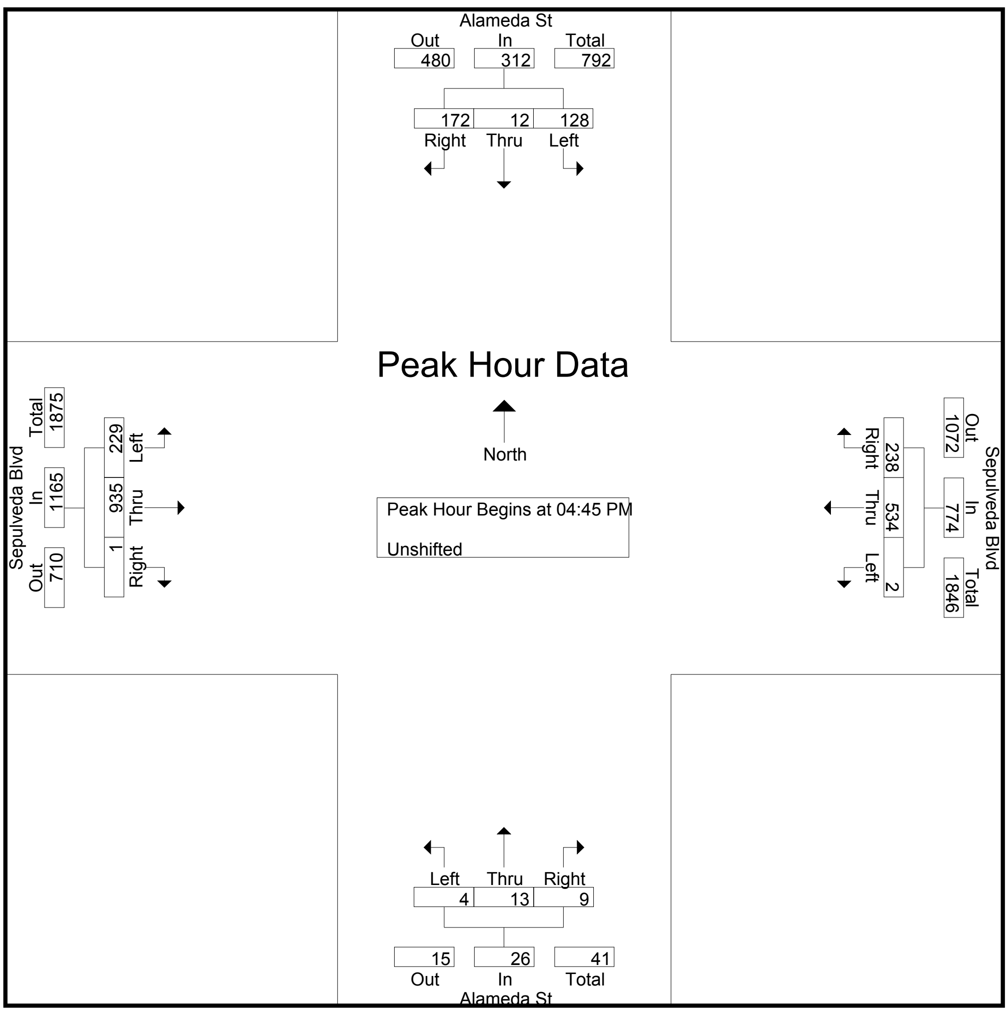
	Alameda St Southbound				Sepulveda Blvd Westbound				Alameda St Northbound				Sepulveda Blvd Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	34	**5**	33	72	**1**	120	**70**	191	1	**6**	**3**	**10**	62	219	0	281	554
05:00 PM	32	4	40	76	0	130	69	199	**2**	2	3	7	59	243	0	302	**584**
05:15 PM	**35**	2	**60**	**97**	1	**151**	51	**203**	0	2	2	4	42	210	0	252	556
05:30 PM	27	1	39	67	0	133	48	181	1	3	1	5	**66**	**263**	**1**	**330**	583
Total Volume	128	12	172	312	2	534	238	774	4	13	9	26	229	935	1	1165	2277
% App. Total	41	3.8	55.1		0.3	69	30.7		15.4	50	34.6		19.7	80.3	0.1		
PHF	.914	.600	.717	.804	.500	.884	.850	.953	.500	.542	.750	.650	.867	.889	.250	.883	.975



File Name : Alameda_405SBRamps
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Groups Printed- Unshifted

	405 SB Ramps Southbound			Alameda @ 223rd St Westbound			Driveway Northbound			Alameda @ 223rd St Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
06:00 AM	2	1	33	0	79	6	2	3	7	62	35	3	233
06:15 AM	8	0	35	6	101	6	4	4	4	67	37	1	273
06:30 AM	8	1	31	2	165	7	0	3	3	66	40	1	327
06:45 AM	3	2	35	0	173	4	1	0	1	71	57	1	348
Total	21	4	134	8	518	23	7	10	15	266	169	6	1181
07:00 AM	6	0	27	0	202	7	1	0	2	79	56	0	380
07:15 AM	12	0	25	0	204	7	0	1	2	84	75	0	410
07:30 AM	22	0	37	2	231	15	0	0	0	95	83	2	487
07:45 AM	15	0	34	1	200	3	0	0	1	95	88	2	439
Total	55	0	123	3	837	32	1	1	5	353	302	4	1716
08:00 AM	12	0	28	2	162	4	3	0	0	86	70	4	371
08:15 AM	12	0	41	1	137	10	0	0	0	98	77	1	377
08:30 AM	7	0	31	0	109	4	1	1	0	78	63	2	296
08:45 AM	9	0	35	1	105	5	0	0	0	79	64	0	298
Total	40	0	135	4	513	23	4	1	0	341	274	7	1342
04:00 PM	13	0	8	3	74	14	1	0	2	186	199	0	500
04:15 PM	21	0	13	2	78	5	0	2	0	198	217	1	537
04:30 PM	26	1	8	0	65	19	1	0	1	210	204	14	549
04:45 PM	31	0	11	1	93	12	0	2	0	213	202	1	566
Total	91	1	40	6	310	50	2	4	3	807	822	16	2152
05:00 PM	36	1	6	1	100	25	1	3	2	227	192	2	596
05:15 PM	32	0	11	2	89	21	1	1	0	190	200	1	548
05:30 PM	24	0	7	4	77	18	0	1	2	185	208	0	526
05:45 PM	32	1	10	3	71	12	1	1	0	180	200	0	511
Total	124	2	34	10	337	76	3	6	4	782	800	3	2181
Grand Total	331	7	466	31	2515	204	17	22	27	2549	2367	36	8572
Apprch %	41.2	0.9	58	1.1	91.5	7.4	25.8	33.3	40.9	51.5	47.8	0.7	
Total %	3.9	0.1	5.4	0.4	29.3	2.4	0.2	0.3	0.3	29.7	27.6	0.4	

File Name : Alameda_405SBRamps
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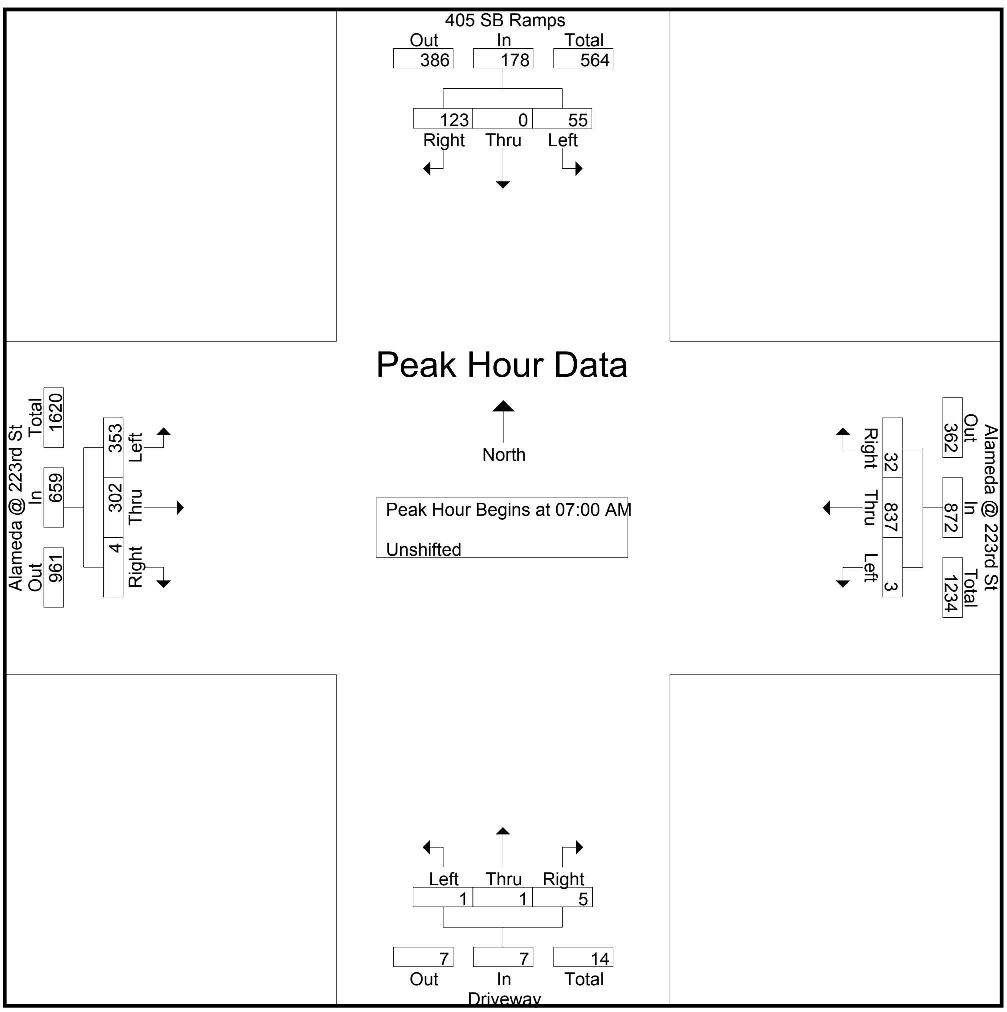
	405 SB Ramps Southbound				Alameda @ 223rd St Westbound				Driveway Northbound				Alameda @ 223rd St Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	6	0	27	33	0	202	7	209	**1**	0	**2**	**3**	79	56	0	135	380
07:15 AM	12	0	25	37	0	204	7	211	0	**1**	2	3	84	75	0	159	410
07:30 AM	**22**	0	**37**	**59**	**2**	**231**	**15**	**248**	0	0	0	0	**95**	83	**2**	180	**487**
07:45 AM	15	0	34	49	1	200	3	204	0	0	1	1	95	**88**	2	**185**	439
Total Volume	55	0	123	178	3	837	32	872	1	1	5	7	353	302	4	659	1716
% App. Total	30.9	0	69.1		0.3	96	3.7		14.3	14.3	71.4		53.6	45.8	0.6		
PHF	.625	.000	.831	.754	.375	.906	.533	.879	.250	.250	.625	.583	.929	.858	.500	.891	.881



File Name : Alameda_405SBRamps
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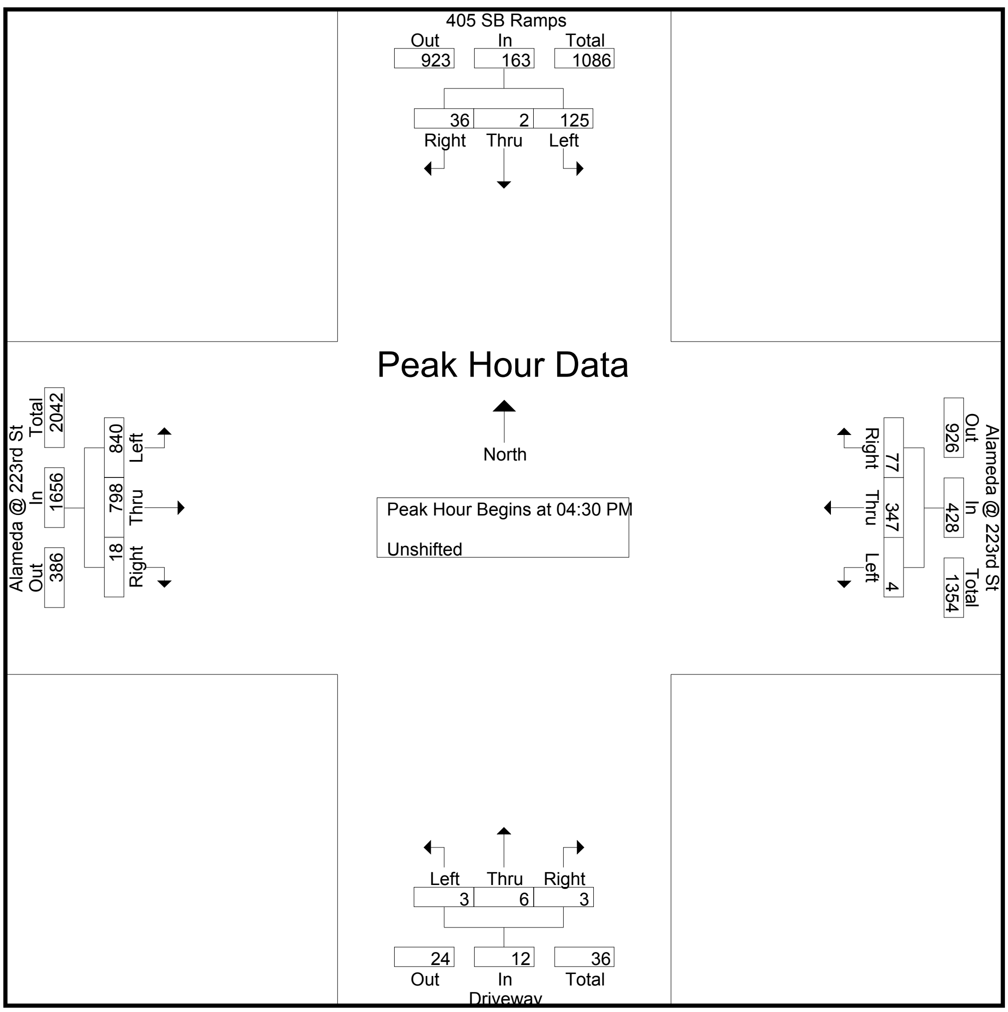
	405 SB Ramps Southbound				Alameda @ 223rd St Westbound				Driveway Northbound				Alameda @ 223rd St Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	26	**1**	8	35	0	65	19	84	**1**	0	1	2	210	**204**	**14**	**428**	549
04:45 PM	31	0	**11**	42	1	93	12	106	0	2	0	2	213	202	1	416	566
05:00 PM	**36**	1	6	**43**	1	**100**	**25**	**126**	1	**3**	**2**	**6**	**227**	192	2	421	**596**
05:15 PM	32	0	11	43	**2**	89	21	112	1	1	0	2	190	200	1	391	548
Total Volume	125	2	36	163	4	347	77	428	3	6	3	12	840	798	18	1656	2259
% App. Total	76.7	1.2	22.1		0.9	81.1	18		25	50	25		50.7	48.2	1.1		
PHF	.868	.500	.818	.948	.500	.868	.770	.849	.750	.500	.375	.500	.925	.978	.321	.967	.948



File Name : Sepulveda_TerminalIslandFrwy103
Site Code : 00000000
Start Date : 8/20/2014
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Groups Printed- Unshifted

	Southbound			Sepulveda Blvd Westbound			Terminal Island Frwy 103 Northbound			Sepulveda Blvd Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
06:00 AM	0	0	0	42	99	0	6	0	18	0	28	13	206
06:15 AM	0	0	0	50	143	0	17	0	10	0	34	11	265
06:30 AM	0	0	0	67	197	0	21	0	23	0	35	25	368
06:45 AM	0	0	0	55	186	4	20	0	21	0	66	27	379
Total	0	0	0	214	625	4	64	0	72	0	163	76	1218
07:00 AM	0	0	0	47	147	3	27	0	19	1	61	34	339
07:15 AM	0	0	0	73	194	0	23	0	22	2	67	44	425
07:30 AM	0	0	0	59	230	8	22	0	24	0	78	55	476
07:45 AM	0	0	0	66	206	5	34	0	28	2	93	39	473
Total	0	0	0	245	777	16	106	0	93	5	299	172	1713
08:00 AM	0	0	0	38	164	3	18	0	25	0	78	45	371
08:15 AM	0	0	0	29	128	1	20	0	24	0	75	32	309
08:30 AM	0	0	0	33	117	2	35	0	18	1	75	46	327
08:45 AM	0	0	0	19	109	1	39	0	27	1	70	33	299
Total	0	0	0	119	518	7	112	0	94	2	298	156	1306
04:00 PM	0	0	0	55	88	1	75	1	44	0	192	44	500
04:15 PM	0	0	0	45	96	1	88	1	59	0	232	56	578
04:30 PM	0	0	0	53	94	1	55	0	55	1	266	67	592
04:45 PM	0	0	0	55	103	1	102	0	55	0	248	63	627
Total	0	0	0	208	381	4	320	2	213	1	938	230	2297
05:00 PM	0	0	0	38	105	0	60	0	67	0	245	80	595
05:15 PM	0	0	0	37	111	0	82	0	78	0	226	58	592
05:30 PM	0	0	0	37	106	0	67	0	48	0	281	55	594
05:45 PM	0	0	0	35	96	0	37	0	30	0	229	63	490
Total	0	0	0	147	418	0	246	0	223	0	981	256	2271
Grand Total	0	0	0	933	2719	31	848	2	695	8	2679	890	8805
Apprch %	0	0	0	25.3	73.8	0.8	54.9	0.1	45	0.2	74.9	24.9	
Total %	0	0	0	10.6	30.9	0.4	9.6	0	7.9	0.1	30.4	10.1	

File Name : Sepulveda_TerminalIslandFrwy103
Site Code : 00000000
Start Date : 8/20/2014
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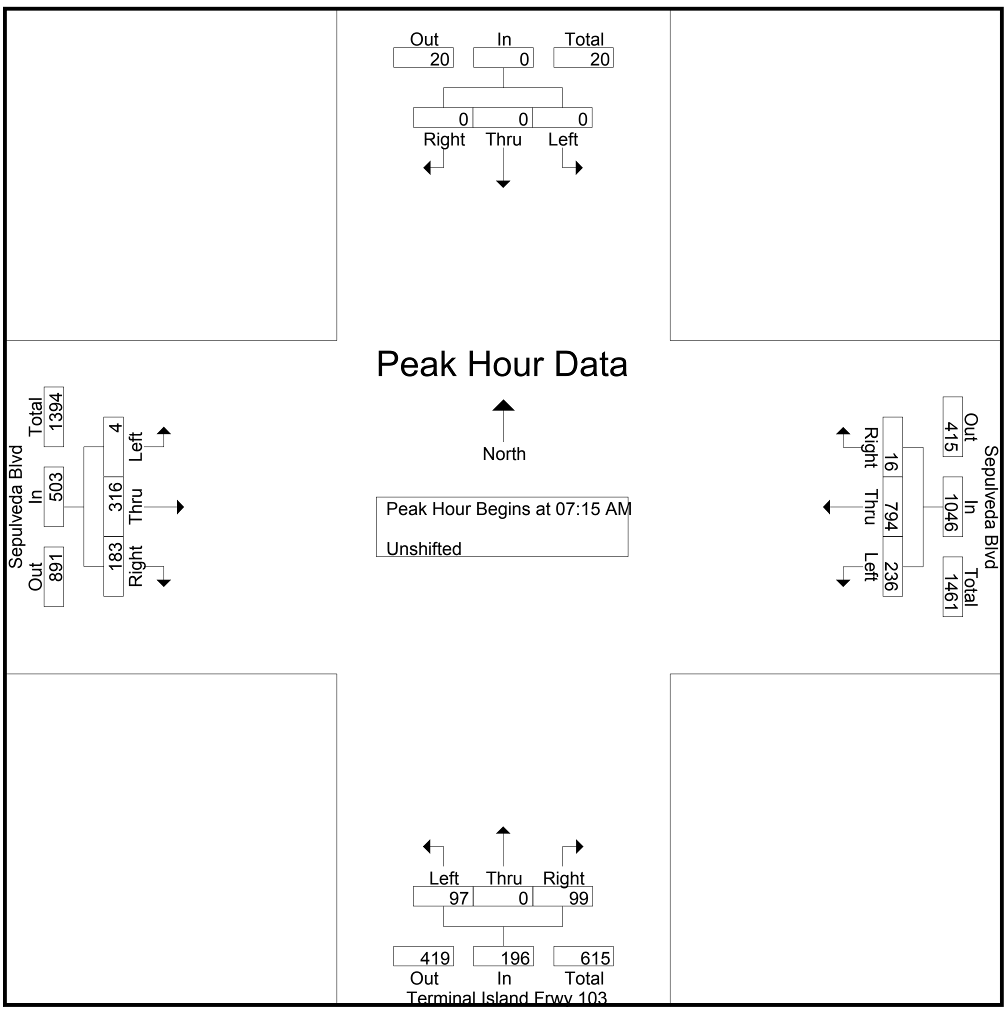
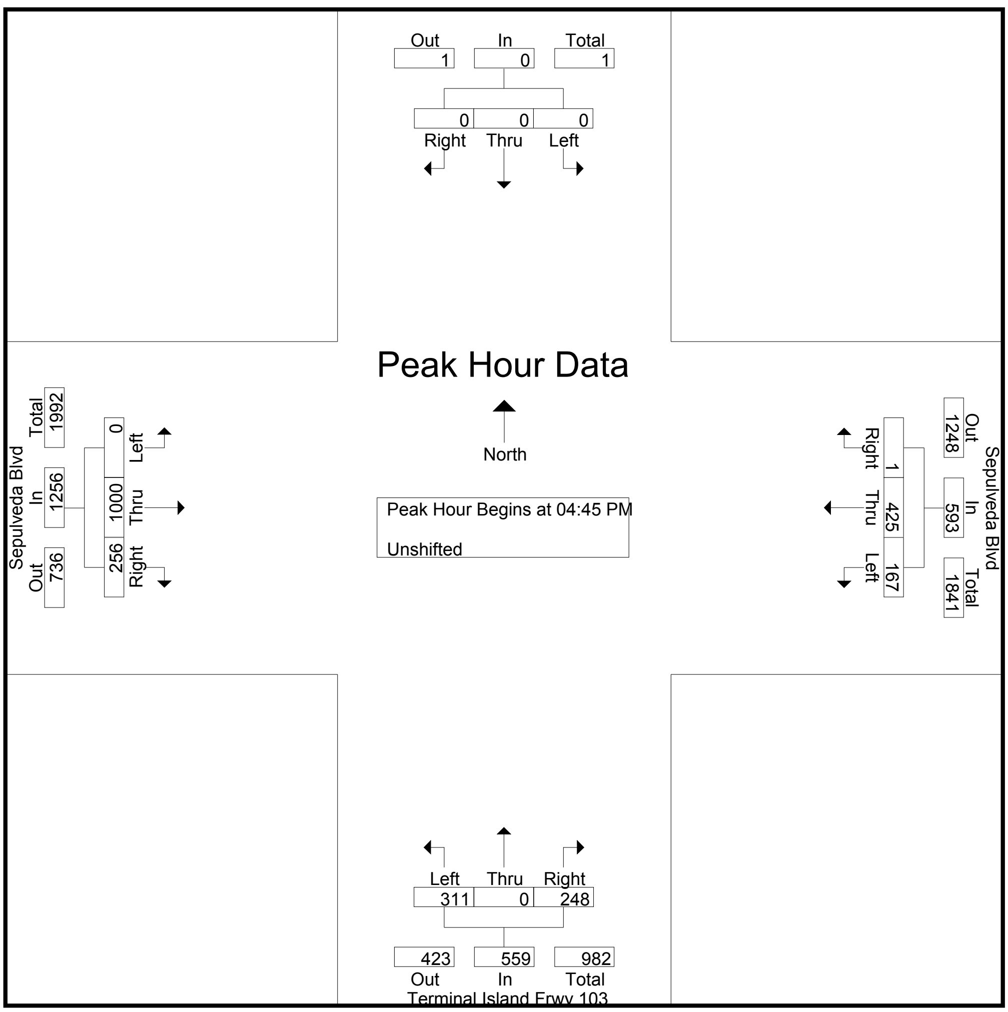
	Southbound				Sepulveda Blvd Westbound				Terminal Island Frwy 103 Northbound				Sepulveda Blvd Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	0	0	0	0	**73**	194	0	267	23	0	22	45	**2**	67	44	113	425
07:30 AM	0	0	0	0	59	**230**	**8**	**297**	22	0	24	46	0	78	**55**	133	**476**
07:45 AM	0	0	0	0	66	206	5	277	**34**	0	**28**	**62**	2	**93**	39	**134**	473
08:00 AM	0	0	0	0	38	164	3	205	18	0	25	43	0	78	45	123	371
Total Volume	0	0	0	0	236	794	16	1046	97	0	99	196	4	316	183	503	1745
% App. Total	0	0	0		22.6	75.9	1.5		49.5	0	50.5		0.8	62.8	36.4		
PHF	.000	.000	.000	.000	.808	.863	.500	.880	.713	.000	.884	.790	.500	.849	.832	.938	.916



File Name : Sepulveda_TerminalIslandFrwy103
Site Code : 00000000
Start Date : 8/20/2014
Page No : 3

	Southbound				Sepulveda Blvd Westbound				Terminal Island Frwy 103 Northbound				Sepulveda Blvd Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	0	0	0	0	**55**	103	**1**	**159**	**102**	0	55	157	0	248	63	311	**627**
05:00 PM	0	0	0	0	38	105	0	143	60	0	67	127	0	245	**80**	325	595
05:15 PM	0	0	0	0	37	**111**	0	148	82	0	**78**	**160**	0	226	58	284	592
05:30 PM	0	0	0	0	37	106	0	143	67	0	48	115	0	**281**	55	**336**	594
Total Volume	0	0	0	0	167	425	1	593	311	0	248	559	0	1000	256	1256	2408
% App. Total	0	0	0		28.2	71.7	0.2		55.6	0	44.4		0	79.6	20.4		
PHF	.000	.000	.000	.000	.759	.957	.250	.932	.762	.000	.795	.873	.000	.890	.800	.935	.960



File Name : Sepulveda_SantaFe
Site Code : 00000000
Start Date : 8/20/2014
Page No : 1

Groups Printed- Unshifted

	Santa Fe Ave Southbound			Sepulveda Blvd Westbound			Santa Fe Ave Northbound			Sepulveda Blvd Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
06:00 AM	14	24	14	9	114	15	11	22	10	6	55	4	298
06:15 AM	20	27	15	14	130	22	18	23	11	2	51	5	338
06:30 AM	28	37	27	9	194	17	18	35	15	4	68	6	458
06:45 AM	29	42	25	19	201	23	15	31	7	18	100	6	516
Total	91	130	81	51	639	77	62	111	43	30	274	21	1610
07:00 AM	24	38	26	15	184	24	23	36	8	12	84	2	476
07:15 AM	38	62	42	31	200	27	16	42	17	16	98	6	595
07:30 AM	30	56	38	45	201	21	22	40	23	27	106	4	613
07:45 AM	51	72	35	50	200	34	19	55	23	15	126	15	695
Total	143	228	141	141	785	106	80	173	71	70	414	27	2379
08:00 AM	33	68	17	33	166	26	19	47	17	15	96	7	544
08:15 AM	34	55	20	22	115	19	16	40	15	19	94	13	462
08:30 AM	34	47	16	19	120	36	20	37	31	10	97	8	475
08:45 AM	51	50	10	33	108	25	12	32	20	10	84	7	442
Total	152	220	63	107	509	106	67	156	83	54	371	35	1923
04:00 PM	70	76	23	41	111	43	24	72	40	33	202	10	745
04:15 PM	59	81	21	39	118	38	15	77	47	34	242	7	778
04:30 PM	70	69	16	31	129	42	17	112	45	31	270	13	845
04:45 PM	85	91	17	29	133	34	18	122	61	40	247	8	885
Total	284	317	77	140	491	157	74	383	193	138	961	38	3253
05:00 PM	82	71	21	30	90	34	21	98	49	40	228	9	773
05:15 PM	94	80	8	47	131	39	26	96	45	29	237	13	845
05:30 PM	81	71	15	45	116	31	21	85	41	29	238	6	779
05:45 PM	75	86	9	52	104	47	21	63	43	33	233	16	782
Total	332	308	53	174	441	151	89	342	178	131	936	44	3179
Grand Total	1002	1203	415	613	2865	597	372	1165	568	423	2956	165	12344
Apprch %	38.2	45.9	15.8	15	70.3	14.7	17.7	55.3	27	11.9	83.4	4.7	
Total %	8.1	9.7	3.4	5	23.2	4.8	3	9.4	4.6	3.4	23.9	1.3	

File Name : Sepulveda_SantaFe
Site Code : 00000000
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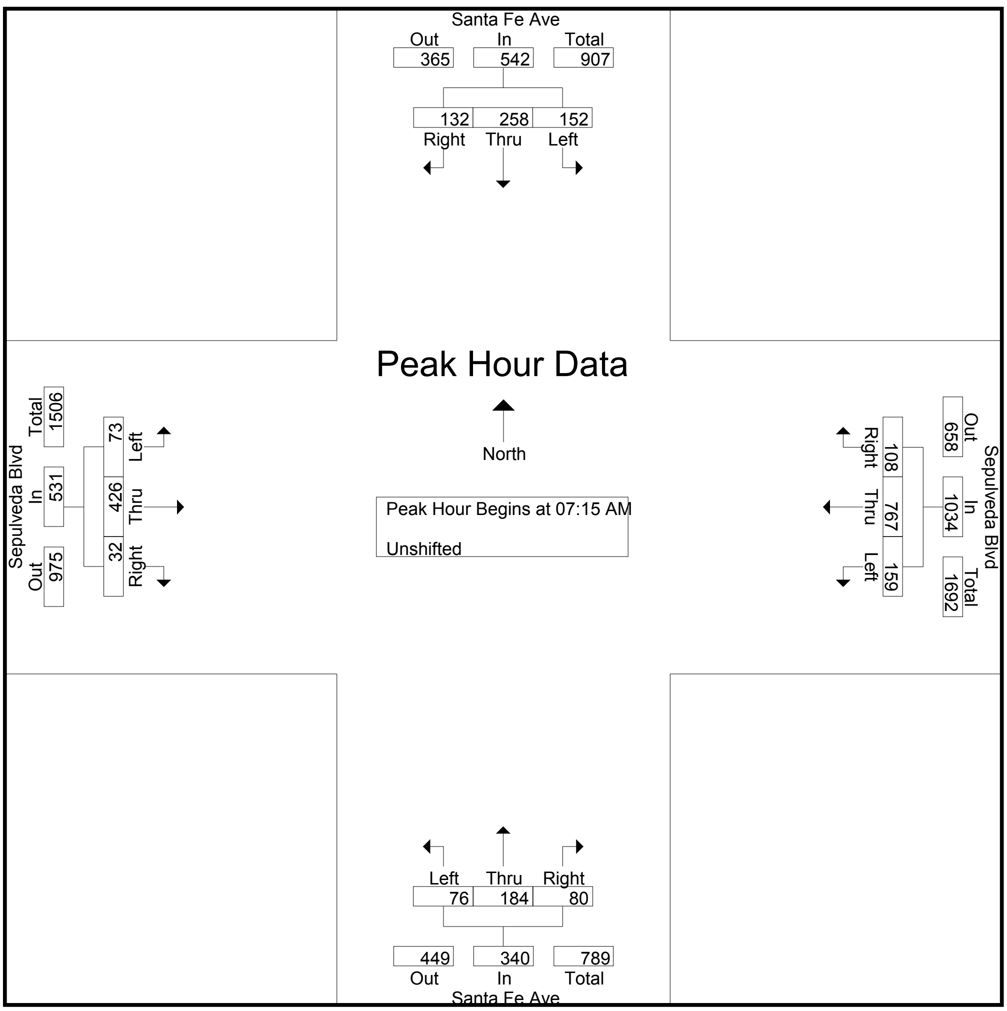
	Santa Fe Ave Southbound				Sepulveda Blvd Westbound				Santa Fe Ave Northbound				Sepulveda Blvd Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	38	62	**42**	142	31	200	27	258	16	42	17	75	16	98	6	120	595
07:30 AM	30	56	38	124	45	**201**	21	267	**22**	40	**23**	85	**27**	106	4	137	613
07:45 AM	**51**	**72**	35	**158**	**50**	200	**34**	**284**	19	**55**	23	**97**	15	**126**	**15**	**156**	**695**
08:00 AM	33	68	17	118	33	166	26	225	19	47	17	83	15	96	7	118	544
Total Volume	152	258	132	542	159	767	108	1034	76	184	80	340	73	426	32	531	2447
% App. Total	28	47.6	24.4		15.4	74.2	10.4		22.4	54.1	23.5		13.7	80.2	6		
PHF	.745	.896	.786	.858	.795	.954	.794	.910	.864	.836	.870	.876	.676	.845	.533	.851	.880



File Name : Sepulveda_SantaFe
Site Code : 00000000
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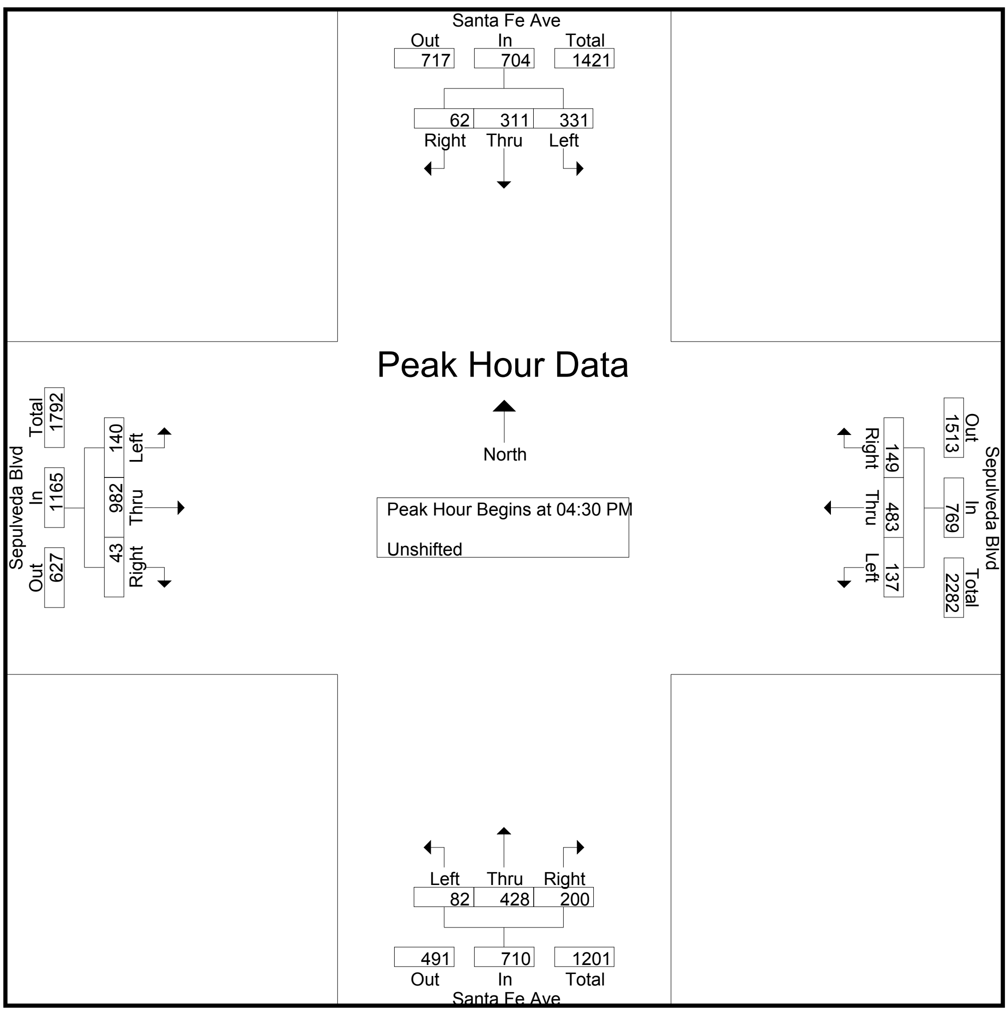
	Santa Fe Ave Southbound				Sepulveda Blvd Westbound				Santa Fe Ave Northbound				Sepulveda Blvd Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	70	69	16	155	31	129	**42**	202	17	112	45	174	31	**270**	**13**	**314**	845
04:45 PM	85	**91**	17	**193**	29	**133**	34	196	18	**122**	**61**	**201**	**40**	247	8	295	**885**
05:00 PM	82	71	**21**	174	30	90	34	154	21	98	49	168	40	228	9	277	773
05:15 PM	**94**	80	8	182	**47**	131	39	**217**	**26**	96	45	167	29	237	13	279	845
Total Volume	331	311	62	704	137	483	149	769	82	428	200	710	140	982	43	1165	3348
% App. Total	47	44.2	8.8		17.8	62.8	19.4		11.5	60.3	28.2		12	84.3	3.7		
PHF	.880	.854	.738	.912	.729	.908	.887	.886	.788	.877	.820	.883	.875	.909	.827	.928	.946



File Name : Willow_710SBRamps
Site Code : 00000000
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Groups Printed- Unshifted

	710 SB Ramps Southbound			Willow St Westbound			710 SB Ramps Northbound			Willow St Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
06:00 AM	0	0	74	0	90	22	0	0	15	0	131	21	353
06:15 AM	0	0	81	0	134	18	0	0	30	0	184	28	475
06:30 AM	0	0	135	0	174	28	0	0	30	0	200	26	593
06:45 AM	0	0	112	0	193	23	0	0	34	0	221	39	622
Total	0	0	402	0	591	91	0	0	109	0	736	114	2043
07:00 AM	0	0	80	0	196	19	0	0	34	0	227	16	572
07:15 AM	0	0	137	0	215	42	0	0	50	0	242	39	725
07:30 AM	0	0	98	0	291	51	0	0	43	0	259	37	779
07:45 AM	0	0	111	0	261	48	0	0	47	0	323	42	832
Total	0	0	426	0	963	160	0	0	174	0	1051	134	2908
08:00 AM	0	0	89	0	230	32	0	0	52	0	245	41	689
08:15 AM	0	0	90	0	200	30	0	0	44	0	272	33	669
08:30 AM	0	0	68	0	179	29	0	0	54	0	269	51	650
08:45 AM	0	0	71	0	192	24	0	0	58	0	281	38	664
Total	0	0	318	0	801	115	0	0	208	0	1067	163	2672
04:00 PM	0	0	131	0	262	18	0	0	95	0	409	53	968
04:15 PM	0	0	161	0	261	21	0	0	93	0	426	55	1017
04:30 PM	0	0	139	0	288	30	0	0	129	0	462	55	1103
04:45 PM	0	0	118	0	290	26	0	0	99	0	441	48	1022
Total	0	0	549	0	1101	95	0	0	416	0	1738	211	4110
05:00 PM	0	0	211	0	317	31	0	0	109	0	475	70	1213
05:15 PM	0	0	254	0	299	22	0	0	103	0	451	57	1186
05:30 PM	0	0	196	0	340	16	0	0	104	0	446	73	1175
05:45 PM	0	0	295	0	317	23	0	0	87	0	420	55	1197
Total	0	0	956	0	1273	92	0	0	403	0	1792	255	4771
Grand Total	0	0	2651	0	4729	553	0	0	1310	0	6384	877	16504
Apprch %	0	0	100	0	89.5	10.5	0	0	100	0	87.9	12.1	
Total %	0	0	16.1	0	28.7	3.4	0	0	7.9	0	38.7	5.3	

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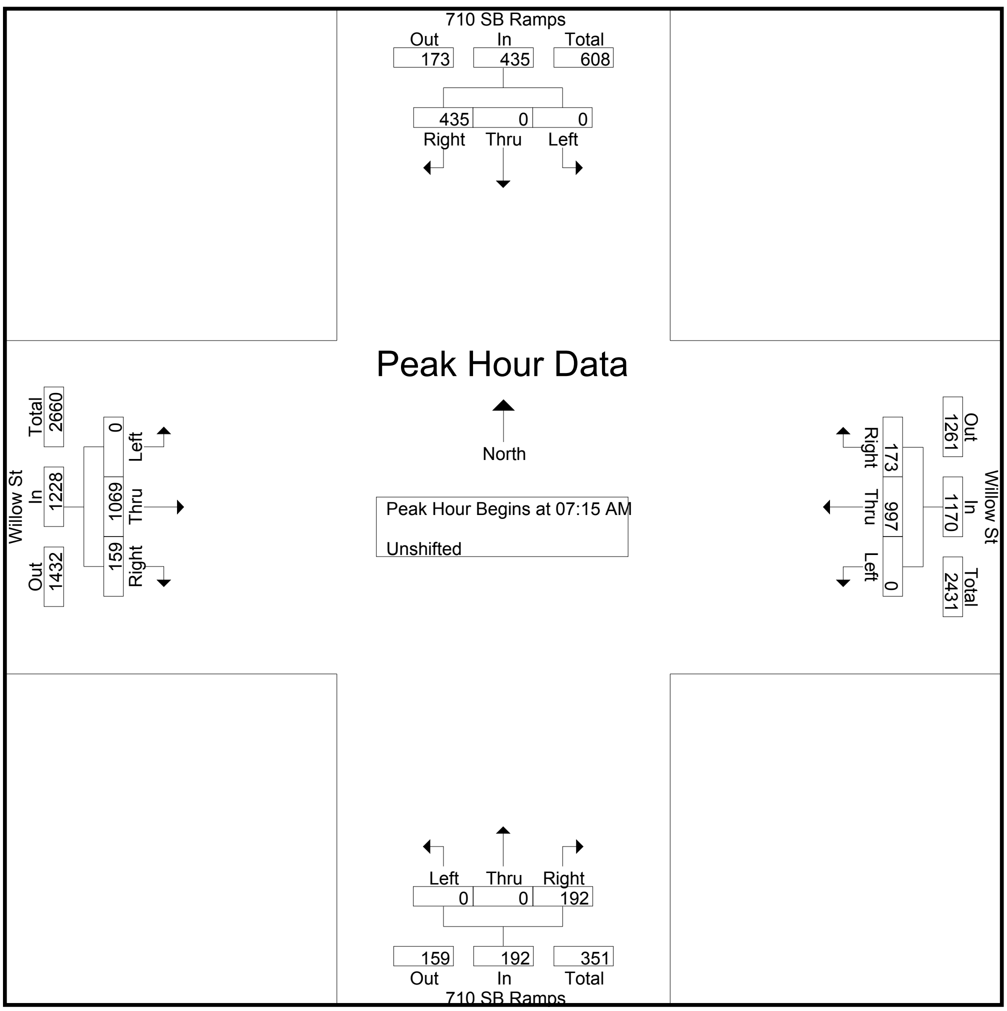
	710 SB Ramps Southbound				Willow St Westbound				710 SB Ramps Northbound				Willow St Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	0	0	**137**	**137**	0	215	42	257	0	0	50	50	0	242	39	281	725
07:30 AM	0	0	98	98	0	**291**	**51**	**342**	0	0	43	43	0	259	37	296	779
07:45 AM	0	0	111	111	0	261	48	309	0	0	47	47	0	**323**	**42**	**365**	**832**
08:00 AM	0	0	89	89	0	230	32	262	0	0	**52**	**52**	0	245	41	286	689
Total Volume	0	0	435	435	0	997	173	1170	0	0	192	192	0	1069	159	1228	3025
% App. Total	0	0	100		0	85.2	14.8		0	0	100		0	87.1	12.9		
PHF	.000	.000	.794	.794	.000	.857	.848	.855	.000	.000	.923	.923	.000	.827	.946	.841	.909



File Name : Willow_710SBRamps
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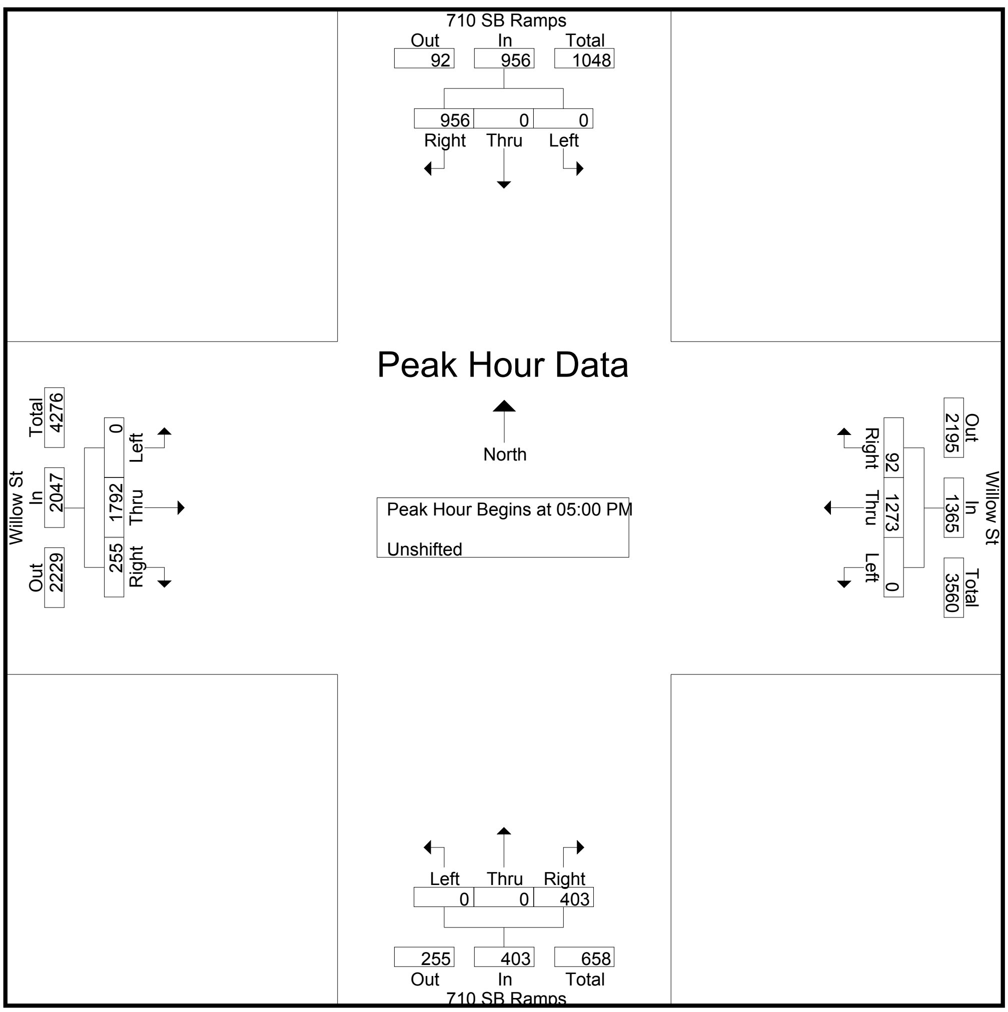
	710 SB Ramps Southbound				**Willow St Westbound**				**710 SB Ramps Northbound**				**Willow St Eastbound**				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	0	0	211	211	0	317	**31**	348	0	0	**109**	**109**	0	**475**	70	**545**	**1213**
05:15 PM	0	0	254	254	0	299	22	321	0	0	103	103	0	451	57	508	1186
05:30 PM	0	0	196	196	0	**340**	16	**356**	0	0	104	104	0	446	**73**	519	1175
05:45 PM	0	0	**295**	**295**	0	317	23	340	0	0	87	87	0	420	55	475	1197
Total Volume	0	0	956	956	0	1273	92	1365	0	0	403	403	0	1792	255	2047	4771
% App. Total	0	0	100		0	93.3	6.7		0	0	100		0	87.5	12.5		
PHF	.000	.000	.810	.810	.000	.936	.742	.959	.000	.000	.924	.924	.000	.943	.873	.939	.983



File Name : Willow_710NBRamps
Site Code : 00000000
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Groups Printed- Unshifted

	710 NB Ramps Southbound			Willow St Westbound			710 NB Ramps Northbound			Willow St Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
06:00 AM	0	0	15	0	97	73	0	0	18	0	91	52	346
06:15 AM	0	0	22	0	127	78	0	0	18	0	129	88	462
06:30 AM	0	0	21	0	185	117	0	0	20	0	150	95	588
06:45 AM	0	0	21	0	191	110	0	0	31	0	172	81	606
Total	0	0	79	0	600	378	0	0	87	0	542	316	2002
07:00 AM	0	0	22	0	196	105	0	0	25	0	172	89	609
07:15 AM	0	0	29	0	229	93	0	0	22	0	203	92	668
07:30 AM	0	0	35	0	304	92	0	0	44	0	215	87	777
07:45 AM	0	0	34	0	276	88	0	0	40	0	267	100	805
Total	0	0	120	0	1005	378	0	0	131	0	857	368	2859
08:00 AM	0	0	22	0	240	81	0	0	45	0	229	72	689
08:15 AM	0	0	21	0	210	66	0	0	28	0	225	90	640
08:30 AM	0	0	23	0	186	50	0	0	31	0	221	97	608
08:45 AM	0	0	27	0	188	75	0	0	26	0	258	79	653
Total	0	0	93	0	824	272	0	0	130	0	933	338	2590
04:00 PM	0	0	19	0	257	66	0	0	33	0	400	103	878
04:15 PM	0	0	24	0	260	54	0	0	29	0	409	112	888
04:30 PM	0	0	26	0	294	62	0	0	24	0	447	136	989
04:45 PM	0	0	21	0	297	63	0	0	26	0	460	81	948
Total	0	0	90	0	1108	245	0	0	112	0	1716	432	3703
05:00 PM	0	0	16	0	330	93	0	0	23	0	492	89	1043
05:15 PM	0	0	19	0	304	71	0	0	21	0	454	99	968
05:30 PM	0	0	38	0	315	69	0	0	38	0	454	94	1008
05:45 PM	0	0	32	0	307	73	0	0	19	0	416	94	941
Total	0	0	105	0	1256	306	0	0	101	0	1816	376	3960
Grand Total	0	0	487	0	4793	1579	0	0	561	0	5864	1830	15114
Apprch %	0	0	100	0	75.2	24.8	0	0	100	0	76.2	23.8	
Total %	0	0	3.2	0	31.7	10.4	0	0	3.7	0	38.8	12.1	

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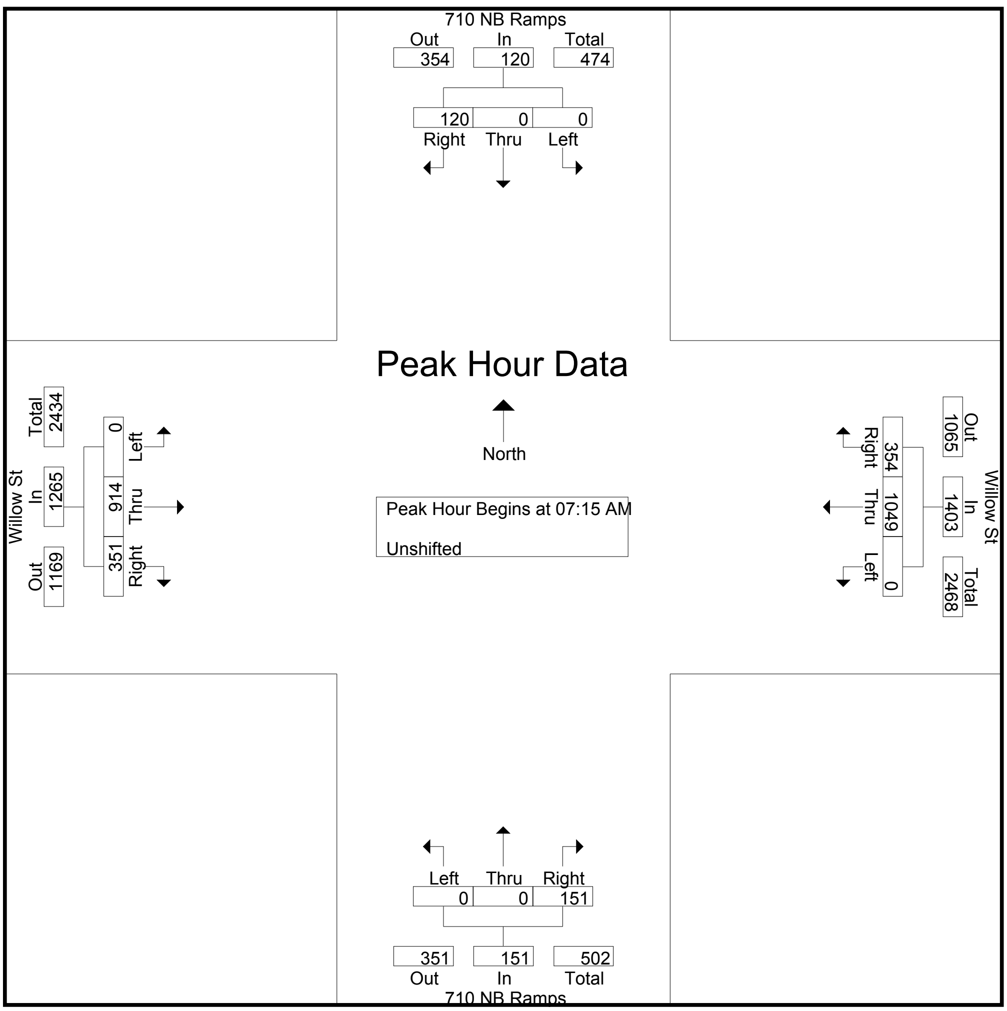
	710 NB Ramps Southbound				Willow St Westbound				710 NB Ramps Northbound				Willow St Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	0	0	29	29	0	229	**93**	322	0	0	22	22	0	203	92	295	668
07:30 AM	0	0	**35**	**35**	0	**304**	92	**396**	0	0	44	44	0	215	87	302	777
07:45 AM	0	0	34	34	0	276	88	364	0	0	40	40	0	**267**	**100**	**367**	**805**
08:00 AM	0	0	22	22	0	240	81	321	0	0	**45**	**45**	0	229	72	301	689
Total Volume	0	0	120	120	0	1049	354	1403	0	0	151	151	0	914	351	1265	2939
% App. Total	0	0	100		0	74.8	25.2		0	0	100		0	72.3	27.7		
PHF	.000	.000	.857	.857	.000	.863	.952	.886	.000	.000	.839	.839	.000	.856	.878	.862	.913



File Name : Willow_710NBRamps
Site Code : 00000000
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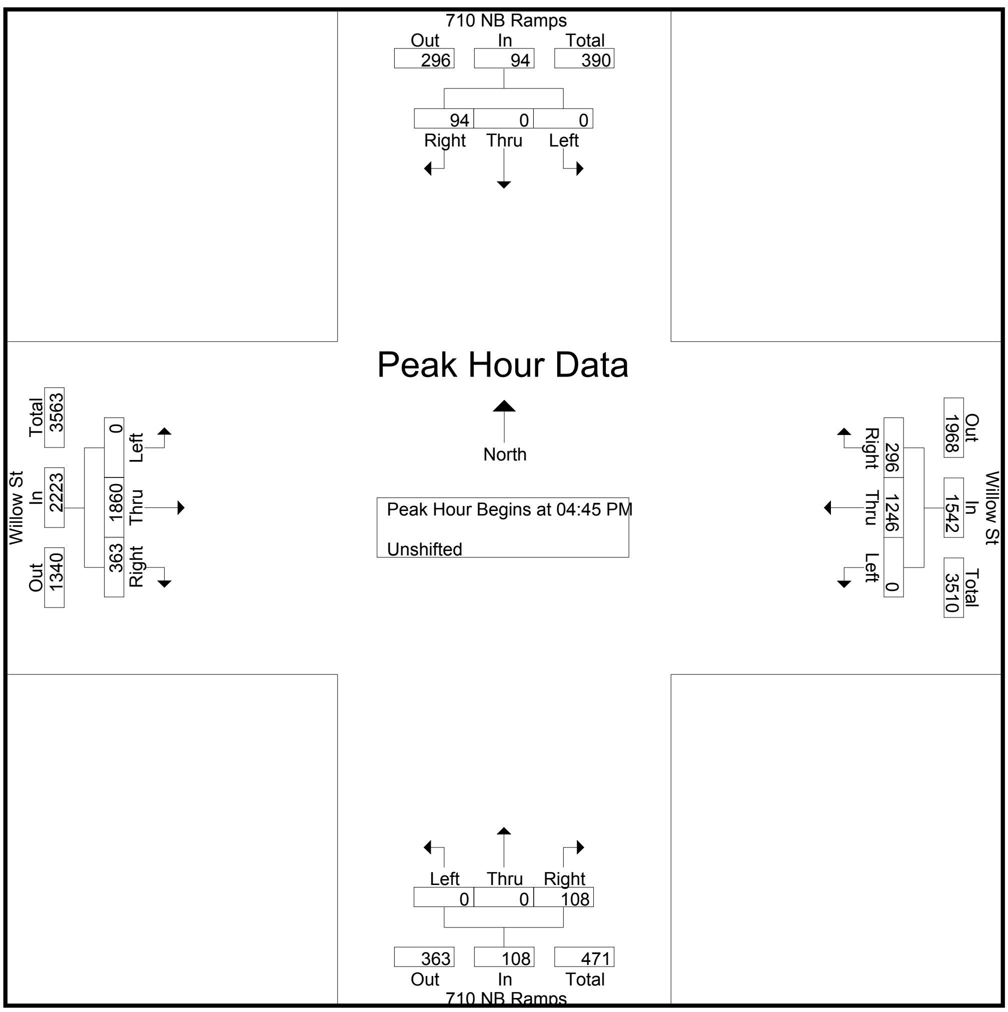
Page No : 3

	710 NB Ramps Southbound				Willow St Westbound				710 NB Ramps Northbound				Willow St Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	0	0	21	21	0	297	63	360	0	0	26	26	0	460	81	541	948
05:00 PM	0	0	16	16	0	**330**	**93**	**423**	0	0	23	23	0	**492**	89	**581**	**1043**
05:15 PM	0	0	19	19	0	304	71	375	0	0	21	21	0	454	**99**	553	968
05:30 PM	0	0	**38**	**38**	0	315	69	384	0	0	**38**	**38**	0	454	94	548	1008
Total Volume	0	0	94	94	0	1246	296	1542	0	0	108	108	0	1860	363	2223	3967
% App. Total	0	0	100		0	80.8	19.2		0	0	100		0	83.7	16.3		
PHF	.000	.000	.618	.618	.000	.944	.796	.911	.000	.000	.711	.711	.000	.945	.917	.957	.951



APPENDIX B: LOS CALCULATION SHEETS

EXISTING CONDITIONS (BASELINE)

Project: **Tesoro Los Angeles Refinery Traffic Study**
Int #: **3**
North/South Street: **WILMINGTON AVENUE**
East/West Street: **223RD STREET**

Scenario: **Existing Conditions**

Thru Lane:	1600 vph	N-S Split Phase :	N
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	1.00	319	1,600	0.114	N-S(1):	0.160
	TH	2.00	647	3,200	0.202 *	N-S(2):	0.209 *
	LT	1.00	57	1,600	0.036	E-W(1):	0.295
Westbound	RT	1.00	53	1,600	0.000	E-W(2):	0.334 *
	TH	2.00	794	3,200	0.248 *		
	LT	1.00	200	1,600	0.125	V/C:	0.543
Northbound	RT	0.50	80	800	0.000	Lost Time:	0.100
	TH	2.50	494	4,000	0.124		
	LT	1.00	11	1,600	0.007 *		
Eastbound	RT	1.00	16	1,600	0.003	ICU:	0.643
	TH	2.00	545	3,200	0.170		
	LT	1.00	137	1,600	0.086 *	LOS:	B

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	1.00	199	1,600	0.000	N-S(1):	0.138
	TH	2.00	724	3,200	0.226 *	N-S(2):	0.231 *
	LT	1.00	55	1,600	0.034	E-W(1):	0.359 *
Westbound	RT	1.00	143	1,600	0.055	E-W(2):	0.258
	TH	2.00	345	3,200	0.108		
	LT	1.00	177	1,600	0.111 *	V/C:	0.590
Northbound	RT	0.50	124	800	0.000	Lost Time:	0.100
	TH	2.50	416	4,000	0.104		
	LT	1.00	8	1,600	0.005 *		
Eastbound	RT	1.00	10	1,600	0.001	ICU:	0.690
	TH	2.00	792	3,200	0.248 *		
	LT	1.00	240	1,600	0.150	LOS:	B

* = Critical Movement

Project: Tesoro Los Angeles Refinery Traffic Study
Int #: 5
North/South Street: 223rd Street Ramp (on Alameda Street)
East/West Street: Alameda Street

Scenario: Existing Conditions

Thru Lane:	1600 vph	N-S Split Phase :	N
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.250 *
	TH	3.00	1,122	4,800	0.234	N-S(2):	0.234
	LT	1.00	159	1,600	0.099 *	E-W(1):	0.110 *
Westbound	RT	1.00	119	1,600	0.000	E-W(2):	0.000
	TH	0.00	0	0	0.000		
	LT	1.00	176	1,600	0.110 *	V/C:	0.360
Northbound	RT	0.00	242	1,600	0.151 *	Lost Time:	0.100
	TH	3.00	471	3,200	0.147		
	LT	0.00	0	0	0.000		
Eastbound	RT	0.00	0	0	0.000	ICU:	0.460
	TH	0.00	0	0	0.000 *		
	LT	0.00	0	0	0.000	LOS:	A

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.401 *
	TH	3.00	980	4,800	0.204	N-S(2):	0.204
	LT	1.00	164	1,600	0.103 *	E-W(1):	0.069 *
Westbound	RT	1.00	122	1,600	0.000	E-W(2):	0.000
	TH	0.00	0	0	0.000		
	LT	1.00	111	1,600	0.069 *	V/C:	0.470
Northbound	RT	0.00	461	0	0.000	Lost Time:	0.100
	TH	3.00	968	4,800	0.298 *		
	LT	0.00	0	0	0.000		
Eastbound	RT	0.00	0	0	0.000	ICU:	0.570
	TH	0.00	0	0	0.000 *		
	LT	0.00	0	0	0.000	LOS:	A

* = Critical Movement

Project: Tesoro Los Angeles Refinery Traffic Study
Int #: 6
North/South Street: 223rd Street
East/West Street: Alameda Street Ramp

Scenario: Existing Conditions

Thru Lane:	1600 vph	N-S Split Phase :	N
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.088 *
	TH	0.00	0	0	0.000	N-S(2):	0.081
	LT	0.00	0	0	0.000 *	E-W(1):	0.161 *
Westbound	RT	0.00	0	0	0.000	E-W(2):	0.141
	TH	3.00	747	5,280	0.141		
	LT	2.00	223	3,168	0.070 *	V/C:	0.249
Northbound	RT	1.00	266	1,760	0.088 *	Lost Time:	0.100
	TH	0.00	0	0	0.000		
	LT	1.00	143	1,760	0.081		
Eastbound	RT	0.00	80	0	0.000	ICU:	0.349
	TH	3.00	398	5,280	0.091 *		
	LT	0.00	0	0	0.000	LOS:	A

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.255 *
	TH	0.00	0	0	0.000	N-S(2):	0.055
	LT	0.00	0	0	0.000 *	E-W(1):	0.279 *
Westbound	RT	0.00	0	0	0.000	E-W(2):	0.054
	TH	3.00	283	5,280	0.054		
	LT	2.00	92	3,168	0.029 *	V/C:	0.534
Northbound	RT	1.00	494	1,760	0.255 *	Lost Time:	0.100
	TH	0.00	0	0	0.000		
	LT	1.00	97	1,760	0.055		
Eastbound	RT	0.00	138	0	0.000	ICU:	0.634
	TH	3.00	1,183	5,280	0.250 *		
	LT	0.00	0	0	0.000	LOS:	B

* = Critical Movement

Project: Tesoro Los Angeles Refinery Traffic Study
Int #: 7
North/South Street: ALAMEDA STREET
East/West Street: SEPULVEDA BOULEVARD-ALAMEDA RAMF

Scenario: Existing Conditions

Thru Lane:	1600 vph	N-S Split Phase :	N
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.243 *
	TH	3.00	766	4,800	0.160	N-S(2):	0.160
	LT	1.00	229	1,600	0.143 *	E-W(1):	0.031 *
Westbound	RT	2.00	198	3,200	0.000	E-W(2):	0.000
	TH	0.00	0	0	0.000		
	LT	1.00	49	1,600	0.031 *	V/C:	0.274
Northbound	RT	0.00	50	0	0.000	Lost Time:	0.100
	TH	3.00	428	4,800	0.100 *		
	LT	0.00	0	0	0.000		
Eastbound	RT	0.00	0	0	0.000	ICU:	0.374
	TH	0.00	0	0	0.000 *		
	LT	0.00	0	0	0.000	LOS:	A

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.379 *
	TH	3.00	856	4,800	0.178	N-S(2):	0.178
	LT	1.00	250	1,600	0.156 *	E-W(1):	0.058 *
Westbound	RT	2.00	407	3,200	0.049	E-W(2):	0.049
	TH	0.00	0	0	0.000		
	LT	1.00	93	1,600	0.058 *	V/C:	0.437
Northbound	RT	0.00	83	0	0.000	Lost Time:	0.100
	TH	3.00	988	4,800	0.223 *		
	LT	0.00	0	0	0.000		
Eastbound	RT	0.00	0	0	0.000	ICU:	0.537
	TH	0.00	0	0	0.000 *		
	LT	0.00	0	0	0.000	LOS:	A

* = Critical Movement

Project: Tesoro Los Angeles Refinery Traffic Study
Int #: 8
North/South Street: SEPULVEDA BOULEVARD-ALAMEDA RAMF
East/West Street: SEPULVEDA BOULEVARD

Scenario: Existing Conditions

Thru Lane:	1600 vph	N-S Split Phase :	Y
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	1.00	144	1,600	0.016	N-S(1):	0.055 *
	TH	0.13	9	215	0.042	N-S(2):	0.000
	LT	1.87	125	2,687	0.047 *	E-W(1):	0.227
Westbound	RT	1.00	98	1,600	0.019	E-W(2):	0.260 *
	TH	2.00	594	3,200	0.186 *		
	LT	1.00	8	1,600	0.005	V/C:	0.315
Northbound	RT	0.00	4	0	0.000	Lost Time:	0.100
	TH	2.00	19	3,200	0.008 *		
	LT	0.00	2	1,600	0.001		
Eastbound	RT	1.00	6	1,600	0.003	ICU:	0.415
	TH	1.00	355	1,600	0.222		
	LT	1.00	118	1,600	0.074 *	LOS:	A

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	1.00	172	1,600	0.000	N-S(1):	0.057 *
	TH	0.17	12	274	0.044	N-S(2):	0.000
	LT	1.83	128	2,633	0.049 *	E-W(1):	0.585 *
Westbound	RT	1.00	238	1,600	0.105	E-W(2):	0.310
	TH	2.00	534	3,200	0.167		
	LT	1.00	2	1,600	0.001 *	V/C:	0.642
Northbound	RT	0.00	9	0	0.000	Lost Time:	0.100
	TH	2.00	13	3,200	0.008 *		
	LT	0.00	4	1,600	0.003		
Eastbound	RT	1.00	1	1,600	0.000	ICU:	0.742
	TH	1.00	935	1,600	0.584 *		
	LT	1.00	229	1,600	0.143	LOS:	C

* = Critical Movement

Project: Tesoro Los Angeles Refinery Traffic Study
Int #: 10
North/South Street: TERMINAL ISLAND FREEWAY (SR-103)
East/West Street: WILLOW STREET

Scenario: Existing Conditions

Thru Lane:	1600 vph	N-S Split Phase :	Y
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.034 *
	TH	1.00	0	1,600	0.000	N-S(2):	0.000
	LT	0.00	0	0	0.000 *	E-W(1):	0.181
Westbound	RT	0.00	16	0	0.000	E-W(2):	0.256 *
	TH	2.00	794	3,200	0.253 *		
	LT	2.00	236	2,880	0.082	V/C:	0.290
Northbound	RT	2.00	97	3,200	0.000	Lost Time:	0.100
	TH	0.00	0	0	0.000		
	LT	2.00	99	2,880	0.034 *		
Eastbound	RT	1.00	183	1,600	0.083	ICU:	0.390
	TH	2.00	316	3,200	0.099		
	LT	1.00	4	1,600	0.003 *	LOS:	A

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.108 *
	TH	1.00	0	1,600	0.000	N-S(2):	0.000
	LT	0.00	0	0	0.000 *	E-W(1):	0.371 *
Westbound	RT	0.00	1	0	0.000	E-W(2):	0.133
	TH	2.00	425	3,200	0.133		
	LT	2.00	167	2,880	0.058 *	V/C:	0.479
Northbound	RT	2.00	248	3,200	0.051	Lost Time:	0.100
	TH	0.00	0	0	0.000		
	LT	2.00	311	2,880	0.108 *		
Eastbound	RT	1.00	256	1,600	0.063	ICU:	0.579
	TH	2.00	1,000	3,200	0.313 *		
	LT	1.00	0	1,600	0.000	LOS:	A

* = Critical Movement

Project: Tesoro Los Angeles Refinery Traffic Study
Int #: 11
North/South Street: SANTA FE AVE
East/West Street: SEPULVEDA BOULEVARD

Scenario: Existing Conditions

Thru Lane:	1600 vph	N-S Split Phase :	Y
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	132	0	0.000	N-S(1):	0.205 *
	TH	2.00	258	3,200	0.122 *	N-S(2):	0.000
	LT	2.00	152	2,880	0.053	E-W(1):	0.198
Westbound	RT	0.00	108	0	0.000	E-W(2):	0.319 *
	TH	2.00	767	3,200	0.273 *		
	LT	2.00	159	2,880	0.055	V/C:	0.524
Northbound	RT	0.00	80	0	0.000	Lost Time:	0.100
	TH	2.00	184	3,200	0.083 *		
	LT	1.00	76	1,600	0.048		
Eastbound	RT	0.00	32	0	0.000	ICU:	0.624
	TH	2.00	426	3,200	0.143		
	LT	1.00	73	1,600	0.046 *	LOS:	B

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	62	0	0.000	N-S(1):	0.313 *
	TH	2.00	311	3,200	0.117 *	N-S(2):	0.000
	LT	2.00	331	2,880	0.115	E-W(1):	0.368 *
Westbound	RT	0.00	149	0	0.000	E-W(2):	0.286
	TH	2.00	483	3,200	0.198		
	LT	2.00	137	2,880	0.048 *	V/C:	0.681
Northbound	RT	0.00	200	0	0.000	Lost Time:	0.100
	TH	2.00	428	3,200	0.196 *		
	LT	1.00	82	1,600	0.051		
Eastbound	RT	0.00	43	0	0.000	ICU:	0.781
	TH	2.00	982	3,200	0.320 *		
	LT	1.00	140	1,600	0.088	LOS:	C

* = Critical Movement

Appendix E

Level of Service Workheet
(Circular 212 Method)

I/S #:	31

PROJECT TITLE: ICTF Modification and Expansion Project EIR
North-South Street: 223rd Street (on 223rd **East-West Street:** Alameda Street Ramp
Scenario: CEQA Baseline
Count Date: **Analyst:** Iteris, Inc. **Date:** 7/22/2014

	AM PEAK HOUR				MD PEAK HOUR				PM PEAK HOUR			
No. of Phases				3				3				3
Opposed Ø'ing: N/S-1, E/W-2 or Both-3?				2				2				2
Right Turns: FREE-1, NRTOR-2 or OLA-3?	NB --	3	SB --	0	NB --	3	SB --	0	NB --	0	SB --	0
	EB --	0	WB --	0	EB --	0	WB --	0	EB --	3	WB --	0
ATSAC-1 or ATSAC+ATCS-2?				2				2				2
Override Capacity				1500				1500				1500

	MOVEMENT	AM Volume	AM No. of Lanes	AM Lane Volume	MD Volume	MD No. of Lanes	MD Lane Volume	PM Volume	PM No. of Lanes	PM Lane Volume
NORTHBOUND	Left	143	1	143	0	1	60	97	1	97
	Left-Through		0			0			0	
	Through	0	0	0	0	0	0	0	0	0
	Through-Right		0			0			0	
	Right	266	1	143	0	1	403	494	1	443
	Left-Through-Right		0			0			0	
	Left-Right		0			0			0	
SOUTHBOUND	Left	0	0	0	0	0	0	0	0	0
	Left-Through		0			0			0	
	Through	0	0	0	0	0	0	0	0	0
	Through-Right		0			0			0	
	Right	0	0	0	0	0	0	0	0	0
	Left-Through-Right		0			0			0	
	Left-Right		0			0			0	
EASTBOUND	Left	0	0	0	0	0	0	0	0	0
	Left-Through		0			0			0	
	Through	398	2	159	0	2	380	1,183	2	440
	Through-Right		1			1			1	
	Right	80	0	80	0	0	45	138	0	138
	Left-Through-Right		0			0			0	
	Left-Right		0			0			0	
WESTBOUND	Left	223	2	123	0	2	77	92	2	51
	Left-Through		0			0			0	
	Through	747	3	249	0	3	82	283	3	94
	Through-Right		0			0			0	
	Right	0	0	0	0	0	0	0	0	0
	Left-Through-Right		0			0			0	
	Left-Right		0			0			0	
CRITICAL VOLUMES			North-South:	143		North-South:	403		North-South:	443
			East-West:	408		East-West:	462		East-West:	534
			SUM:	551		SUM:	865		SUM:	977
VOLUME/CAPACITY (V/C) RATIO:				0.387			0.577			0.686
V/C LESS ATSAC/ATCS ADJUSTMENT:				0.287			0.477			0.586
LEVEL OF SERVICE (LOS):				A			A			A

Version: 1i Beta; 8/4/2011

Tesoro Los Angeles Refinery
Integration & Compliance Project Traffic Study
Existing AM Peak Hour

Scenario Report

Scenario: EX AM

Command: Default Command
Volume: AM
Geometry: Default Geometry
Impact Fee: Default Impact Fee
Trip Generation: Default Trip Generation
Trip Distribution: Default Trip Distribution
Paths: Default Path
Routes: Default Route
Configuration: Default Configuration

Tesoro Los Angeles Refinery

EX_AM.out
Integration & Compliance Project Traffic Study
Existing AM Peak Hour

Impact Analysis Report
Level Of Service

Intersection	Base LOS	Base Del/Veh	Base V/C	Future LOS	Future Del/Veh	Future V/C	Change in
# 1 Wilmington Ave / I-405 NB Ramp	C	20.0	0.478	C	20.0	0.478	+ 0.000 D/V
# 2 Wilmington Ave / I-405 SB Ramp	B	12.4	0.463	B	12.4	0.463	+ 0.000 D/V
# 4 Alameda Ave / I-405 NB Ramps	B	18.3	0.633	B	18.3	0.633	+ 0.000 D/V
# 9 I-405 SB Ramps / 223rd St	C	20.4	0.422	C	20.4	0.422	+ 0.000 D/V

Tesoro Los Angeles Refinery
Integration & Compliance Project Traffic Study
Existing AM Peak Hour

EX_AM.out
Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)
****
Intersection #1 Wilmington Ave / I-405 NB Ramps
****

Cycle (sec):	100	Critical Vol./Cap.(X):	0.478
Loss Time (sec):	4 (Y+R=4.0 sec)	Average Delay (sec/veh):	20.0
Optimal Cycle:	25	Level Of Service:	C

****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Permitted			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0 0 2 0 1			1 0 3 0 0			0 0 0 0 0			2 0 0 0 1		
Volume Module:												
Base Vol:	0	362	33	21	371	0	0	0	0	693	0	484
Growth 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
Initial Bse:	0	362	33	21	371	0	0	0	0	693	0	484
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	0	362	33	21	371	0	0	0	0	693	0	484
User 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
PHF Adj:	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PHF Volume:	0	404	37	23	414	0	0	0	0	773	0	540
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	0	404	37	23	414	0	0	0	0	773	0	540
PCE 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
MLF 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
FinalVolume:	0	404	37	23	414	0	0	0	0	773	0	540
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	1.00	0.95	0.85	0.28	0.91	1.00	1.00	1.00	1.00	0.59	1.00	0.85
Lanes:	0.00	2.00	1.00	1.00	3.00	0.00	0.00	0.00	0.00	2.00	0.00	1.00
Final Sat.:	0	3610	1615	536	5187	0	0	0	0	2226	0	1615
Capacity Analysis Module:												
Vol/Sat:	0.00	0.11	0.02	0.04	0.08	0.00	0.00	0.00	0.00	0.35	0.00	0.33
Crit Moves:		****								****		
Green/Cycle:	0.00	0.34	0.34	0.14	0.14	0.00	0.00	0.00	0.00	0.62	0.00	0.62
Volume/Cap:	0.00	0.33	0.07	0.31	0.56	0.00	0.00	0.00	0.00	0.56	0.00	0.54
Delay/Veh:	0.0	24.7	22.3	40.8	41.0	0.0	0.0	0.0	0.0	11.6	0.0	11.5
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	0.0	24.7	22.3	40.8	41.0	0.0	0.0	0.0	0.0	11.6	0.0	11.5
LOS by Move:	A	C	C	D	D	A	A	A	A	B	A	B
HCM2kAvgQ:	0	5	1	1	5	0	0	0	0	8	0	10

****
Note: Queue reported is the number of cars per lane.
****

Traffix 7.9.0415 (c) 2007 Dowling Assoc. Licensed to MMA, LONG BEACH, CA♀
EX AM Fri Nov 14, 2014 09:29:32 Page 4-1

Tesoro Los Angeles Refinery
Integration & Compliance Project Traffic Study
Existing AM Peak Hour

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)
****

```
                              EX_AM.out
Intersection #2 Wilmington Ave / I-405 SB Ramps
********************************************************************************
Cycle (sec):        100                Critical Vol./Cap.(X):        0.463
Loss Time (sec):      4 (Y+R=4.0 sec)  Average Delay (sec/veh):       12.4
Optimal Cycle:       21                Level Of Service:                 B
********************************************************************************
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Permitted      Prot+Permit        Permitted        Permitted
Rights:          Include          Include          Include          Include
Min. Green:     0    0     0    0    0     0    0    0     0    0    0     0
Lanes:        0  0  2  0  1   1  0  3  0  0   0  1  0  1  0   0  0  0  0  0
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:       0  304   359  141  906     0  123    0   164    0    0     0
Growth 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
Initial Bse:    0  304   359  141  906     0  123    0   164    0    0     0
Added Vol:      0    0     0    0    0     0    0    0     0    0    0     0
PasserByVol:    0    0     0    0    0     0    0    0     0    0    0     0
Initial Fut:    0  304   359  141  906     0  123    0   164    0    0     0
User 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
PHF Adj:     0.95 0.95  0.95 0.95 0.95  0.95 0.95 0.95  0.95 0.95 0.95  0.95
PHF Volume:     0  321   379  149  958     0  130    0   173    0    0     0
Reduct Vol:     0    0     0    0    0     0    0    0     0    0    0     0
Reduced Vol:    0  321   379  149  958     0  130    0   173    0    0     0
PCE 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
MLF 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
FinalVolume:    0  321   379  149  958     0  130    0   173    0    0     0
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900 1900 1900  1900 1900 1900  1900 1900 1900  1900
Adjustment:  1.00 0.95  0.85 0.95 0.91  1.00 0.72 0.95  0.72 1.00 1.00  1.00
Lanes:       0.00 2.00  1.00 1.00 3.00  0.00 1.00 0.00  1.00 0.00 0.00  0.00
Final Sat.:     0 3610  1615 1805 5187     0 1366    0  1366    0    0     0
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.09  0.23 0.08 0.18  0.00 0.10 0.00  0.13 0.00 0.00  0.00
Crit Moves:             ****  ****                          ****
Green/Cycle: 0.00 0.51  0.51 0.69 0.69  0.00 0.27 0.00  0.27 0.00 0.00  0.00
Volume/Cap:  0.00 0.18  0.46 0.19 0.27  0.00 0.35 0.00  0.46 0.00 0.00  0.00
Delay/Veh:    0.0 13.4  16.3  5.7  6.1   0.0 29.4  0.0  30.7  0.0  0.0   0.0
User DelAdj: 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
AdjDel/Veh:   0.0 13.4  16.3  5.7  6.1   0.0 29.4  0.0  30.7  0.0  0.0   0.0
LOS by Move:   A    B     B    A    A     A    C    A     C    A    A     A
HCM2kAvgQ:      0    3     8    2    4     0    4    0     5    0    0     0
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************

  Traffix 7.9.0415 (c) 2007 Dowling Assoc. Licensed to MMA, LONG BEACH, CA♀
EX AM                      Fri Nov 14, 2014 09:29:32                  Page 5-1
--------------------------------------------------------------------------------
                         Tesoro Los Angeles Refinery
                Integration & Compliance Project Traffic Study
                             Existing AM Peak Hour
--------------------------------------------------------------------------------
                      Level Of Service Computation Report
             2000 HCM Operations Method (Future Volume Alternative)
********************************************************************************
Intersection #4 Alameda Ave / I-405 NB Ramps
********************************************************************************
Cycle (sec):        100                Critical Vol./Cap.(X):        0.633
                                      Page 4
```

```
Loss Time (sec):       4 (Y+R=4.0 sec)  Average Delay (sec/veh):       18.3
Optimal Cycle:       30                 Level Of Service:                 B
********************************************************************************
Approach:      North Bound       South Bound       East Bound        West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Protected         Protected         Protected         Permitted
Rights:           Include           Include           Include           Include
Min. Green:    0    0     0    0    0     0    0    0     0    0    0     0
Lanes:       0  0  2  0  1   1  0  1  1  0   0  0  0  0  0   1  0  0  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:      0  557    47    0  840    50    0    0     0  462    0   312
Growth 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
Initial Bse:   0  557    47    0  840    50    0    0     0  462    0   312
Added Vol:     0    0     0    0    0     0    0    0     0    0    0     0
PasserByVol:   0    0     0    0    0     0    0    0     0    0    0     0
Initial Fut:   0  557    47    0  840    50    0    0     0  462    0   312
User 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
PHF Adj:     0.93 0.93  0.93  0.93 0.93  0.93  0.93 0.93  0.93  0.93 0.93  0.93
PHF Volume:    0  599    51    0  903    54    0    0     0  497    0   335
Reduct Vol:    0    0     0    0    0     0    0    0     0    0    0     0
Reduced Vol:   0  599    51    0  903    54    0    0     0  497    0   335
PCE 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
MLF 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
FinalVolume:   0  599    51    0  903    54    0    0     0  497    0   335
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  1.00 0.95  0.85  1.00 0.94  0.94  1.00 1.00  1.00  0.77 1.00  0.85
Lanes:       0.00 2.00  1.00  1.00 1.89  0.11  0.00 0.00  0.00  1.00 0.00  1.00
Final Sat.:    0 3610  1615  1900 3380   201    0    0     0  1461    0  1615
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.17  0.03  0.00 0.27  0.27  0.00 0.00  0.00  0.34 0.00  0.21
Crit Moves:  ****                   ****                         ****
Green/Cycle: 0.00 0.42  0.42  0.00 0.42  0.42  0.00 0.00  0.00  0.54 0.00  1.08
Volume/Cap:  0.00 0.39  0.07  0.00 0.63  0.63  0.00 0.00  0.00  0.63 0.00  0.19
Delay/Veh:    0.0 20.2  17.3   0.0 23.6  23.6   0.0  0.0   0.0  17.9  0.0   0.4
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:   0.0 20.2  17.3   0.0 23.6  23.6   0.0  0.0   0.0  17.9  0.0   0.4
LOS by Move:   A    C     B    A    C     C    A    A     A    B    A     A
HCM2kAvgQ:     0    7     1    0   13    13    0    0     0   11    0     0
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************

  Traffix 7.9.0415 (c) 2007 Dowling Assoc. Licensed to MMA, LONG BEACH, CA♀
EX AM                      Fri Nov 14, 2014 09:29:32                   Page 6-1
--------------------------------------------------------------------------------
                           Tesoro Los Angeles Refinery
                 Integration & Compliance Project Traffic Study
                              Existing AM Peak Hour
--------------------------------------------------------------------------------
                        Level Of Service Computation Report
             2000 HCM Operations Method (Future Volume Alternative)
********************************************************************************
Intersection #9 I-405 SB Ramps / 223rd St
********************************************************************************
Cycle (sec):        100                 Critical Vol./Cap.(X):        0.422
Loss Time (sec):       6 (Y+R=4.0 sec)  Average Delay (sec/veh):       20.4
Optimal Cycle:       24                 Level Of Service:                 C
********************************************************************************
```

```
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Permitted        Protected        Protected        Protected
Rights:          Include          Include          Include          Include
Min. Green:     0    0     0    0    0     0    0    0     0    0    0     0
Lanes:        0  0  1! 0  0    1  0  0  1  0    2  0  2  1  0    1  0  2  1  0
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:       1    1     5   55    0   123  353  302     4    3  837    32
Growth 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
Initial Bse:    1    1     5   55    0   123  353  302     4    3  837    32
Added Vol:      0    0     0    0    0     0    0    0     0    0    0     0
PasserByVol:    0    0     0    0    0     0    0    0     0    0    0     0
Initial Fut:    1    1     5   55    0   123  353  302     4    3  837    32
User 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
PHF Adj:     0.88 0.88  0.88 0.88 0.88  0.88 0.88 0.88  0.88 0.88 0.88  0.88
PHF Volume:     1    1     6   62    0   140  401  343     5    3  950    36
Reduct Vol:     0    0     0    0    0     0    0    0     0    0    0     0
Reduced Vol:    1    1     6   62    0   140  401  343     5    3  950    36
PCE 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
MLF 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
FinalVolume:    1    1     6   62    0   140  401  343     5    3  950    36
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900 1900 1900  1900 1900 1900  1900 1900 1900  1900
Adjustment:  0.90 0.90  0.90 0.95 1.00  0.85 0.92 0.91  0.91 0.95 0.90  0.90
Lanes:       0.14 0.14  0.72 1.00 0.00  1.00 2.00 2.96  0.04 1.00 2.89  0.11
Final Sat.:   245  245  1227 1805    0  1615 3502 5109    68 1805 4966   190
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.00  0.00 0.03 0.00  0.09 0.11 0.07  0.07 0.00 0.19  0.19
Crit Moves:       ****                  **** ****                  ****
Green/Cycle: 0.01 0.01  0.01 0.20 0.00  0.22 0.27 0.70  0.70 0.02 0.45  0.45
Volume/Cap:  0.41 0.41  0.41 0.17 0.00  0.40 0.42 0.10  0.10 0.10 0.42  0.42
Delay/Veh:   62.9 62.9  62.9 33.0  0.0  34.4 30.3  4.7   4.7 49.3 18.6  18.6
User DelAdj: 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
AdjDel/Veh:  62.9 62.9  62.9 33.0  0.0  34.4 30.3  4.7   4.7 49.3 18.6  18.6
LOS by Move:   E    E     E    C    A     C    C    A     A    D    B     B
HCM2kAvgQ:      1    1     1    2    0     4    5    1     1    0    8     8
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************
```

Tesoro Los Angeles Refinery
Existing Conditionsq
PM Peak Hour

Scenario Report

Scenario:	EX PM
Command:	EX-PM
Volume:	PM
Geometry:	Existing
Impact Fee:	Default Impact Fee
Trip Generation:	Const-PM
Trip Distribution:	Default Trip Distribution
Paths:	Default Path
Routes:	Default Route
Configuration:	EX-PM

Tesoro Los Angeles Refinery

EX_PM.out
Existing Conditionsq
PM Peak Hour

Impact Analysis Report
Level Of Service

Intersection	Base LOS	Base Del/ Veh	Base V/ C	Future LOS	Future Del/ Veh	Future V/ C	Change in
# 1 Wilmington Ave / I-405 NB Ramp	B	18.5	0.395	B	18.5	0.395	+ 0.000 D/V
# 2 Wilmington Ave / I-405 SB Ramp	B	15.7	0.629	B	15.7	0.629	+ 0.000 D/V
# 4 Alameda Ave / I-405 NB Ramps	C	23.2	0.665	C	23.2	0.665	+ 0.000 D/V
# 9 I-405 SB Ramps / 223rd St	B	19.0	0.502	B	19.0	0.502	+ 0.000 D/V

```
                              EX_PM.out
                 Level Of Service Computation Report
           2000 HCM Operations Method (Future Volume Alternative)
********************************************************************************
Intersection #1 Wilmington Ave / I-405 NB Ramps
********************************************************************************
Cycle (sec):         100                Critical Vol./Cap.(X):         0.395
Loss Time (sec):       8 (Y+R=4.0 sec)  Average Delay (sec/veh):        18.5
Optimal Cycle:        27                Level Of Service:                  B
********************************************************************************
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Protected         Permitted        Permitted        Permitted
Rights:           Include           Include          Include          Include
Min. Green:     0    0     0     0    0     0     0    0     0     0    0     0
Lanes:        0  0  2  0  1    1  0  3  0  0    0  0  0  0  0    2  0  0  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:       0  282   151    71  794     0     0    0     0   428    0   302
Growth 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
Initial Bse:    0  282   151    71  794     0     0    0     0   428    0   302
Added Vol:      0    0     0     0    0     0     0    0     0     0    0     0
PasserByVol:    0    0     0     0    0     0     0    0     0     0    0     0
Initial Fut:    0  282   151    71  794     0     0    0     0   428    0   302
User 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
PHF Adj:     0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95
PHF Volume:     0  297   159    75  837     0     0    0     0   451    0   318
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:    0  297   159    75  837     0     0    0     0   451    0   318
PCE 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
MLF 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
FinalVolume:    0  297   159    75  837     0     0    0     0   451    0   318
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  1.00 0.95  0.85  0.52 0.91  1.00  1.00 1.00  1.00  0.59 1.00  0.85
Lanes:       0.00 2.00  1.00  1.00 3.00  0.00  0.00 0.00  0.00  2.00 0.00  1.00
Final Sat.:     0 3610  1615   979 5187     0     0    0     0  2234    0  1615
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.08  0.10  0.08 0.16  0.00  0.00 0.00  0.00  0.20 0.00  0.20
Crit Moves:  ****                 ****                           ****
Green/Cycle: 0.00 0.41  0.41  0.41 0.41  0.00  0.00 0.00  0.00  0.51 0.00  0.51
Volume/Cap:  0.00 0.20  0.24  0.19 0.39  0.00  0.00 0.00  0.00  0.39 0.00  0.39
Delay/Veh:    0.0 19.1  19.6  19.2 21.0   0.0   0.0  0.0   0.0  15.2  0.0  15.2
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:   0.0 19.1  19.6  19.2 21.0   0.0   0.0  0.0   0.0  15.2  0.0  15.2
LOS by Move:   A    B     B     B    C     A     A    A     A     B    A     B
HCM2kAvgQ:      0    3     3     2    7     0     0    0     0     5    0     6
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************

  Traffix 7.9.0415 (c) 2007 Dowling Assoc. Licensed to MMA, LONG BEACH, CA♀
EX PM                        Wed Nov 26, 2014 17:31:44                Page 4-1
--------------------------------------------------------------------------------
                         Tesoro Los Angeles Refinery
                            Existing Conditionsq
                                PM Peak Hour
--------------------------------------------------------------------------------
                 Level Of Service Computation Report
           2000 HCM Operations Method (Future Volume Alternative)
********************************************************************************
                                  Page 3
```

```
Intersection #2 Wilmington Ave / I-405 SB Ramps
********************************************************************************
Cycle (sec):        100               Critical Vol./Cap.(X):        0.629
Loss Time (sec):     12 (Y+R=4.0 sec) Average Delay (sec/veh):       15.7
Optimal Cycle:       51               Level Of Service:                 B
********************************************************************************
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Permitted        Protected         Permitted        Permitted
Rights:          Include          Include           Include          Include
Min. Green:     0    0     0    0    0     0    0    0     0    0    0     0
Lanes:        0  0  2  0  1   1  0  3  0  0   0  1  0  1  0   0  0  0  0  0
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:       0  406   479  337  888     0   26    0    82    0    0     0
Growth 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
Initial Bse:    0  406   479  337  888     0   26    0    82    0    0     0
Added Vol:      0    0     0    0    0     0    0    0     0    0    0     0
PasserByVol:    0    0     0    0    0     0    0    0     0    0    0     0
Initial Fut:    0  406   479  337  888     0   26    0    82    0    0     0
User 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
PHF Adj:     0.98 0.98  0.98 0.98 0.98  0.98 0.98 0.98  0.98 0.98 0.98  0.98
PHF Volume:     0  415   490  345  908     0   27    0    84    0    0     0
Reduct Vol:     0    0     0    0    0     0    0    0     0    0    0     0
Reduced Vol:    0  415   490  345  908     0   27    0    84    0    0     0
PCE 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
MLF 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
FinalVolume:    0  415   490  345  908     0   27    0    84    0    0     0
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900 1900 1900  1900 1900 1900  1900 1900 1900  1900
Adjustment:  1.00 0.95  0.85 0.95 0.91  1.00 0.74 0.95  0.74 1.00 1.00  1.00
Lanes:       0.00 2.00  1.00 1.00 3.00  0.00 1.00 0.00  1.00 0.00 0.00  0.00
Final Sat.:     0 3610  1615 1805 5187     0 1415    0  1415    0    0     0
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.11  0.30 0.19 0.18  0.00 0.02 0.00  0.06 0.00 0.00  0.00
Crit Moves:             ****  ****                          ****
Green/Cycle: 0.00 0.48  0.48 0.30 0.79  0.00 0.09 0.00  0.09 0.00 0.00  0.00
Volume/Cap:  0.00 0.24  0.63 0.63 0.22  0.00 0.20 0.00  0.63 0.00 0.00  0.00
Delay/Veh:    0.0 15.2  20.9 32.3  2.8   0.0 42.0  0.0  51.0  0.0  0.0   0.0
User DelAdj: 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
AdjDel/Veh:   0.0 15.2  20.9 32.3  2.8   0.0 42.0  0.0  51.0  0.0  0.0   0.0
LOS by Move:   A    B     C    C    A     A    D    A     D    A    A     A
HCM2kAvgQ:      0    4    12   10    3     0    1    0     4    0    0     0
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************

  Traffix 7.9.0415 (c) 2007 Dowling Assoc. Licensed to MMA, LONG BEACH, CA♀
EX PM                        Wed Nov 26, 2014 17:31:44                Page 5-1
--------------------------------------------------------------------------------
                          Tesoro Los Angeles Refinery
                             Existing Conditionsq
                                 PM Peak Hour
--------------------------------------------------------------------------------
                      Level Of Service Computation Report
            2000 HCM Operations Method (Future Volume Alternative)
********************************************************************************
Intersection #4 Alameda Ave / I-405 NB Ramps
********************************************************************************
Cycle (sec):        100               Critical Vol./Cap.(X):        0.665
```

```
                                 EX_PM.out
Loss Time (sec):      12 (Y+R=4.0 sec)  Average Delay (sec/veh):       23.2
Optimal Cycle:        55                Level Of Service:                 C
**********************************************************************************
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:    L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:       Protected        Protected        Protected         Permitted
Rights:          Include          Include          Include          Include
Min. Green:    0    0     0    0    0     0    0    0     0    0    0     0
Lanes:       0  0  2  0  1   1  0  2  0  0   0  0  0  0  0   1  0  0  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:      0  922   190   80  755     0    0    0     0  384    0   105
Growth 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
Initial Bse:   0  922   190   80  755     0    0    0     0  384    0   105
Added Vol:     0    0     0    0    0     0    0    0     0    0    0     0
PasserByVol:   0    0     0    0    0     0    0    0     0    0    0     0
Initial Fut:   0  922   190   80  755     0    0    0     0  384    0   105
User 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
PHF Adj:     0.96 0.96  0.96 0.96 0.96  0.96 0.96 0.96  0.96 0.96 0.96  0.96
PHF Volume:    0  959   198   83  786     0    0    0     0  400    0   109
Reduct Vol:    0    0     0    0    0     0    0    0     0    0    0     0
Reduced Vol:   0  959   198   83  786     0    0    0     0  400    0   109
PCE 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
MLF 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
FinalVolume:   0  959   198   83  786     0    0    0     0  400    0   109
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900 1900 1900  1900 1900 1900  1900 1900 1900  1900
Adjustment:  1.00 0.95  0.85 0.95 0.95  1.00 1.00 1.00  1.00 0.77 1.00  0.85
Lanes:       0.00 2.00  1.00 1.00 2.00  0.00 0.00 0.00  0.00 1.00 0.00  1.00
Final Sat.:    0 3610  1615 1805 3610     0    0    0     0 1461    0  1615
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.27  0.12 0.05 0.22  0.00 0.00 0.00  0.00 0.27 0.00  0.07
Crit Moves:       ****       ****                                ****
Green/Cycle: 0.00 0.40  0.40 0.07 0.47  0.00 0.00 0.00  0.00 0.41 0.00  0.82
Volume/Cap:  0.00 0.67  0.31 0.67 0.46  0.00 0.00 0.00  0.00 0.67 0.00  0.08
Delay/Veh:    0.0 25.7  20.8 58.2 18.2   0.0  0.0  0.0   0.0 26.7  0.0   1.7
User DelAdj: 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
AdjDel/Veh:   0.0 25.7  20.8 58.2 18.2   0.0  0.0  0.0   0.0 26.7  0.0   1.7
LOS by Move:   A    C     C    E    B     A    A    A     A    C    A     A
HCM2kAvgQ:     0   13     4    4    9     0    0    0     0   11    0     1
**********************************************************************************
Note: Queue reported is the number of cars per lane.
**********************************************************************************

  Traffix 7.9.0415 (c) 2007 Dowling Assoc. Licensed to MMA, LONG BEACH, CA♀
EX PM                       Wed Nov 26, 2014 17:31:44                  Page 6-1
----------------------------------------------------------------------------------
                          Tesoro Los Angeles Refinery
                             Existing Conditionsq
                                 PM Peak Hour
----------------------------------------------------------------------------------
                      Level Of Service Computation Report
            2000 HCM Operations Method (Future Volume Alternative)
**********************************************************************************
Intersection #9 I-405 SB Ramps / 223rd St
**********************************************************************************
Cycle (sec):         100                Critical Vol./Cap.(X):        0.502
Loss Time (sec):      16 (Y+R=4.0 sec)  Average Delay (sec/veh):       19.0
Optimal Cycle:        49                Level Of Service:                 B
**********************************************************************************
```

```
                                EX_PM.out
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:       Split Phase      Split Phase       Protected        Protected
Rights:          Include          Include          Include          Include
Min. Green:    0    0     0    0    0     0    0    0     0    0    0     0
Lanes:        0  0  1! 0  0    1  0  0  1  0    2  0  2  1  0    1  0  2  1  0
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:      3    6     3   125    2    36   840  798    18     4  347    77
Growth 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
Initial Bse:   3    6     3   125    2    36   840  798    18     4  347    77
Added Vol:     0    0     0     0    0     0     0    0     0     0    0     0
PasserByVol:   0    0     0     0    0     0     0    0     0     0    0     0
Initial Fut:   3    6     3   125    2    36   840  798    18     4  347    77
User 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
PHF Adj:     0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95
PHF Volume:    3    6     3   132    2    38   886  842    19     4  366    81
Reduct Vol:    0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:   3    6     3   132    2    38   886  842    19     4  366    81
PCE 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
MLF 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
FinalVolume:   3    6     3   132    2    38   886  842    19     4  366    81
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  0.95 0.95  0.95  0.95 0.86  0.86  0.92 0.91  0.91  0.95 0.89  0.89
Lanes:       0.25 0.50  0.25  1.00 0.05  0.95  2.00 2.93  0.07  1.00 2.46  0.54
Final Sat.:   453  907   453  1805   86  1544  3502 5057   114  1805 4130   917
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.01 0.01  0.01  0.07 0.02  0.02  0.25 0.17  0.17  0.00 0.09  0.09
Crit Moves:       ****        ****             ****                  ****
Green/Cycle: 0.01 0.01  0.01  0.15 0.15  0.15  0.50 0.67  0.67  0.01 0.18  0.18
Volume/Cap:  0.50 0.50  0.50  0.50 0.17  0.17  0.50 0.25  0.25  0.25 0.50  0.50
Delay/Veh:   64.0 64.0  64.0  40.9 37.8  37.8  16.7  6.5   6.5  56.7 37.7  37.7
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  64.0 64.0  64.0  40.9 37.8  37.8  16.7  6.5   6.5  56.7 37.7  37.7
LOS by Move:   E    E     E     D    D     D     B    A     A     E    D     D
HCM2kAvgQ:     1    1     1     4    1     1     9    4     4     0    5     5
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************

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BASELINE PLUS PROJECT CONSTRUCTION

Project: Tesoro Los Angeles Refinery Traffic Study
Int #: 3
North/South Street: WILMINGTON AVENUE
East/West Street: 223RD STREET

Scenario: Existing Plus Construction

Thru Lane:	1600 vph	N-S Split Phase :	N
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: AM PEAK HOUR

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	1.00	319	1,600	0.114	N-S(1):	0.203
	TH	2.00	679	3,200	0.212 *	N-S(2):	0.219 *
	LT	1.00	125	1,600	0.078	E-W(1):	0.296
Westbound	RT	1.00	59	1,600	0.000	E-W(2):	0.334 *
	TH	2.00	794	3,200	0.248 *		
	LT	1.00	200	1,600	0.125	V/C:	0.553
Northbound	RT	0.50	84	800	0.000	Lost Time:	0.100
	TH	2.50	501	4,000	0.125		
	LT	1.00	11	1,600	0.007 *		
Eastbound	RT	1.00	17	1,600	0.004	ICU:	0.653
	TH	2.00	548	3,200	0.171		
	LT	1.00	137	1,600	0.086 *	LOS:	B

Peak Period: PM PEAK HOUR

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	1.00	199	1,600	0.000	N-S(1):	0.144
	TH	2.00	733	3,200	0.229 *	N-S(2):	0.234 *
	LT	1.00	61	1,600	0.038	E-W(1):	0.362 *
Westbound	RT	1.00	215	1,600	0.096	E-W(2):	0.259
	TH	2.00	349	3,200	0.109		
	LT	1.00	182	1,600	0.114 *	V/C:	0.596
Northbound	RT	0.50	124	800	0.000	Lost Time:	0.100
	TH	2.50	424	4,000	0.106		
	LT	1.00	8	1,600	0.005 *		
Eastbound	RT	1.00	10	1,600	0.001	ICU:	0.696
	TH	2.00	792	3,200	0.248 *		
	LT	1.00	240	1,600	0.150	LOS:	B

* = Critical Movement

Project: Tesoro Los Angeles Refinery Traffic Study
Int #: 5
North/South Street: 223rd Street Ramp (on Alameda Street)
East/West Street: Alameda Street

Scenario: Existing Plus Construction

Thru Lane:	1600 vph	N-S Split Phase :	N
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.257 *
	TH	3.00	1,145	4,800	0.239	N-S(2):	0.239
	LT	1.00	159	1,600	0.099 *	E-W(1):	0.127 *
Westbound	RT	1.00	119	1,600	0.000	E-W(2):	0.000
	TH	0.00	0	0	0.000		
	LT	1.00	203	1,600	0.127 *	V/C:	0.384
Northbound	RT	0.00	253	1,600	0.158 *	Lost Time:	0.100
	TH	3.00	489	3,200	0.153		
	LT	0.00	0	0	0.000		
Eastbound	RT	0.00	0	0	0.000	ICU:	0.484
	TH	0.00	0	0	0.000 *		
	LT	0.00	0	0	0.000	LOS:	A

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.433 *
	TH	3.00	1,001	4,800	0.209	N-S(2):	0.209
	LT	1.00	164	1,600	0.103 *	E-W(1):	0.071 *
Westbound	RT	1.00	122	1,600	0.000	E-W(2):	0.000
	TH	0.00	0	0	0.000		
	LT	1.00	114	1,600	0.071 *	V/C:	0.504
Northbound	RT	0.00	528	1,600	0.330 *	Lost Time:	0.100
	TH	3.00	1,025	3,200	0.320		
	LT	0.00	0	0	0.000		
Eastbound	RT	0.00	0	0	0.000	ICU:	0.604
	TH	0.00	0	0	0.000 *		
	LT	0.00	0	0	0.000	LOS:	B

* = Critical Movement

Project: Tesoro Los Angeles Refinery Traffic Study
Int #: 6
North/South Street: 223rd Street
East/West Street: Alameda Street Ramp

Scenario: Existing Plus Construction

Thru Lane:	1600 vph	N-S Split Phase :	N
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: AM PEAK HOUR

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.086 *
	TH	0.00	0	0	0.000	N-S(2):	0.081
	LT	0.00	0	0	0.000 *	E-W(1):	0.172 *
Westbound	RT	0.00	0	0	0.000	E-W(2):	0.142
	TH	3.00	751	5,280	0.142		
	LT	2.00	250	3,168	0.079 *	V/C:	0.258
Northbound	RT	1.00	277	1,760	0.086 *	Lost Time:	0.100
	TH	0.00	0	0	0.000		
	LT	1.00	143	1,760	0.081		
Eastbound	RT	0.00	80	0	0.000	ICU:	0.358
	TH	3.00	409	5,280	0.093 *		
	LT	0.00	0	0	0.000	LOS:	A

Peak Period: PM PEAK HOUR

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.291 *
	TH	0.00	0	0	0.000	N-S(2):	0.056
	LT	0.00	0	0	0.000 *	E-W(1):	0.305 *
Westbound	RT	0.00	0	0	0.000	E-W(2):	0.054
	TH	3.00	283	5,280	0.054		
	LT	2.00	95	3,168	0.030 *	V/C:	0.596
Northbound	RT	1.00	559	1,760	0.291 *	Lost Time:	0.100
	TH	0.00	0	0	0.000		
	LT	1.00	99	1,760	0.056		
Eastbound	RT	0.00	138	0	0.000	ICU:	0.696
	TH	3.00	1,314	5,280	0.275 *		
	LT	0.00	0	0	0.000	LOS:	B

* = Critical Movement

Project: Tesoro Los Angeles Refinery Traffic Study
Int #: 7
North/South Street: ALAMEDA STREET
East/West Street: SEPULVEDA BOULEVARD-ALAMEDA RAMF

Scenario: Existing Plus Construction

Thru Lane:	1600 vph	N-S Split Phase :	N
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.275 *
	TH	3.00	766	4,800	0.160	N-S(2):	0.160
	LT	1.00	279	1,600	0.174 *	E-W(1):	0.031 *
Westbound	RT	2.00	290	3,200	0.003	E-W(2):	0.003
	TH	0.00	0	0	0.000		
	LT	1.00	49	1,600	0.031 *	V/C:	0.306
Northbound	RT	0.00	52	0	0.000	Lost Time:	0.100
	TH	3.00	434	4,800	0.101 *		
	LT	0.00	0	0	0.000		
Eastbound	RT	0.00	0	0	0.000	ICU:	0.406
	TH	0.00	0	0	0.000 *		
	LT	0.00	0	0	0.000	LOS:	A

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.392 *
	TH	3.00	861	4,800	0.179	N-S(2):	0.179
	LT	1.00	270	1,600	0.169 *	E-W(1):	0.060 *
Westbound	RT	2.00	461	3,200	0.060 *	E-W(2):	0.060 *
	TH	0.00	0	0	0.000		
	LT	1.00	96	1,600	0.060 *	V/C:	0.452
Northbound	RT	0.00	83	0	0.000	Lost Time:	0.100
	TH	3.00	989	4,800	0.223 *		
	LT	0.00	0	0	0.000		
Eastbound	RT	0.00	0	0	0.000	ICU:	0.552
	TH	0.00	0	0	0.000 *		
	LT	0.00	0	0	0.000 *	LOS:	A

* = Critical Movement

Project: Tesoro Los Angeles Refinery Traffic Study
Int #: 8
North/South Street: SEPULVEDA BOULEVARD-ALAMEDA RAMF
East/West Street: SEPULVEDA BOULEVARD

Scenario: Existing Plus Construction

Thru Lane:	1600 vph	N-S Split Phase :	Y
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	1.00	151	1,600	0.000	N-S(1):	0.070 *
	TH	0.10	9	161	0.056	N-S(2):	0.000
	LT	1.90	170	2,735	0.062 *	E-W(1):	0.233
Westbound	RT	1.00	157	1,600	0.042	E-W(2):	0.282 *
	TH	2.00	602	3,200	0.188 *		
	LT	1.00	8	1,600	0.005	V/C:	0.352
Northbound	RT	0.00	4	0	0.000	Lost Time:	0.100
	TH	2.00	19	3,200	0.008 *		
	LT	0.00	2	1,600	0.001		
Eastbound	RT	1.00	6	1,600	0.003	ICU:	0.452
	TH	1.00	365	1,600	0.228		
	LT	1.00	151	1,600	0.094 *	LOS:	A

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	1.00	179	1,600	0.000	N-S(1):	0.061 *
	TH	0.16	12	251	0.048	N-S(2):	0.000
	LT	1.84	141	2,654	0.053 *	E-W(1):	0.590 *
Westbound	RT	1.00	287	1,600	0.132	E-W(2):	0.320
	TH	2.00	546	3,200	0.171		
	LT	1.00	2	1,600	0.001 *	V/C:	0.651
Northbound	RT	0.00	9	0	0.000	Lost Time:	0.100
	TH	2.00	13	3,200	0.008 *		
	LT	0.00	4	1,600	0.003		
Eastbound	RT	1.00	1	1,600	0.000	ICU:	0.751
	TH	1.00	943	1,600	0.589 *		
	LT	1.00	238	1,600	0.149	LOS:	C

* = Critical Movement

Project: Tesoro Los Angeles Refinery Traffic Study
Int #: 10
North/South Street: TERMINAL ISLAND FREEWAY (SR-103)
East/West Street: WILLOW STREET

Scenario: Existing Plus Construction

Thru Lane:	1600 vph	N-S Split Phase :	Y
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.035 *
	TH	1.00	0	1,600	0.000	N-S(2):	0.000
	LT	0.00	0	0	0.000 *	E-W(1):	0.184
Westbound	RT	0.00	16	0	0.000	E-W(2):	0.286 *
	TH	2.00	890	3,200	0.283 *		
	LT	2.00	236	2,880	0.082	V/C:	0.321
Northbound	RT	2.00	99	3,200	0.000	Lost Time:	0.100
	TH	0.00	0	0	0.000		
	LT	2.00	101	2,880	0.035 *		
Eastbound	RT	1.00	184	1,600	0.083	ICU:	0.421
	TH	2.00	327	3,200	0.102		
	LT	1.00	4	1,600	0.003 *	LOS:	A

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.108 *
	TH	1.00	0	1,600	0.000	N-S(2):	0.000
	LT	0.00	0	0	0.000 *	E-W(1):	0.387 *
Westbound	RT	0.00	1	0	0.000	E-W(2):	0.138
	TH	2.00	440	3,200	0.138		
	LT	2.00	167	2,880	0.058 *	V/C:	0.495
Northbound	RT	2.00	248	3,200	0.051	Lost Time:	0.100
	TH	0.00	0	0	0.000		
	LT	2.00	312	2,880	0.108 *		
Eastbound	RT	1.00	260	1,600	0.065	ICU:	0.595
	TH	2.00	1,054	3,200	0.329 *		
	LT	1.00	0	1,600	0.000	LOS:	A

* = Critical Movement

Project: Tesoro Los Angeles Refinery Traffic Study
Int #: 11
North/South Street: SANTA FE AVE
East/West Street: SEPULVEDA BOULEVARD

Scenario: Existing Plus Construction

Thru Lane:	1600 vph	N-S Split Phase :	Y
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	132	0	0.000	N-S(1):	0.205 *
	TH	2.00	258	3,200	0.122 *	N-S(2):	0.000
	LT	2.00	152	2,880	0.053	E-W(1):	0.202
Westbound	RT	0.00	108	0	0.000	E-W(2):	0.349 *
	TH	2.00	863	3,200	0.303 *		
	LT	2.00	159	2,880	0.055	V/C:	0.554
Northbound	RT	0.00	80	0	0.000	Lost Time:	0.100
	TH	2.00	184	3,200	0.083 *		
	LT	1.00	76	1,600	0.048		
Eastbound	RT	0.00	32	0	0.000	ICU:	0.654
	TH	2.00	437	3,200	0.147		
	LT	1.00	73	1,600	0.046 *	LOS:	B

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	62	0	0.000	N-S(1):	0.313 *
	TH	2.00	311	3,200	0.117 *	N-S(2):	0.000
	LT	2.00	331	2,880	0.115	E-W(1):	0.385 *
Westbound	RT	0.00	149	0	0.000	E-W(2):	0.290
	TH	2.00	498	3,200	0.202		
	LT	2.00	137	2,880	0.048 *	V/C:	0.698
Northbound	RT	0.00	200	0	0.000	Lost Time:	0.100
	TH	2.00	428	3,200	0.196 *		
	LT	1.00	82	1,600	0.051		
Eastbound	RT	0.00	43	0	0.000	ICU:	0.798
	TH	2.00	1,036	3,200	0.337 *		
	LT	1.00	140	1,600	0.088	LOS:	C

* = Critical Movement

Appendix E

Level of Service Workheet

(Circular 212 Method)

I/S #:	
31	

PROJECT TITLE: ICTF Modification and Expansion Project EIR
North-South Street: 223rd Street (on 223rd **East-West Street:** Alameda Street Ramp
Scenario: CEQA Baseline
Count Date: **Analyst:** Iteris, Inc. **Date:** 7/22/2014

	AM PEAK HOUR			MD PEAK HOUR			PM PEAK HOUR		
No. of Phases			3			3			3
Opposed Ø'ing: N/S-1, E/W-2 or Both-3?			2			2			2
Right Turns: FREE-1, NRTOR-2 or OLA-3?	NB -- 3	SB --	0	NB -- 3	SB --	0	NB -- 0	SB --	0
	EB -- 0	WB --	0	EB -- 0	WB --	0	EB -- 3	WB --	0
ATSAC-1 or ATSAC+ATCS-2?			2			2			2
Override Capacity			1500			1500			1500

	MOVEMENT	AM Volume	AM No. of Lanes	AM Lane Volume	MD Volume	MD No. of Lanes	MD Lane Volume	PM Volume	PM No. of Lanes	PM Lane Volume
NORTHBOUND	Left	143	1	**143**	0	1	**60**	97	1	97
	Left-Through		0			0			0	
	Through	0	0	**0**	0	0	0	0	0	**0**
	Through-Right		0			0			0	
	Right	266	1	143	0	1	403	494	1	443
	Left-Through-Right		0			0			0	
	Left-Right		0			0			0	
SOUTHBOUND	Left	0	0	0	0	0	0	0	0	**0**
	Left-Through		0			0			0	
	Through	0	0	**0**	0	0	**0**	0	0	0
	Through-Right		0			0			0	
	Right	0	0	0	0	0	0	0	0	0
	Left-Through-Right		0			0			0	
	Left-Right		0			0			0	
EASTBOUND	Left	0	0	**0**	0	0	0	0	0	0
	Left-Through		0			0			0	
	Through	398	2	159	0	2	**380**	1,183	2	**440**
	Through-Right		1			1			1	
	Right	80	0	80	0	0	45	138	0	138
	Left-Through-Right		0			0			0	
	Left-Right		0			0			0	
WESTBOUND	Left	223	2	123	0	2	**77**	92	2	**51**
	Left-Through		0			0			0	
	Through	747	3	**249**	0	3	82	283	3	94
	Through-Right		0			0			0	
	Right	0	0	0	0	0	0	0	0	0
	Left-Through-Right		0			0			0	
	Left-Right		0			0			0	
CRITICAL VOLUMES			*North-South:*	143		*North-South:*	403		*North-South:*	443
			East-West:	408		*East-West:*	462		*East-West:*	534
			SUM:	551		*SUM:*	865		*SUM:*	977
VOLUME/CAPACITY *(V/C)* RATIO:				0.387			0.577			0.686
V/C LESS ATSAC/ATCS ADJUSTMENT:				0.287			0.477			**0.586**
LEVEL OF SERVICE (LOS):				**A**			**A**			**A**

Version: 1i Beta; 8/4/2011

Tesoro Los Angeles Refinery
Existing Plus Construction Conditions
AM Peak Hour

Scenario Report

Scenario:	EX + Const AM
Command:	EX+Const-AM
Volume:	AM
Geometry:	Existing
Impact Fee:	Default Impact Fee
Trip Generation:	Const-AM
Trip Distribution:	Default Trip Distribution
Paths:	Default Path
Routes:	Default Route
Configuration:	EX+Const-AM

EX+Const-AM.out
Existing Plus Construction Conditions
AM Peak Hour

Impact Analysis Report
Level Of Service

Intersection	Base LOS	Base Del/ Veh	Base V/ C	Future LOS	Future Del/ Veh	Future V/ C	Change in
# 1 Wilmington Ave / I-405 NB Ramp	C	21.4	0.499	C	21.5	0.500	+ 0.080 D/V
# 2 Wilmington Ave / I-405 SB Ramp	D	44.2	0.355	E	57.9	0.439	+13.706 D/V
# 4 Alameda Ave / I-405 NB Ramps	C	21.2	0.690	C	25.6	0.807	+ 4.446 D/V
# 9 I-405 SB Ramps / 223rd St	C	23.4	0.472	C	24.6	0.502	+ 1.194 D/V

Tesoro Los Angeles Refinery
Existing Plus Construction Conditions
AM Peak Hour

```
                              EX+Const-AM.out
                    Level Of Service Computation Report
          2000 HCM Operations Method (Future Volume Alternative)
********************************************************************************
Intersection #1 Wilmington Ave / I-405 NB Ramps
********************************************************************************
Cycle (sec):         100                Critical Vol./Cap.(X):         0.500
Loss Time (sec):       8 (Y+R=4.0 sec)  Average Delay (sec/veh):        21.5
Optimal Cycle:        37                Level Of Service:                  C
********************************************************************************
Approach:     North Bound      South Bound       East Bound       West Bound
Movement:    L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:       Protected         Permitted        Permitted        Permitted
Rights:          Include          Include          Include          Include
Min. Green:    0    0    0     0    0    0     0    0    0     0    0    0
Lanes:       0  0  2  0  1   1  0  3  0  0   0  0  0  0  0   2  0  0  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:      0  362   33    21  371    0     0    0    0   693    0  484
Growth 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
Initial Bse:   0  362   33    21  371    0     0    0    0   693    0  484
Added Vol:     0    1   13     0    4    0     0    0    0     0    0    0
PasserByVol:   0    0    0     0    0    0     0    0    0     0    0    0
Initial Fut:   0  363   46    21  375    0     0    0    0   693    0  484
User 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
PHF Adj:     0.90 0.90 0.90  0.90 0.90 0.90  0.90 0.90 0.90  0.90 0.90 0.90
PHF Volume:    0  405   51    23  419    0     0    0    0   773    0  540
Reduct Vol:    0    0    0     0    0    0     0    0    0     0    0    0
Reduced Vol:   0  405   51    23  419    0     0    0    0   773    0  540
PCE 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
MLF 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
FinalVolume:   0  405   51    23  419    0     0    0    0   773    0  540
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900 1900  1900 1900 1900  1900 1900 1900  1900 1900 1900
Adjustment:  1.00 0.95 0.85  0.30 0.91 1.00  1.00 1.00 1.00  0.59 1.00 0.85
Lanes:       0.00 2.00 1.00  1.00 3.00 0.00  0.00 0.00 0.00  2.00 0.00 1.00
Final Sat.:     0 3610 1615   574 5187    0     0    0    0  2226    0 1615
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.11 0.03  0.04 0.08 0.00  0.00 0.00 0.00  0.35 0.00 0.33
Crit Moves:       ****                                       ****
Green/Cycle: 0.00 0.33 0.33  0.14 0.14 0.00  0.00 0.00 0.00  0.59 0.00 0.59
Volume/Cap:  0.00 0.34 0.10  0.30 0.59 0.00  0.00 0.00 0.00  0.59 0.00 0.56
Delay/Veh:    0.0 25.6 23.4  40.9 41.8  0.0   0.0  0.0  0.0  13.4  0.0 13.3
User DelAdj: 1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
AdjDel/Veh:   0.0 25.6 23.4  40.9 41.8  0.0   0.0  0.0  0.0  13.4  0.0 13.3
LOS by Move:   A    C    C     D    D    A     A    A    A     B    A    B
HCM2kAvgQ:     0    5    1     1    5    0     0    0    0     8    0   10
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************

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EX + Const AM              Mon Nov 24, 2014 13:57:53                Page 4-1
--------------------------------------------------------------------------------
                         Tesoro Los Angeles Refinery
                     Existing Plus Construction Conditions
                                AM Peak Hour
--------------------------------------------------------------------------------
                    Level Of Service Computation Report
          2000 HCM Operations Method (Future Volume Alternative)
********************************************************************************
```

```
                              EX+Const-AM.out
Intersection #2 Wilmington Ave / I-405 SB Ramps
********************************************************************************
Cycle (sec):          100                Critical Vol./Cap.(X):         0.439
Loss Time (sec):       12 (Y+R=4.0 sec)  Average Delay (sec/veh):        57.9
Optimal Cycle:         44                Level Of Service:                  E
********************************************************************************
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Permitted        Protected         Permitted        Permitted
Rights:          Include          Include           Include          Include
Min. Green:     0    0     0    0    0     0    0    0     0    0    0     0
Lanes:        0  0  2  0  1   1  0  3  0  0   0  1  0  1  0   0  0  0  0  0
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:       0  304   359  141  906     0  123    0   164    0    0     0
Growth 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
Initial Bse:    0  304   359  141  906     0  123    0   164    0    0     0
Added Vol:      0   13     0    0    4     0    0    0    96    0    0     0
PasserByVol:    0    0     0    0    0     0    0    0     0    0    0     0
Initial Fut:    0  317   359  141  910     0  123    0   260    0    0     0
User 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
PHF Adj:     0.95 0.95  0.95 0.95 0.95  0.95 0.95 0.95  0.95 0.95 0.95  0.95
PHF Volume:     0  335   379  149  962     0  130    0   275    0    0     0
Reduct Vol:     0    0     0    0    0     0    0    0     0    0    0     0
Reduced Vol:    0  335   379  149  962     0  130    0   275    0    0     0
PCE 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
MLF 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
FinalVolume:    0  335   379  149  962     0  130    0   275    0    0     0
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900 1900 1900  1900 1900 1900  1900 1900 1900  1900
Adjustment:  1.00 0.95  0.85 0.95 0.91  1.00 0.72 0.95  0.72 1.00 1.00  1.00
Lanes:       0.00 2.00  1.00 1.00 3.00  0.00 1.00 0.00  1.00 0.00 0.00  0.00
Final Sat.:     0 3610  1615 1805 5187     0 1368    0  1368    0    0     0
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.09  0.23 0.08 0.19  0.00 0.10 0.00  0.20 0.00 0.00  0.00
Crit Moves:                       ****                  ****
Green/Cycle: 0.00 0.17  0.17 0.34 0.51  0.00 0.37 0.00  0.37 0.00 0.00  0.00
Volume/Cap:  0.00 0.54  1.38 0.24 0.36  0.00 0.26 0.00  0.54 0.00 0.00  0.00
Delay/Veh:    0.0 38.9 232.8 23.9 14.8   0.0 22.1  0.0  25.8  0.0  0.0   0.0
User DelAdj: 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
AdjDel/Veh:   0.0 38.9 232.8 23.9 14.8   0.0 22.1  0.0  25.8  0.0  0.0   0.0
LOS by Move:    A    D     F    C    B     A    C    A     C    A    A     A
HCM2kAvgQ:      0    6    27    3    6     0    3    0     7    0    0     0
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************

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EX + Const AM              Mon Nov 24, 2014 13:57:53                   Page 5-1
--------------------------------------------------------------------------------
                           Tesoro Los Angeles Refinery
                      Existing Plus Construction Conditions
                                  AM Peak Hour
--------------------------------------------------------------------------------
                        Level Of Service Computation Report
            2000 HCM Operations Method (Future Volume Alternative)
********************************************************************************
Intersection #4 Alameda Ave / I-405 NB Ramps
********************************************************************************
Cycle (sec):          100                Critical Vol./Cap.(X):         0.807
                                  Page 4
```

```
Loss Time (sec):      12 (Y+R=4.0 sec)  Average Delay (sec/veh):        25.6
Optimal Cycle:        79                Level Of Service:                  C
********************************************************************************
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Protected        Protected        Protected         Permitted
Rights:           Include          Include          Include          Include
Min. Green:    0    0     0    0    0     0    0    0     0    0    0     0
Lanes:       0  0  2  0  1   1  0  1  1  0   0  0  0  0  0   1  0  0  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:      0  557    47    0  840    50    0    0     0  462    0   312
Growth 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
Initial Bse:   0  557    47    0  840    50    0    0     0  462    0   312
Added Vol:     0    2     4    0   12     0    0    0     0  135    0     0
PasserByVol:   0    0     0    0    0     0    0    0     0    0    0     0
Initial Fut:   0  559    51    0  852    50    0    0     0  597    0   312
User 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
PHF Adj:     0.93 0.93  0.93  0.93 0.93  0.93  0.93 0.93  0.93  0.93 0.93  0.93
PHF Volume:    0  601    55    0  916    54    0    0     0  642    0   335
Reduct Vol:    0    0     0    0    0     0    0    0     0    0    0     0
Reduced Vol:   0  601    55    0  916    54    0    0     0  642    0   335
PCE 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
MLF 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
FinalVolume:   0  601    55    0  916    54    0    0     0  642    0   335
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  1.00 0.95  0.85  1.00 0.94  0.94  1.00 1.00  1.00  0.77 1.00  0.85
Lanes:       0.00 2.00  1.00  1.00 1.89  0.11  0.00 0.00  0.00  1.00 0.00  1.00
Final Sat.:     0 3610  1615  1900 3383   199     0    0     0  1461    0  1615
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.17  0.03  0.00 0.27  0.27  0.00 0.00  0.00  0.44 0.00  0.21
Crit Moves:  ****                   ****                          ****
Green/Cycle: 0.00 0.34  0.34  0.00 0.34  0.34  0.00 0.00  0.00  0.54 0.00  1.09
Volume/Cap:  0.00 0.50  0.10  0.00 0.81  0.81  0.00 0.00  0.00  0.81 0.00  0.19
Delay/Veh:    0.0 26.8  22.9   0.0 34.4  34.4   0.0  0.0   0.0  24.6  0.0   0.6
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:   0.0 26.8  22.9   0.0 34.4  34.4   0.0  0.0   0.0  24.6  0.0   0.6
LOS by Move:   A    C     C    A    C     C    A    A     A    C    A     A
HCM2kAvgQ:     0    8     1    0   16    16    0    0     0   18    0     0
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************

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EX + Const AM              Mon Nov 24, 2014 13:57:53                  Page 6-1
--------------------------------------------------------------------------------

                           Tesoro Los Angeles Refinery
                      Existing Plus Construction Conditions
                                  AM Peak Hour
--------------------------------------------------------------------------------

                        Level Of Service Computation Report
            2000 HCM Operations Method (Future Volume Alternative)
********************************************************************************
Intersection #9 I-405 SB Ramps / 223rd St
********************************************************************************
Cycle (sec):         100                Critical Vol./Cap.(X):         0.502
Loss Time (sec):      16 (Y+R=4.0 sec)  Average Delay (sec/veh):        24.6
Optimal Cycle:        49                Level Of Service:                  C
********************************************************************************
```

EX+Const-AM.out

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Split Phase			Split Phase			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0 0 1! 0 0			1 0 0 1 0			2 0 2 1 0			1 0 2 1 0		
Volume Module:												
Base Vol:	1	1	5	55	0	123	353	302	4	3	837	32
Growth 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
Initial Bse:	1	1	5	55	0	123	353	302	4	3	837	32
Added Vol:	0	0	0	0	0	24	21	1	0	0	8	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	1	1	5	55	0	147	374	303	4	3	845	32
User 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
PHF Adj:	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
PHF Volume:	1	1	6	62	0	167	425	344	5	3	959	36
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	1	1	6	62	0	167	425	344	5	3	959	36
PCE 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
MLF 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
FinalVolume:	1	1	6	62	0	167	425	344	5	3	959	36
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.90	0.90	0.90	0.95	1.00	0.85	0.92	0.91	0.91	0.95	0.91	0.91
Lanes:	0.14	0.14	0.72	1.00	0.00	1.00	2.00	2.96	0.04	1.00	2.89	0.11
Final Sat.:	244	244	1218	1805	0	1615	3502	5109	67	1805	4973	188
Capacity Analysis Module:												
Vol/Sat:	0.00	0.00	0.00	0.03	0.00	0.10	0.12	0.07	0.07	0.00	0.19	0.19
Crit Moves:			****			****	****				****	
Green/Cycle:	0.01	0.01	0.01	0.21	0.00	0.21	0.24	0.61	0.61	0.02	0.38	0.38
Volume/Cap:	0.50	0.50	0.50	0.17	0.00	0.50	0.50	0.11	0.11	0.11	0.50	0.50
Delay/Veh:	72.6	72.6	72.6	32.9	0.0	36.4	33.2	8.3	8.3	50.0	23.7	23.7
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	72.6	72.6	72.6	32.9	0.0	36.4	33.2	8.3	8.3	50.0	23.7	23.7
LOS by Move:	E	E	E	C	A	D	C	A	A	D	C	C
HCM2kAvgQ:	1	1	1	2	0	5	6	2	2	0	9	9

Note: Queue reported is the number of cars per lane.

Tesoro Los Angeles Refinery
Existing Plus Construction Conditions
PM Peak Hour

Scenario Report

Scenario: EX + Const PM

Command: EX+Const-PM
Volume: PM
Geometry: Existing
Impact Fee: Default Impact Fee
Trip Generation: Const-PM
Trip Distribution: Default Trip Distribution
Paths: Default Path
Routes: Default Route
Configuration: EX+Const-PM

Tesoro Los Angeles Refinery

EX+Const-PM.out
Existing Plus Construction Conditions
PM Peak Hour

Impact Analysis Report
Level Of Service

Intersection	Base LOS	Base Del/ Veh	Base V/ C	Future LOS	Future Del/ Veh	Future V/ C	Change in
# 1 Wilmington Ave / I-405 NB Ramp	B	18.5	0.395	B	18.6	0.395	+ 0.176 D/V
# 2 Wilmington Ave / I-405 SB Ramp	B	15.7	0.629	B	16.5	0.641	+ 0.786 D/V
# 4 Alameda Ave / I-405 NB Ramps	C	23.2	0.665	C	23.8	0.683	+ 0.617 D/V
# 9 I-405 SB Ramps / 223rd St	C	24.3	0.327	C	23.7	0.395	-0.516 D/V

EX+Const-PM.out

Level Of Service Computation Report

2000 HCM Operations Method (Future Volume Alternative)

****

Intersection #1 Wilmington Ave / I-405 NB Ramps

****

Cycle (sec):	100	Critical Vol./Cap.(X):	0.395
Loss Time (sec):	8 (Y+R=4.0 sec)	Average Delay (sec/veh):	18.6
Optimal Cycle:	27	Level Of Service:	B

****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Permitted			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0 0	2 0	1	1 0	3 0	0	0 0	0 0	0	2 0	0 0	1
Volume Module:												
Base Vol:	0	282	151	71	794	0	0	0	0	428	0	302
Growth 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
Initial Bse:	0	282	151	71	794	0	0	0	0	428	0	302
Added Vol:	0	4	75	0	1	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	0	286	226	71	795	0	0	0	0	428	0	302
User 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
PHF Adj:	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
PHF Volume:	0	301	238	75	838	0	0	0	0	451	0	318
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	0	301	238	75	838	0	0	0	0	451	0	318
PCE 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
MLF 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
FinalVolume:	0	301	238	75	838	0	0	0	0	451	0	318
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	1.00	0.95	0.85	0.51	0.91	1.00	1.00	1.00	1.00	0.59	1.00	0.85
Lanes:	0.00	2.00	1.00	1.00	3.00	0.00	0.00	0.00	0.00	2.00	0.00	1.00
Final Sat.:	0	3610	1615	973	5187	0	0	0	0	2234	0	1615
Capacity Analysis Module:												
Vol/Sat:	0.00	0.08	0.15	0.08	0.16	0.00	0.00	0.00	0.00	0.20	0.00	0.20
Crit Moves:	****				****					****		
Green/Cycle:	0.00	0.41	0.41	0.41	0.41	0.00	0.00	0.00	0.00	0.51	0.00	0.51
Volume/Cap:	0.00	0.20	0.36	0.19	0.39	0.00	0.00	0.00	0.00	0.40	0.00	0.39
Delay/Veh:	0.0	19.1	20.8	19.2	21.0	0.0	0.0	0.0	0.0	15.2	0.0	15.2
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	0.0	19.1	20.8	19.2	21.0	0.0	0.0	0.0	0.0	15.2	0.0	15.2
LOS by Move:	A	B	C	B	C	A	A	A	A	B	A	B
HCM2kAvgQ:	0	3	5	2	7	0	0	0	0	5	0	6

****

Note: Queue reported is the number of cars per lane.

****

Tesoro Los Angeles Refinery

Existing Plus Construction Conditions

PM Peak Hour

Level Of Service Computation Report

2000 HCM Operations Method (Future Volume Alternative)

****

Intersection #2 Wilmington Ave / I-405 SB Ramps

****

Cycle (sec): 100 — Critical Vol./Cap.(X): 0.641
Loss Time (sec): 12 (Y+R=4.0 sec) — Average Delay (sec/veh): 16.5
Optimal Cycle: 52 — Level Of Service: B

****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Protected			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0 0 2 0 1			1 0 3 0 0			0 1 0 1 0			0 0 0 0 0		
Volume Module:												
Base Vol:	0	406	479	337	888	0	26	0	82	0	0	0
Growth 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
Initial Bse:	0	406	479	337	888	0	26	0	82	0	0	0
Added Vol:	0	79	0	0	1	0	0	0	15	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	0	485	479	337	889	0	26	0	97	0	0	0
User 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
PHF Adj:	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
PHF Volume:	0	496	490	345	909	0	27	0	99	0	0	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	0	496	490	345	909	0	27	0	99	0	0	0
PCE 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
MLF 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
FinalVolume:	0	496	490	345	909	0	27	0	99	0	0	0
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	1.00	0.95	0.85	0.95	0.91	1.00	0.75	0.95	0.75	1.00	1.00	1.00
Lanes:	0.00	2.00	1.00	1.00	3.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00
Final Sat.:	0	3610	1615	1805	5187	0	1423	0	1423	0	0	0
Capacity Analysis Module:												
Vol/Sat:	0.00	0.14	0.30	0.19	0.18	0.00	0.02	0.00	0.07	0.00	0.00	0.00
Crit Moves:			****	****					****			
Green/Cycle:	0.00	0.47	0.47	0.30	0.77	0.00	0.11	0.00	0.11	0.00	0.00	0.00
Volume/Cap:	0.00	0.29	0.64	0.64	0.23	0.00	0.17	0.00	0.64	0.00	0.00	0.00
Delay/Veh:	0.0	16.2	21.7	33.1	3.2	0.0	40.6	0.0	49.9	0.0	0.0	0.0
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	0.0	16.2	21.7	33.1	3.2	0.0	40.6	0.0	49.9	0.0	0.0	0.0
LOS by Move:	A	B	C	C	A	A	D	A	D	A	A	A
HCM2kAvgQ:	0	5	12	10	3	0	1	0	4	0	0	0

****

Note: Queue reported is the number of cars per lane.

****

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EX + Const PM — Mon Nov 24, 2014 13:58:18 — Page 5-1

Tesoro Los Angeles Refinery
Existing Plus Construction Conditions
PM Peak Hour

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

****

Intersection #4 Alameda Ave / I-405 NB Ramps

****

Cycle (sec): 100 — Critical Vol./Cap.(X): 0.683

Loss Time (sec): 12 (Y+R=4.0 sec) Average Delay (sec/veh): 23.8
Optimal Cycle: 57 Level Of Service: C

****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0 0 2 0 1			1 0 2 0 0			0 0 0 0 0			1 0 0 0 1		
Volume Module:												
Base Vol:	0	922	190	80	755	0	0	0	0	384	0	105
Growth 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
Initial Bse:	0	922	190	80	755	0	0	0	0	384	0	105
Added Vol:	0	13	50	0	2	0	0	0	0	17	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	0	935	240	80	757	0	0	0	0	401	0	105
User 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
PHF Adj:	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
PHF Volume:	0	973	250	83	788	0	0	0	0	417	0	109
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	0	973	250	83	788	0	0	0	0	417	0	109
PCE 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
MLF 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
FinalVolume:	0	973	250	83	788	0	0	0	0	417	0	109
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	1.00	0.95	0.85	0.95	0.95	1.00	1.00	1.00	1.00	0.77	1.00	0.85
Lanes:	0.00	2.00	1.00	1.00	2.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
Final Sat.:	0	3610	1615	1805	3610	0	0	0	0	1461	0	1615
Capacity Analysis Module:												
Vol/Sat:	0.00	0.27	0.15	0.05	0.22	0.00	0.00	0.00	0.00	0.29	0.00	0.07
Crit Moves:		****		****						****		
Green/Cycle:	0.00	0.39	0.39	0.07	0.46	0.00	0.00	0.00	0.00	0.42	0.00	0.84
Volume/Cap:	0.00	0.68	0.39	0.68	0.47	0.00	0.00	0.00	0.00	0.68	0.00	0.08
Delay/Veh:	0.0	26.5	22.1	60.4	18.7	0.0	0.0	0.0	0.0	26.9	0.0	1.5
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	0.0	26.5	22.1	60.4	18.7	0.0	0.0	0.0	0.0	26.9	0.0	1.5
LOS by Move:	A	C	C	E	B	A	A	A	A	C	A	A
HCM2kAvgQ:	0	14	6	4	9	0	0	0	0	11	0	1

****

Note: Queue reported is the number of cars per lane.

****

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EX + Const PM Mon Nov 24, 2014 13:58:18 Page 6-1

Tesoro Los Angeles Refinery
Existing Plus Construction Conditions
PM Peak Hour

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

****

Intersection #9 I-405 SB Ramps / 223rd St

****

Cycle (sec): 100 Critical Vol./Cap.(X): 0.395
Loss Time (sec): 16 (Y+R=4.0 sec) Average Delay (sec/veh): 23.7
Optimal Cycle: 42 Level Of Service: C

****

```
                                 EX+Const-PM.out
Approach:      North Bound      South Bound       East Bound        West Bound
Movement:    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:       Split Phase      Split Phase       Protected         Protected
Rights:          Include          Include          Include           Include
Min. Green:    0    0     0    0    0     0    0    0     0    0    0     0
Lanes:       0  0  1! 0  0    1  0  0  1  0    2  0  2  1  0    1  0  2  1  0
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:      3    6     3   125    2    36   353  302     4     4  347    77
Growth 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
Initial Bse:   3    6     3   125    2    36   353  302     4     4  347    77
Added Vol:     0    0     0     0    0     2   187    8     0     0    1     0
PasserByVol:   0    0     0     0    0     0     0    0     0     0    0     0
Initial Fut:   3    6     3   125    2    38   540  310     4     4  348    77
User 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
PHF Adj:     0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95
PHF Volume:    3    6     3   132    2    40   570  327     4     4  367    81
Reduct Vol:    0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:   3    6     3   132    2    40   570  327     4     4  367    81
PCE 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
MLF 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
FinalVolume:   3    6     3   132    2    40   570  327     4     4  367    81
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  0.95 0.95  0.95  0.95 0.86  0.86  0.92 0.91  0.91  0.95 0.89  0.89
Lanes:       0.25 0.50  0.25  1.00 0.05  0.95  2.00 2.96  0.04  1.00 2.46  0.54
Final Sat.:   453  907   453  1805   82  1549  3502 5111    66  1805 4133   914
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.01 0.01  0.01  0.07 0.03  0.03  0.16 0.06  0.06  0.00 0.09  0.09
Crit Moves:       ****        ****             ****                   ****
Green/Cycle: 0.02 0.02  0.02  0.19 0.19  0.19  0.41 0.61  0.61  0.02 0.23  0.23
Volume/Cap:  0.39 0.39  0.39  0.39 0.14  0.14  0.39 0.10  0.10  0.10 0.39  0.39
Delay/Veh:   56.4 56.4  56.4  36.6 34.3  34.3  20.8  7.9   7.9  49.0 33.2  33.2
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  56.4 56.4  56.4  36.6 34.3  34.3  20.8  7.9   7.9  49.0 33.2  33.2
LOS by Move:   E    E     E     D    C     C     C    A     A     D    C     C
HCM2kAvgQ:     1    1     1     4    1     1     6    2     2     0    5     5
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************

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YEAR 2021
WITHOUT PROJECT

Project: Tesoro Los Angeles Refinery Traffic Study
Int #: 3
North/South Street: WILMINGTON AVENUE
East/West Street: 223RD STREET

Scenario: 2021 Base

Thru Lane:	1600 vph	N-S Split Phase :	N
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	1.00	327	1,600	0.117	N-S(1):	0.163
	TH	2.00	663	3,200	0.207 *	N-S(2):	0.214 *
	LT	1.00	58	1,600	0.036	E-W(1):	0.302
Westbound	RT	1.00	54	1,600	0.000	E-W(2):	0.342 *
	TH	2.00	813	3,200	0.254 *		
	LT	1.00	205	1,600	0.128	V/C:	0.556
Northbound	RT	0.50	82	800	0.000	Lost Time:	0.100
	TH	2.50	506	4,000	0.127		
	LT	1.00	11	1,600	0.007 *		
Eastbound	RT	1.00	16	1,600	0.003	ICU:	0.656
	TH	2.00	558	3,200	0.174		
	LT	1.00	140	1,600	0.088 *	LOS:	B

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	1.00	204	1,600	0.000	N-S(1):	0.142
	TH	2.00	742	3,200	0.232 *	N-S(2):	0.237 *
	LT	1.00	56	1,600	0.035	E-W(1):	0.366 *
Westbound	RT	1.00	146	1,600	0.056	E-W(2):	0.264
	TH	2.00	353	3,200	0.110		
	LT	1.00	181	1,600	0.113 *	V/C:	0.603
Northbound	RT	0.50	127	800	0.000	Lost Time:	0.100
	TH	2.50	426	4,000	0.107		
	LT	1.00	8	1,600	0.005 *		
Eastbound	RT	1.00	10	1,600	0.001	ICU:	0.703
	TH	2.00	811	3,200	0.253 *		
	LT	1.00	246	1,600	0.154	LOS:	C

* = Critical Movement

Project: **Tesoro Los Angeles Refinery Traffic Study**
Int #: **5**
North/South Street: **223rd Street Ramp (on Alameda Street)**
East/West Street: **Alameda Street**

Scenario: **2021 Base**

Thru Lane:	1600 vph	N-S Split Phase :	N
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.257 *
	TH	3.00	1,149	4,800	0.239	N-S(2):	0.239
	LT	1.00	163	1,600	0.102 *	E-W(1):	0.113 *
Westbound	RT	1.00	122	1,600	0.000	E-W(2):	0.000
	TH	0.00	0	0	0.000		
	LT	1.00	180	1,600	0.113 *	V/C:	0.370
Northbound	RT	0.00	248	1,600	0.155 *	Lost Time:	0.100
	TH	3.00	482	3,200	0.151		
	LT	0.00	0	0	0.000		
Eastbound	RT	0.00	0	0	0.000	ICU:	0.470
	TH	0.00	0	0	0.000 *		
	LT	0.00	0	0	0.000	LOS:	A

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.410 *
	TH	3.00	1,004	4,800	0.209	N-S(2):	0.209
	LT	1.00	168	1,600	0.105 *	E-W(1):	0.071 *
Westbound	RT	1.00	125	1,600	0.000	E-W(2):	0.000
	TH	0.00	0	0	0.000		
	LT	1.00	114	1,600	0.071 *	V/C:	0.481
Northbound	RT	0.00	472	0	0.000	Lost Time:	0.100
	TH	3.00	991	4,800	0.305 *		
	LT	0.00	0	0	0.000		
Eastbound	RT	0.00	0	0	0.000	ICU:	0.581
	TH	0.00	0	0	0.000 *		
	LT	0.00	0	0	0.000	LOS:	A

* = Critical Movement

Project: Tesoro Los Angeles Refinery Traffic Study
Int #: 6
North/South Street: 223rd Street
East/West Street: Alameda Street Ramp

Scenario: 2021 Base

Thru Lane:	1600 vph	N-S Split Phase :	N
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.090 *
	TH	0.00	0	0	0.000	N-S(2):	0.083
	LT	0.00	0	0	0.000 *	E-W(1):	0.165 *
Westbound	RT	0.00	0	0	0.000	E-W(2):	0.145
	TH	3.00	765	5,280	0.145		
	LT	2.00	228	3,168	0.072 *	V/C:	0.255
Northbound	RT	1.00	272	1,760	0.090 *	Lost Time:	0.100
	TH	0.00	0	0	0.000		
	LT	1.00	146	1,760	0.083		
Eastbound	RT	0.00	82	0	0.000	ICU:	0.355
	TH	3.00	408	5,280	0.093 *		
	LT	0.00	0	0	0.000	LOS:	A

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.261 *
	TH	0.00	0	0	0.000	N-S(2):	0.056
	LT	0.00	0	0	0.000 *	E-W(1):	0.286 *
Westbound	RT	0.00	0	0	0.000	E-W(2):	0.055
	TH	3.00	290	5,280	0.055		
	LT	2.00	94	3,168	0.030 *	V/C:	0.547
Northbound	RT	1.00	506	1,760	0.261 *	Lost Time:	0.100
	TH	0.00	0	0	0.000		
	LT	1.00	99	1,760	0.056		
Eastbound	RT	0.00	141	0	0.000	ICU:	0.647
	TH	3.00	1,212	5,280	0.256 *		
	LT	0.00	0	0	0.000	LOS:	B

* = Critical Movement

Project: Tesoro Los Angeles Refinery Traffic Study
Int #: 7
North/South Street: ALAMEDA STREET
East/West Street: SEPULVEDA BOULEVARD-ALAMEDA RAMF

Scenario: 2021 Base

Thru Lane:	1600 vph	N-S Split Phase :	N
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.249 *
	TH	3.00	785	4,800	0.164	N-S(2):	0.164
	LT	1.00	235	1,600	0.147 *	E-W(1):	0.031 *
Westbound	RT	2.00	203	3,200	0.000	E-W(2):	0.000
	TH	0.00	0	0	0.000		
	LT	1.00	50	1,600	0.031 *	V/C:	0.280
Northbound	RT	0.00	51	0	0.000	Lost Time:	0.100
	TH	3.00	438	4,800	0.102 *		
	LT	0.00	0	0	0.000		
Eastbound	RT	0.00	0	0	0.000	ICU:	0.380
	TH	0.00	0	0	0.000 *		
	LT	0.00	0	0	0.000	LOS:	A

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.389 *
	TH	3.00	877	4,800	0.183	N-S(2):	0.183
	LT	1.00	256	1,600	0.160 *	E-W(1):	0.059 *
Westbound	RT	2.00	417	3,200	0.050	E-W(2):	0.050
	TH	0.00	0	0	0.000		
	LT	1.00	95	1,600	0.059 *	V/C:	0.448
Northbound	RT	0.00	85	0	0.000	Lost Time:	0.100
	TH	3.00	1,012	4,800	0.229 *		
	LT	0.00	0	0	0.000		
Eastbound	RT	0.00	0	0	0.000	ICU:	0.548
	TH	0.00	0	0	0.000 *		
	LT	0.00	0	0	0.000	LOS:	A

* = Critical Movement

Project: **Tesoro Los Angeles Refinery Traffic Study**
Int #: **8**
North/South Street: **SEPULVEDA BOULEVARD-ALAMEDA RAMF**
East/West Street: **SEPULVEDA BOULEVARD**

Scenario: **2021 Base**

Thru Lane:	1600 vph	N-S Split Phase :	Y
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	1.00	147	1,600	0.016	N-S(1):	0.056 *
	TH	0.13	9	210	0.043	N-S(2):	0.000
	LT	1.87	128	2,691	0.048 *	E-W(1):	0.233
Westbound	RT	1.00	100	1,600	0.020	E-W(2):	0.266 *
	TH	2.00	608	3,200	0.190 *		
	LT	1.00	8	1,600	0.005	V/C:	0.322
Northbound	RT	0.00	4	0	0.000	Lost Time:	0.100
	TH	2.00	19	3,200	0.008 *		
	LT	0.00	2	1,600	0.001		
Eastbound	RT	1.00	6	1,600	0.003	ICU:	0.422
	TH	1.00	364	1,600	0.228		
	LT	1.00	121	1,600	0.076 *	LOS:	A

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	1.00	176	1,600	0.000	N-S(1):	0.058 *
	TH	0.17	12	269	0.045	N-S(2):	0.000
	LT	1.83	131	2,638	0.050 *	E-W(1):	0.600 *
Westbound	RT	1.00	244	1,600	0.108	E-W(2):	0.318
	TH	2.00	547	3,200	0.171		
	LT	1.00	2	1,600	0.001 *	V/C:	0.658
Northbound	RT	0.00	9	0	0.000	Lost Time:	0.100
	TH	2.00	13	3,200	0.008 *		
	LT	0.00	4	1,600	0.003		
Eastbound	RT	1.00	1	1,600	0.000	ICU:	0.758
	TH	1.00	958	1,600	0.599 *		
	LT	1.00	235	1,600	0.147	LOS:	C

* = Critical Movement

Project: **Tesoro Los Angeles Refinery Traffic Study**
Int #: **10**
North/South Street: **TERMINAL ISLAND FREEWAY (SR-103)**
East/West Street: **WILLOW STREET**

Scenario: **2021 Base**

Thru Lane:	1600 vph	N-S Split Phase :	Y
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.034 *
	TH	1.00	0	1,600	0.000	N-S(2):	0.000
	LT	0.00	0	0	0.000 *	E-W(1):	0.185
Westbound	RT	0.00	16	0	0.000	E-W(2):	0.262 *
	TH	2.00	813	3,200	0.259 *		
	LT	2.00	242	2,880	0.084	V/C:	0.296
Northbound	RT	2.00	101	3,200	0.000	Lost Time:	0.100
	TH	0.00	0	0	0.000		
	LT	2.00	99	2,880	0.034 *		
Eastbound	RT	1.00	187	1,600	0.086	ICU:	0.396
	TH	2.00	324	3,200	0.101		
	LT	1.00	4	1,600	0.003 *	LOS:	A

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.111 *
	TH	1.00	0	1,600	0.000	N-S(2):	0.000
	LT	0.00	0	0	0.000 *	E-W(1):	0.379 *
Westbound	RT	0.00	1	0	0.000	E-W(2):	0.136
	TH	2.00	435	3,200	0.136		
	LT	2.00	171	2,880	0.059 *	V/C:	0.490
Northbound	RT	2.00	254	3,200	0.053	Lost Time:	0.100
	TH	0.00	0	0	0.000		
	LT	2.00	319	2,880	0.111 *		
Eastbound	RT	1.00	262	1,600	0.064	ICU:	0.590
	TH	2.00	1,024	3,200	0.320 *		
	LT	1.00	0	1,600	0.000	LOS:	A

* = Critical Movement

Project: **Tesoro Los Angeles Refinery Traffic Study**
Int #: **11**
North/South Street: **SANTA FE AVE**
East/West Street: **SEPULVEDA BOULEVARD**

Scenario: **2021 Base**

Thru Lane:	1600 vph	N-S Split Phase :	Y
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	135	0	0.000	N-S(1):	0.209 *
	TH	2.00	264	3,200	0.125 *	N-S(2):	0.000
	LT	2.00	156	2,880	0.054	E-W(1):	0.204
Westbound	RT	0.00	111	0	0.000	E-W(2):	0.327 *
	TH	2.00	786	3,200	0.280 *		
	LT	2.00	163	2,880	0.057	V/C:	0.536
Northbound	RT	0.00	82	0	0.000	Lost Time:	0.100
	TH	2.00	188	3,200	0.084 *		
	LT	1.00	78	1,600	0.049		
Eastbound	RT	0.00	33	0	0.000	ICU:	0.636
	TH	2.00	436	3,200	0.147		
	LT	1.00	75	1,600	0.047 *	LOS:	B

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	64	0	0.000	N-S(1):	0.321 *
	TH	2.00	319	3,200	0.120 *	N-S(2):	0.000
	LT	2.00	339	2,880	0.118	E-W(1):	0.377 *
Westbound	RT	0.00	153	0	0.000	E-W(2):	0.292
	TH	2.00	495	3,200	0.203		
	LT	2.00	140	2,880	0.049 *	V/C:	0.698
Northbound	RT	0.00	205	0	0.000	Lost Time:	0.100
	TH	2.00	438	3,200	0.201 *		
	LT	1.00	84	1,600	0.053		
Eastbound	RT	0.00	44	0	0.000	ICU:	0.798
	TH	2.00	1,006	3,200	0.328 *		
	LT	1.00	143	1,600	0.089	LOS:	C

* = Critical Movement

Level of Service Workheet
(Circular 212 Method)

I/S #: 31

PROJECT TITLE: ICTF Modification and Expansion Project EIR
North-South Street: 223rd Street (on 223rd **East-West Street:** Alameda Street Ramp
Scenario: CEQA Baseline
Count Date: **Analyst:** Iteris, Inc. **Date:** 7/22/2014

	AM PEAK HOUR			MD PEAK HOUR			PM PEAK HOUR		
No. of Phases			3			3			3
Opposed Ø'ing: N/S-1, E/W-2 or Both-3?			2			2			2
Right Turns: FREE-1, NRTOR-2 or OLA-3?	NB -- 3	SB --	0	NB -- 3	SB --	0	NB -- 0	SB --	0
	EB -- 0	WB --	0	EB -- 0	WB --	0	EB -- 3	WB --	0
ATSAC-1 or ATSAC+ATCS-2?			2			2			2
Override Capacity			1500			1500			1500

	MOVEMENT	AM Volume	AM No. of Lanes	AM Lane Volume	MD Volume	MD No. of Lanes	MD Lane Volume	PM Volume	PM No. of Lanes	PM Lane Volume
NORTHBOUND	Left	146	1	146	0	1	60	99	1	99
	Left-Through		0			0			0	
	Through	0	0	0	0	0	0	0	0	0
	Through-Right		0			0			0	
	Right	272	1	147	0	1	403	506	1	454
	Left-Through-Right		0			0			0	
	Left-Right		0			0			0	
SOUTHBOUND	Left	0	0	0	0	0	0	0	0	0
	Left-Through		0			0			0	
	Through	0	0	0	0	0	0	0	0	0
	Through-Right		0			0			0	
	Right	0	0	0	0	0	0	0	0	0
	Left-Through-Right		0			0			0	
	Left-Right		0			0			0	
EASTBOUND	Left	0	0	0	0	0	0	0	0	0
	Left-Through		0			0			0	
	Through	408	2	163	0	2	380	1,212	2	451
	Through-Right		1			1			1	
	Right	82	0	82	0	0	45	141	0	141
	Left-Through-Right		0			0			0	
	Left-Right		0			0			0	
WESTBOUND	Left	228	2	125	0	2	77	94	2	52
	Left-Through		0			0			0	
	Through	765	3	255	0	3	82	290	3	97
	Through-Right		0			0			0	
	Right	0	0	0	0	0	0	0	0	0
	Left-Through-Right		0			0			0	
	Left-Right		0			0			0	
CRITICAL VOLUMES			North-South:	147		North-South:	403		North-South:	454
			East-West:	418		East-West:	462		East-West:	548
			SUM:	565		SUM:	865		SUM:	1002
VOLUME/CAPACITY *(V/C)* RATIO:				0.396			0.577			0.703
V/C LESS ATSAC/ATCS ADJUSTMENT:				0.296			0.477			0.603
LEVEL OF SERVICE (LOS):				A			A			B

Version: 1i Beta; 8/4/2011

Tesoro Los Angeles Refinery
Year 2020 No Project
AM Peak Hour

Scenario Report

Scenario: 2020 NP AM

Command: 2020-AM
Volume: 2020 AM
Geometry: 2017
Impact Fee: Default Impact Fee
Trip Generation: Const-AM
Trip Distribution: Default Trip Distribution
Paths: Default Path
Routes: Default Route
Configuration: 2020-AM

2020NP-AM.out
Year 2020 No Project
AM Peak Hour

Impact Analysis Report
Level Of Service

Intersection	Base LOS	Base Del/Veh	Base V/C	Future LOS	Future Del/Veh	Future V/C	Change in
# 1 Wilmington Ave / I-405 NB Ramp	C	21.7	0.512	C	21.7	0.512	+ 0.000 D/V
# 2 Wilmington Ave / I-405 SB Ramp	C	21.8	0.364	C	21.8	0.364	+ 0.000 D/V
# 4 Alameda Ave / I-405 NB Ramps	C	23.4	0.687	C	23.4	0.687	+ 0.000 D/V
# 9 I-405 SB Ramps / 223rd St	C	23.5	0.484	C	23.5	0.484	+ 0.000 D/V

```
                               2020NP-AM.out
                      Level Of Service Computation Report
            2000 HCM Operations Method (Future Volume Alternative)
********************************************************************************
Intersection #1 Wilmington Ave / I-405 NB Ramps
********************************************************************************
Cycle (sec):         100                 Critical Vol./Cap.(X):        0.512
Loss Time (sec):       8 (Y+R=4.0 sec)  Average Delay (sec/veh):       21.7
Optimal Cycle:        39                 Level Of Service:                C
********************************************************************************
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Protected         Permitted         Permitted         Permitted
Rights:           Include           Include           Include           Include
Min. Green:     0     0     0     0     0     0     0     0     0     0     0     0
Lanes:        0  0  2  0  1    0  0  3  0  0    0  0  0  0  0    2  0  0  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:       0   371    34     0   402     0     0     0     0   710     0   496
Growth 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
Initial Bse:    0   371    34     0   402     0     0     0     0   710     0   496
Added Vol:      0     0     0     0     0     0     0     0     0     0     0     0
PasserByVol:    0     0     0     0     0     0     0     0     0     0     0     0
Initial Fut:    0   371    34     0   402     0     0     0     0   710     0   496
User 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
PHF Adj:     0.90  0.90  0.90  0.90  0.90  0.90  0.90  0.90  0.90  0.90  0.90  0.90
PHF Volume:     0   414    38     0   449     0     0     0     0   792     0   554
Reduct Vol:     0     0     0     0     0     0     0     0     0     0     0     0
Reduced Vol:    0   414    38     0   449     0     0     0     0   792     0   554
PCE 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
MLF 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
FinalVolume:    0   414    38     0   449     0     0     0     0   792     0   554
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900  1900  1900  1900  1900  1900  1900  1900  1900  1900  1900  1900
Adjustment:  1.00  0.95  0.85  1.00  0.91  1.00  1.00  1.00  1.00  0.59  1.00  0.85
Lanes:       0.00  2.00  1.00  0.00  3.00  0.00  0.00  0.00  0.00  2.00  0.00  1.00
Final Sat.:     0  3610  1615     0  5187     0     0     0     0  2226     0  1615
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00  0.11  0.02  0.00  0.09  0.00  0.00  0.00  0.00  0.36  0.00  0.34
Crit Moves:        ****                                          ****
Green/Cycle: 0.00  0.33  0.33  0.00  0.14  0.00  0.00  0.00  0.00  0.59  0.00  0.59
Volume/Cap:  0.00  0.35  0.07  0.00  0.61  0.00  0.00  0.00  0.00  0.60  0.00  0.58
Delay/Veh:    0.0  25.4  22.9   0.0  41.7   0.0   0.0   0.0   0.0  14.0   0.0  13.8
User DelAdj: 1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00
AdjDel/Veh:   0.0  25.4  22.9   0.0  41.7   0.0   0.0   0.0   0.0  14.0   0.0  13.8
LOS by Move:    A     C     C     A     D     A     A     A     A     B     A     B
HCM2kAvgQ:      0     5     1     0     6     0     0     0     0     9     0    11
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************

  Traffix 7.9.0415 (c) 2007 Dowling Assoc. Licensed to MMA, LONG BEACH, CA♀
2020 NP AM                 Tue Dec 2, 2014 11:59:34                  Page 4-1
--------------------------------------------------------------------------------
                          Tesoro Los Angeles Refinery
                             Year 2020 No Project
                                 AM Peak Hour
--------------------------------------------------------------------------------
                      Level Of Service Computation Report
            2000 HCM Operations Method (Future Volume Alternative)
********************************************************************************
                                    Page 3
```

```
Intersection #2 Wilmington Ave / I-405 SB Ramps
********************************************************************************
Cycle (sec):          100                 Critical Vol./Cap.(X):         0.364
Loss Time (sec):       12 (Y+R=4.0 sec)  Average Delay (sec/veh):        21.8
Optimal Cycle:         40                 Level Of Service:                 C
********************************************************************************
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Permitted        Protected         Permitted        Permitted
Rights:          Include          Include           Include          Include
Min. Green:     0    0     0    0    0     0    0    0     0    0    0     0
Lanes:        0  0  2  1  1   2  0  3  0  0   0  1  0  1  0   0  0  0  0  0
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:       0  311   368   144  928     0   126    0   168     0    0     0
Growth 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
Initial Bse:    0  311   368   144  928     0   126    0   168     0    0     0
Added Vol:      0    0     0     0    0     0     0    0     0     0    0     0
PasserByVol:    0    0     0     0    0     0     0    0     0     0    0     0
Initial Fut:    0  311   368   144  928     0   126    0   168     0    0     0
User 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
PHF Adj:     0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95
PHF Volume:     0  329   389   152  981     0   133    0   178     0    0     0
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:    0  329   389   152  981     0   133    0   178     0    0     0
PCE 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
MLF 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
FinalVolume:    0  329   389   152  981     0   133    0   178     0    0     0
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  1.00 0.84  0.84  0.92 0.91  1.00  0.71 0.95  0.71  1.00 1.00  1.00
Lanes:       0.00 2.00  2.00  2.00 3.00  0.00  1.00 0.00  1.00  0.00 0.00  0.00
Final Sat.:     0 3178  3178  3502 5187     0  1353    0  1353     0    0     0
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.10  0.12  0.04 0.19  0.00  0.10 0.00  0.13  0.00 0.00  0.00
Crit Moves:                        ****                     ****
Green/Cycle: 0.00 0.21  0.21  0.39 0.61  0.00  0.27 0.00  0.27  0.00 0.00  0.00
Volume/Cap:  0.00 0.48  0.57  0.11 0.31  0.00  0.36 0.00  0.48  0.00 0.00  0.00
Delay/Veh:    0.0 34.6  35.8  19.3  9.6   0.0  29.6  0.0  31.0   0.0  0.0   0.0
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:   0.0 34.6  35.8  19.3  9.6   0.0  29.6  0.0  31.0   0.0  0.0   0.0
LOS by Move:   A    C     D     B    A     A     C    A     C     A    A     A
HCM2kAvgQ:      0    5     7     2    5     0     4    0     5     0    0     0
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************

  Traffix 7.9.0415 (c) 2007 Dowling Assoc. Licensed to MMA, LONG BEACH, CA♀
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--------------------------------------------------------------------------------
                         Tesoro Los Angeles Refinery
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                                AM Peak Hour
--------------------------------------------------------------------------------
                     Level Of Service Computation Report
            2000 HCM Operations Method (Future Volume Alternative)
********************************************************************************
Intersection #4 Alameda Ave / I-405 NB Ramps
********************************************************************************
Cycle (sec):          100                 Critical Vol./Cap.(X):         0.687
```

```
                                2020NP-AM.out
Loss Time (sec):      12 (Y+R=4.0 sec)  Average Delay (sec/veh):       23.4
Optimal Cycle:        58                Level Of Service:                 C
********************************************************************************
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Protected        Protected        Protected         Permitted
Rights:          Include          Include          Include          Include
Min. Green:    0    0     0    0    0     0    0    0     0    0    0     0
Lanes:       0  0  2  0  1   1  0  2  0  0   0  0  0  0  0   1  0  0  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:      0  571    48    51  860     0     0    0     0  473    0   320
Growth 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
Initial Bse:   0  571    48    51  860     0     0    0     0  473    0   320
Added Vol:     0    0     0     0    0     0     0    0     0    0    0     0
PasserByVol:   0    0     0     0    0     0     0    0     0    0    0     0
Initial Fut:   0  571    48    51  860     0     0    0     0  473    0   320
User 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
PHF Adj:     0.93 0.93  0.93  0.93 0.93  0.93  0.93 0.93  0.93  0.93 0.93  0.93
PHF Volume:    0  614    52    55  925     0     0    0     0  509    0   344
Reduct Vol:    0    0     0     0    0     0     0    0     0    0    0     0
Reduced Vol:   0  614    52    55  925     0     0    0     0  509    0   344
PCE 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
MLF 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
FinalVolume:   0  614    52    55  925     0     0    0     0  509    0   344
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  1.00 0.95  0.85  0.95 0.95  1.00  1.00 1.00  1.00  0.77 1.00  0.85
Lanes:       0.00 2.00  1.00  1.00 2.00  0.00  0.00 0.00  0.00  1.00 0.00  1.00
Final Sat.:     0 3610  1615  1805 3610     0     0    0     0  1461    0  1615
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.17  0.03  0.03 0.26  0.00  0.00 0.00  0.00  0.35 0.00  0.21
Crit Moves:  ****                  ****                         ****
Green/Cycle: 0.00 0.32  0.32  0.06 0.37  0.00  0.00 0.00  0.00  0.51 0.00  1.01
Volume/Cap:  0.00 0.54  0.10  0.54 0.69  0.00  0.00 0.00  0.00  0.69 0.00  0.21
Delay/Veh:    0.0 28.7  24.2  51.5 27.9   0.0   0.0  0.0   0.0  21.4  0.0   0.1
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:   0.0 28.7  24.2  51.5 27.9   0.0   0.0  0.0   0.0  21.4  0.0   0.1
LOS by Move:   A    C     C     D    C     A     A    A     A     C    A     A
HCM2kAvgQ:     0    9     1     2   13     0     0    0     0    13    0     0
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************

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                                  AM Peak Hour
--------------------------------------------------------------------------------
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            2000 HCM Operations Method (Future Volume Alternative)
********************************************************************************
Intersection #9 I-405 SB Ramps / 223rd St
********************************************************************************
Cycle (sec):         100                Critical Vol./Cap.(X):        0.484
Loss Time (sec):      16 (Y+R=4.0 sec)  Average Delay (sec/veh):       23.5
Optimal Cycle:        48                Level Of Service:                 C
********************************************************************************
```

```
                                   2020NP-AM.out
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:       Split Phase      Split Phase       Protected        Protected
Rights:           Include          Include          Include          Include
Min. Green:    0    0     0    0    0     0    0    0     0    0    0     0
Lanes:        0  0  1! 0  0   1  0  0  1  0   2  0  2  1  0   1  0  2  1  0
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:      1    1     5   56    0   126  362  309     4    3  857    33
Growth 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
Initial Bse:   1    1     5   56    0   126  362  309     4    3  857    33
Added Vol:     0    0     0    0    0     0    0    0     0    0    0     0
PasserByVol:   0    0     0    0    0     0    0    0     0    0    0     0
Initial Fut:   1    1     5   56    0   126  362  309     4    3  857    33
User 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
PHF Adj:     0.88 0.88  0.88  0.88 0.88  0.88  0.88 0.88  0.88  0.88 0.88  0.88
PHF Volume:    1    1     6   64    0   143  411  351     5    3  973    37
Reduct Vol:    0    0     0    0    0     0    0    0     0    0    0     0
Reduced Vol:   1    1     6   64    0   143  411  351     5    3  973    37
PCE 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
MLF 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
FinalVolume:   1    1     6   64    0   143  411  351     5    3  973    37
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  0.90 0.90  0.90  0.95 1.00  0.85  0.92 0.91  0.91  0.95 0.90  0.90
Lanes:       0.14 0.14  0.72  1.00 0.00  1.00  2.00 2.96  0.04  1.00 2.89  0.11
Final Sat.:   244  244  1218  1805    0  1615  3502 5110    66  1805 4965   191
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.00  0.00  0.04 0.00  0.09  0.12 0.07  0.07  0.00 0.20  0.20
Crit Moves:             ****             ****  ****                  ****
Green/Cycle: 0.01 0.01  0.01  0.18 0.00  0.18  0.24 0.63  0.63  0.02 0.40  0.40
Volume/Cap:  0.48 0.48  0.48  0.19 0.00  0.48  0.48 0.11  0.11  0.11 0.48  0.48
Delay/Veh:   70.0 70.0  70.0  34.9  0.0  37.9  32.9  7.4   7.4  49.9 22.2  22.2
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  70.0 70.0  70.0  34.9  0.0  37.9  32.9  7.4   7.4  49.9 22.2  22.2
LOS by Move:   E    E     E     C    A     D     C    A     A     D    C     C
HCM2kAvgQ:     1    1     1     2    0     4     6    2     2     0    9     9
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************

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```

Tesoro Los Angeles Refinery
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PM Peak Hour

Scenario Report

Scenario:	2020 NP PM
Command:	2020-PM
Volume:	2020 PM
Geometry:	2017
Impact Fee:	Default Impact Fee
Trip Generation:	Const-PM
Trip Distribution:	Default Trip Distribution
Paths:	Default Path
Routes:	Default Route
Configuration:	2020-PM

2020NP-PM.out
Year 2020 No Project
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Impact Analysis Report
Level Of Service

Intersection	Base LOS	Base Del/ Veh	Base V/ C	Future LOS	Future Del/ Veh	Future V/ C	Change in
# 1 Wilmington Ave / I-405 NB Ramp	B	18.4	0.420	B	18.4	0.420	+ 0.000 D/V
# 2 Wilmington Ave / I-405 SB Ramp	B	15.7	0.362	B	15.7	0.362	+ 0.000 D/V
# 4 Alameda Ave / I-405 NB Ramps	C	23.5	0.681	C	23.5	0.681	+ 0.000 D/V
# 9 I-405 SB Ramps / 223rd St	B	19.1	0.514	B	19.1	0.514	+ 0.000 D/V

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Tesoro Los Angeles Refinery
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```
                              2020NP-PM.out
                  Level Of Service Computation Report
            2000 HCM Operations Method (Future Volume Alternative)
********************************************************************************
Intersection #1 Wilmington Ave / I-405 NB Ramps
********************************************************************************
Cycle (sec):          100                 Critical Vol./Cap.(X):         0.420
Loss Time (sec):        8 (Y+R=4.0 sec)  Average Delay (sec/veh):        18.4
Optimal Cycle:         28                 Level Of Service:                  B
********************************************************************************
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Protected        Permitted        Permitted        Permitted
Rights:           Include          Include          Include          Include
Min. Green:     0    0     0     0    0     0     0    0     0     0    0     0
Lanes:        0  0  2  0  1   0  0  3  0  0   0  0  0  0  0   2  0  0  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:       0  289   155     0  886     0     0    0     0   438    0   309
Growth 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
Initial Bse:    0  289   155     0  886     0     0    0     0   438    0   309
Added Vol:      0    0     0     0    0     0     0    0     0     0    0     0
PasserByVol:    0    0     0     0    0     0     0    0     0     0    0     0
Initial Fut:    0  289   155     0  886     0     0    0     0   438    0   309
User 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
PHF Adj:     0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95
PHF Volume:     0  305   163     0  934     0     0    0     0   462    0   326
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:    0  305   163     0  934     0     0    0     0   462    0   326
PCE 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
MLF 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
FinalVolume:    0  305   163     0  934     0     0    0     0   462    0   326
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  1.00 0.95  0.85  1.00 0.91  1.00  1.00 1.00  1.00  0.59 1.00  0.85
Lanes:       0.00 2.00  1.00  0.00 3.00  0.00  0.00 0.00  0.00  2.00 0.00  1.00
Final Sat.:     0 3610  1615     0 5187     0     0    0     0  2234    0  1615
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.08  0.10  0.00 0.18  0.00  0.00 0.00  0.00  0.21 0.00  0.20
Crit Moves:  ****                  ****                          ****
Green/Cycle: 0.00 0.43  0.43  0.00 0.43  0.00  0.00 0.00  0.00  0.49 0.00  0.49
Volume/Cap:  0.00 0.20  0.24  0.00 0.42  0.00  0.00 0.00  0.00  0.42 0.00  0.41
Delay/Veh:    0.0 17.9  18.4   0.0 20.1   0.0   0.0  0.0   0.0  16.5  0.0  16.5
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:   0.0 17.9  18.4   0.0 20.1   0.0   0.0  0.0   0.0  16.5  0.0  16.5
LOS by Move:   A    B     B     A    C     A     A    A     A     B    A     B
HCM2kAvgQ:      0    3     3     0    7     0     0    0     0     5    0     6
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************

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--------------------------------------------------------------------------------
                  Level Of Service Computation Report
            2000 HCM Operations Method (Future Volume Alternative)
********************************************************************************
                                    Page 3
```

```
                                 2020NP-PM.out
Intersection #2 Wilmington Ave / I-405 SB Ramps
********************************************************************************
Cycle (sec):         100                Critical Vol./Cap.(X):         0.362
Loss Time (sec):      12 (Y+R=4.0 sec)  Average Delay (sec/veh):        15.7
Optimal Cycle:        33                Level Of Service:                  B
********************************************************************************
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Permitted        Protected         Permitted        Permitted
Rights:          Include          Include           Include          Include
Min. Green:     0    0     0    0    0     0     0    0     0    0    0     0
Lanes:        0  0  2  1  1    2  0  3  0  0    0  1  0  1  0    0  0  0  0  0
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:       0  416   491   345  910     0    27    0    84     0    0     0
Growth 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
Initial Bse:    0  416   491   345  910     0    27    0    84     0    0     0
Added Vol:      0    0     0     0    0     0     0    0     0     0    0     0
PasserByVol:    0    0     0     0    0     0     0    0     0     0    0     0
Initial Fut:    0  416   491   345  910     0    27    0    84     0    0     0
User 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
PHF Adj:     0.98 0.98  0.98  0.98 0.98  0.98  0.98 0.98  0.98  0.98 0.98  0.98
PHF Volume:     0  425   502   353  930     0    28    0    86     0    0     0
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:    0  425   502   353  930     0    28    0    86     0    0     0
PCE 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
MLF 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
FinalVolume:    0  425   502   353  930     0    28    0    86     0    0     0
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  1.00 0.84  0.84  0.92 0.91  1.00  0.75 0.95  0.75  1.00 1.00  1.00
Lanes:       0.00 2.00  2.00  2.00 3.00  0.00  1.00 0.00  1.00  0.00 0.00  0.00
Final Sat.:     0 3178  3178  3502 5187     0  1430    0  1430     0    0     0
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.13  0.16  0.10 0.18  0.00  0.02 0.00  0.06  0.00 0.00  0.00
Crit Moves:             ****  ****                          ****
Green/Cycle: 0.00 0.44  0.44  0.28 0.71  0.00  0.17 0.00  0.17  0.00 0.00  0.00
Volume/Cap:  0.00 0.31  0.36  0.36 0.25  0.00  0.12 0.00  0.36  0.00 0.00  0.00
Delay/Veh:    0.0 18.4  19.0  29.2  5.0   0.0  35.5  0.0  37.7   0.0  0.0   0.0
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:   0.0 18.4  19.0  29.2  5.0   0.0  35.5  0.0  37.7   0.0  0.0   0.0
LOS by Move:    A    B     B     C    A     A     D    A     D     A    A     A
HCM2kAvgQ:      0    5     6     5    4     0     1    0     3     0    0     0
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************

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--------------------------------------------------------------------------------
                       Level Of Service Computation Report
            2000 HCM Operations Method (Future Volume Alternative)
********************************************************************************
Intersection #4 Alameda Ave / I-405 NB Ramps
********************************************************************************
Cycle (sec):         100                Critical Vol./Cap.(X):         0.681
```

2020NP-PM.out

Loss Time (sec): 12 (Y+R=4.0 sec) Average Delay (sec/veh): 23.5
Optimal Cycle: 57 Level Of Service: C

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0 0 2 0 1			1 0 2 0 0			0 0 0 0 0			1 0 0 0 1		
Volume Module:												
Base Vol:	0	944	195	82	773	0	0	0	0	393	0	108
Growth 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
Initial Bse:	0	944	195	82	773	0	0	0	0	393	0	108
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	0	944	195	82	773	0	0	0	0	393	0	108
User 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
PHF Adj:	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
PHF Volume:	0	982	203	85	804	0	0	0	0	409	0	112
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	0	982	203	85	804	0	0	0	0	409	0	112
PCE 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
MLF 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
FinalVolume:	0	982	203	85	804	0	0	0	0	409	0	112
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	1.00	0.95	0.85	0.95	0.95	1.00	1.00	1.00	1.00	0.77	1.00	0.85
Lanes:	0.00	2.00	1.00	1.00	2.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
Final Sat.:	0	3610	1615	1805	3610	0	0	0	0	1461	0	1615
Capacity Analysis Module:												
Vol/Sat:	0.00	0.27	0.13	0.05	0.22	0.00	0.00	0.00	0.00	0.28	0.00	0.07
Crit Moves:		****		****						****		
Green/Cycle:	0.00	0.40	0.40	0.07	0.47	0.00	0.00	0.00	0.00	0.41	0.00	0.82
Volume/Cap:	0.00	0.68	0.31	0.68	0.48	0.00	0.00	0.00	0.00	0.68	0.00	0.08
Delay/Veh:	0.0	26.1	20.9	59.7	18.4	0.0	0.0	0.0	0.0	27.3	0.0	1.7
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	0.0	26.1	20.9	59.7	18.4	0.0	0.0	0.0	0.0	27.3	0.0	1.7
LOS by Move:	A	C	C	E	B	A	A	A	A	C	A	A
HCM2kAvgQ:	0	14	4	4	9	0	0	0	0	11	0	1

Note: Queue reported is the number of cars per lane.

Traffix 7.9.0415 (c) 2007 Dowling Assoc. Licensed to MMA, LONG BEACH, CA

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Tesoro Los Angeles Refinery
Year 2020 No Project
PM Peak Hour

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

Intersection #9 I-405 SB Ramps / 223rd St

Cycle (sec): 100 Critical Vol./Cap.(X): 0.514
Loss Time (sec): 16 (Y+R=4.0 sec) Average Delay (sec/veh): 19.1
Optimal Cycle: 50 Level Of Service: B

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2020NP-PM.out

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Split Phase			Split Phase			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0 0	1!	0 0	1 0	0	1 0	2 0	2	1 0	1 0	2	1 0
Volume Module:												
Base Vol:	3	6	3	128	2	37	860	817	18	4	355	79
Growth 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
Initial Bse:	3	6	3	128	2	37	860	817	18	4	355	79
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	3	6	3	128	2	37	860	817	18	4	355	79
User 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
PHF Adj:	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
PHF Volume:	3	6	3	135	2	39	907	862	19	4	374	83
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	3	6	3	135	2	39	907	862	19	4	374	83
PCE 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
MLF 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
FinalVolume:	3	6	3	135	2	39	907	862	19	4	374	83
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.95	0.95	0.95	0.95	0.86	0.86	0.92	0.91	0.91	0.95	0.89	0.89
Lanes:	0.25	0.50	0.25	1.00	0.05	0.95	2.00	2.94	0.06	1.00	2.45	0.55
Final Sat.:	453	907	453	1805	84	1547	3502	5060	111	1805	4128	919
Capacity Analysis Module:												
Vol/Sat:	0.01	0.01	0.01	0.07	0.03	0.03	0.26	0.17	0.17	0.00	0.09	0.09
Crit Moves:		****		****			****				****	
Green/Cycle:	0.01	0.01	0.01	0.15	0.15	0.15	0.50	0.67	0.67	0.01	0.18	0.18
Volume/Cap:	0.51	0.51	0.51	0.51	0.17	0.17	0.51	0.25	0.25	0.25	0.51	0.51
Delay/Veh:	66.3	66.3	66.3	41.2	37.8	37.8	16.8	6.5	6.5	57.1	37.8	37.8
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	66.3	66.3	66.3	41.2	37.8	37.8	16.8	6.5	6.5	57.1	37.8	37.8
LOS by Move:	E	E	E	D	D	D	B	A	A	E	D	D
HCM2kAvgQ:	1	1	1	4	1	1	10	4	4	0	5	5

Note: Queue reported is the number of cars per lane.

YEAR 2021
WITH PROJECT

Project: **Tesoro Los Angeles Refinery Traffic Study**
Int #: **3**
North/South Street: **WILMINGTON AVENUE**
East/West Street: **223RD STREET**

Scenario: **2021 Plus Operations**

Thru Lane:	1600 vph	N-S Split Phase :	N
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	1.00	327	1,600	0.117	N-S(1):	0.163
	TH	2.00	664	3,200	0.208 *	N-S(2):	0.215 *
	LT	1.00	58	1,600	0.036	E-W(1):	0.302
Westbound	RT	1.00	54	1,600	0.000	E-W(2):	0.342 *
	TH	2.00	813	3,200	0.254 *		
	LT	1.00	205	1,600	0.128	V/C:	0.557
Northbound	RT	0.50	82	800	0.000	Lost Time:	0.100
	TH	2.50	507	4,000	0.127		
	LT	1.00	11	1,600	0.007 *		
Eastbound	RT	1.00	16	1,600	0.003	ICU:	0.657
	TH	2.00	558	3,200	0.174		
	LT	1.00	140	1,600	0.088 *	LOS:	B

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	1.00	204	1,600	0.000	N-S(1):	0.142
	TH	2.00	743	3,200	0.232 *	N-S(2):	0.237 *
	LT	1.00	56	1,600	0.035	E-W(1):	0.366 *
Westbound	RT	1.00	146	1,600	0.056	E-W(2):	0.264
	TH	2.00	353	3,200	0.110		
	LT	1.00	181	1,600	0.113 *	V/C:	0.603
Northbound	RT	0.50	127	800	0.000	Lost Time:	0.100
	TH	2.50	427	4,000	0.107		
	LT	1.00	8	1,600	0.005 *		
Eastbound	RT	1.00	10	1,600	0.001	ICU:	0.703
	TH	2.00	811	3,200	0.253 *		
	LT	1.00	246	1,600	0.154	LOS:	C

* = Critical Movement

Project: **Tesoro Los Angeles Refinery Traffic Study**
Int #: **5**
North/South Street: **223rd Street Ramp (on Alameda Street)**
East/West Street: **Alameda Street**

Scenario: **2021 Plus Operations**

Thru Lane:	1600 vph	N-S Split Phase :	N
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.258 *
	TH	3.00	1,150	4,800	0.240	N-S(2):	0.240
	LT	1.00	163	1,600	0.102 *	E-W(1):	0.113 *
Westbound	RT	1.00	122	1,600	0.000	E-W(2):	0.000
	TH	0.00	0	0	0.000		
	LT	1.00	180	1,600	0.113 *	V/C:	0.371
Northbound	RT	0.00	249	1,600	0.156 *	Lost Time:	0.100
	TH	3.00	482	3,200	0.151		
	LT	0.00	0	0	0.000		
Eastbound	RT	0.00	0	0	0.000	ICU:	0.471
	TH	0.00	0	0	0.000 *		
	LT	0.00	0	0	0.000	LOS:	A

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.410 *
	TH	3.00	1,005	4,800	0.209	N-S(2):	0.209
	LT	1.00	168	1,600	0.105 *	E-W(1):	0.071 *
Westbound	RT	1.00	125	1,600	0.000	E-W(2):	0.000
	TH	0.00	0	0	0.000		
	LT	1.00	114	1,600	0.071 *	V/C:	0.481
Northbound	RT	0.00	473	0	0.000	Lost Time:	0.100
	TH	3.00	991	4,800	0.305 *		
	LT	0.00	0	0	0.000		
Eastbound	RT	0.00	0	0	0.000	ICU:	0.581
	TH	0.00	0	0	0.000 *		
	LT	0.00	0	0	0.000	LOS:	A

* = Critical Movement

Project: Tesoro Los Angeles Refinery Traffic Study
Int #: 6
North/South Street: Alameda Street Ramp
East/West Street: 223rd Street

Scenario: 2021 Plus Operations

Thru Lane:	1600 vph	N-S Split Phase :	N
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.090 *
	TH	0.00	0	0	0.000	N-S(2):	0.083
	LT	0.00	0	0	0.000 *	E-W(1):	0.165 *
Westbound	RT	0.00	0	0	0.000	E-W(2):	0.145
	TH	3.00	765	5,280	0.145		
	LT	2.00	228	3,168	0.072 *	V/C:	0.255
Northbound	RT	1.00	273	1,760	0.090 *	Lost Time:	0.100
	TH	0.00	0	0	0.000		
	LT	1.00	146	1,760	0.083		
Eastbound	RT	0.00	82	0	0.000	ICU:	0.355
	TH	3.00	408	5,280	0.093 *		
	LT	0.00	0	0	0.000	LOS:	A

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.261 *
	TH	0.00	0	0	0.000	N-S(2):	0.056
	LT	0.00	0	0	0.000 *	E-W(1):	0.286 *
Westbound	RT	0.00	0	0	0.000	E-W(2):	0.055
	TH	3.00	290	5,280	0.055		
	LT	2.00	94	3,168	0.030 *	V/C:	0.547
Northbound	RT	1.00	507	1,760	0.261 *	Lost Time:	0.100
	TH	0.00	0	0	0.000		
	LT	1.00	99	1,760	0.056		
Eastbound	RT	0.00	141	0	0.000	ICU:	0.647
	TH	3.00	1,212	5,280	0.256 *		
	LT	0.00	0	0	0.000	LOS:	B

* = Critical Movement

Project: Tesoro Los Angeles Refinery Traffic Study
Int #: 7
North/South Street: ALAMEDA STREET
East/West Street: SEPULVEDA BOULEVARD-ALAMEDA RAMF

Scenario: 2021 Plus Operations

Thru Lane:	1600 vph	N-S Split Phase :	N
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.250 *
	TH	3.00	785	4,800	0.164	N-S(2):	0.164
	LT	1.00	236	1,600	0.148 *	E-W(1):	0.031 *
Westbound	RT	2.00	204	3,200	0.000	E-W(2):	0.000
	TH	0.00	0	0	0.000		
	LT	1.00	50	1,600	0.031 *	V/C:	0.281
Northbound	RT	0.00	51	0	0.000	Lost Time:	0.100
	TH	3.00	438	4,800	0.102 *		
	LT	0.00	0	0	0.000		
Eastbound	RT	0.00	0	0	0.000	ICU:	0.381
	TH	0.00	0	0	0.000 *		
	LT	0.00	0	0	0.000	LOS:	A

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.390 *
	TH	3.00	877	4,800	0.183	N-S(2):	0.183
	LT	1.00	257	1,600	0.161 *	E-W(1):	0.059 *
Westbound	RT	2.00	418	3,200	0.050	E-W(2):	0.050
	TH	0.00	0	0	0.000		
	LT	1.00	95	1,600	0.059 *	V/C:	0.449
Northbound	RT	0.00	85	0	0.000	Lost Time:	0.100
	TH	3.00	1,012	4,800	0.229 *		
	LT	0.00	0	0	0.000		
Eastbound	RT	0.00	0	0	0.000	ICU:	0.549
	TH	0.00	0	0	0.000 *		
	LT	0.00	0	0	0.000	LOS:	A

* = Critical Movement

Project: **Tesoro Los Angeles Refinery Traffic Study**
Int #: **8**
North/South Street: **SEPULVEDA BOULEVARD-ALAMEDA RAMF**
East/West Street: **SEPULVEDA BOULEVARD**

Scenario: **2021 Plus Operations**

Thru Lane:	1600 vph	N-S Split Phase :	Y
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	1.00	148	1,600	0.016	N-S(1):	0.056 *
	TH	0.13	9	210	0.043	N-S(2):	0.000
	LT	1.87	128	2,691	0.048 *	E-W(1):	0.234
Westbound	RT	1.00	100	1,600	0.020	E-W(2):	0.267 *
	TH	2.00	610	3,200	0.191 *		
	LT	1.00	8	1,600	0.005	V/C:	0.323
Northbound	RT	0.00	4	0	0.000	Lost Time:	0.100
	TH	2.00	19	3,200	0.008 *		
	LT	0.00	2	1,600	0.001		
Eastbound	RT	1.00	6	1,600	0.003	ICU:	0.423
	TH	1.00	366	1,600	0.229		
	LT	1.00	122	1,600	0.076 *	LOS:	A

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	1.00	177	1,600	0.000	N-S(1):	0.058 *
	TH	0.17	12	269	0.045	N-S(2):	0.000
	LT	1.83	131	2,638	0.050 *	E-W(1):	0.601 *
Westbound	RT	1.00	244	1,600	0.108	E-W(2):	0.320
	TH	2.00	549	3,200	0.172		
	LT	1.00	2	1,600	0.001 *	V/C:	0.659
Northbound	RT	0.00	9	0	0.000	Lost Time:	0.100
	TH	2.00	13	3,200	0.008 *		
	LT	0.00	4	1,600	0.003		
Eastbound	RT	1.00	1	1,600	0.000	ICU:	0.759
	TH	1.00	960	1,600	0.600 *		
	LT	1.00	236	1,600	0.148	LOS:	C

* = Critical Movement

Project: **Tesoro Los Angeles Refinery Traffic Study**
Int #: **10**
North/South Street: **TERMINAL ISLAND FREEWAY (SR-103)**
East/West Street: **WILLOW STREET**

Scenario: **2021 Plus Operations**

Thru Lane:	1600 vph	N-S Split Phase :	Y
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.034 *
	TH	1.00	0	1,600	0.000	N-S(2):	0.000
	LT	0.00	0	0	0.000 *	E-W(1):	0.186
Westbound	RT	0.00	16	0	0.000	E-W(2):	0.263 *
	TH	2.00	815	3,200	0.260 *		
	LT	2.00	242	2,880	0.084	V/C:	0.297
Northbound	RT	2.00	101	3,200	0.000	Lost Time:	0.100
	TH	0.00	0	0	0.000		
	LT	2.00	99	2,880	0.034 *		
Eastbound	RT	1.00	187	1,600	0.086	ICU:	0.397
	TH	2.00	326	3,200	0.102		
	LT	1.00	4	1,600	0.003 *	LOS:	A

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.000	N-S(1):	0.111 *
	TH	1.00	0	1,600	0.000	N-S(2):	0.000
	LT	0.00	0	0	0.000 *	E-W(1):	0.380 *
Westbound	RT	0.00	1	0	0.000	E-W(2):	0.137
	TH	2.00	437	3,200	0.137		
	LT	2.00	171	2,880	0.059 *	V/C:	0.491
Northbound	RT	2.00	254	3,200	0.053	Lost Time:	0.100
	TH	0.00	0	0	0.000		
	LT	2.00	319	2,880	0.111 *		
Eastbound	RT	1.00	262	1,600	0.064	ICU:	0.591
	TH	2.00	1,026	3,200	0.321 *		
	LT	1.00	0	1,600	0.000	LOS:	A

* = Critical Movement

Project: Tesoro Los Angeles Refinery Traffic Study
Int #: 11
North/South Street: SANTA FE AVE
East/West Street: SEPULVEDA BOULEVARD

Scenario: 2021 Plus Operations

Thru Lane:	1600 vph	N-S Split Phase :	Y
Left-Turn Lane:	1600 vph	E-W Split Phase :	N
Dual LT Penalty:	10 %	Lost Time (% of cycle) :	10

Peak Period: **AM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	135	0	0.000	N-S(1):	0.209 *
	TH	2.00	264	3,200	0.125 *	N-S(2):	0.000
	LT	2.00	156	2,880	0.054	E-W(1):	0.204
Westbound	RT	0.00	111	0	0.000	E-W(2):	0.328 *
	TH	2.00	788	3,200	0.281 *		
	LT	2.00	163	2,880	0.057	V/C:	0.537
Northbound	RT	0.00	82	0	0.000	Lost Time:	0.100
	TH	2.00	188	3,200	0.084 *		
	LT	1.00	78	1,600	0.049		
Eastbound	RT	0.00	33	0	0.000	ICU:	0.637
	TH	2.00	438	3,200	0.147		
	LT	1.00	75	1,600	0.047 *	LOS:	B

Peak Period: **PM PEAK HOUR**

Approach	Movement	Lanes	Volume	Capacity	V/C	ICU ANALYSIS	
Southbound	RT	0.00	64	0	0.000	N-S(1):	0.321 *
	TH	2.00	319	3,200	0.120 *	N-S(2):	0.000
	LT	2.00	339	2,880	0.118	E-W(1):	0.378 *
Westbound	RT	0.00	153	0	0.000	E-W(2):	0.292
	TH	2.00	497	3,200	0.203		
	LT	2.00	140	2,880	0.049 *	V/C:	0.699
Northbound	RT	0.00	205	0	0.000	Lost Time:	0.100
	TH	2.00	438	3,200	0.201 *		
	LT	1.00	84	1,600	0.053		
Eastbound	RT	0.00	44	0	0.000	ICU:	0.799
	TH	2.00	1,008	3,200	0.329 *		
	LT	1.00	143	1,600	0.089	LOS:	C

* = Critical Movement

Appendix E

Level of Service Workheet

(Circular 212 Method)

I/S #:	31

PROJECT TITLE: ICTF Modification and Expansion Project EIR
North-South Street: 223rd Street (on 223rd **East-West Street:** Alameda Street Ramp
Scenario: CEQA Baseline
Count Date: **Analyst:** Iteris, Inc. **Date:** 7/22/2014

	AM PEAK HOUR			MD PEAK HOUR			PM PEAK HOUR		
No. of Phases			3			3			3
Opposed Ø'ing: N/S-1, E/W-2 or Both-3?			2			2			2
Right Turns: FREE-1, NRTOR-2 or OLA-3?	NB -- 3	SB --	0	NB -- 3	SB --	0	NB -- 0	SB --	0
	EB -- 0	WB --	0	EB -- 0	WB --	0	EB -- 3	WB --	0
ATSAC-1 or ATSAC+ATCS-2?			2			2			2
Override Capacity			1500			1500			1500

	MOVEMENT	AM Volume	AM No. of Lanes	AM Lane Volume	MD Volume	MD No. of Lanes	MD Lane Volume	PM Volume	PM No. of Lanes	PM Lane Volume
NORTHBOUND	Left	146	1	**146**	0	1	**60**	99	1	99
	Left-Through		0			0			0	
	Through	0	0	**0**	0	0	0	0	0	**0**
	Through-Right		0			0			0	
	Right	273	1	148	0	1	403	507	1	455
	Left-Through-Right		0			0			0	
	Left-Right		0			0			0	
SOUTHBOUND	Left	0	0	0	0	0	0	0	0	**0**
	Left-Through		0			0			0	
	Through	0	0	**0**	0	0	**0**	0	0	0
	Through-Right		0			0			0	
	Right	0	0	0	0	0	0	0	0	0
	Left-Through-Right		0			0			0	
	Left-Right		0			0			0	
EASTBOUND	Left	0	0	**0**	0	0	0	0	0	0
	Left-Through		0			0			0	
	Through	408	2	163	0	2	**380**	1,212	2	**451**
	Through-Right		1			1			1	
	Right	82	0	82	0	0	45	141	0	141
	Left-Through-Right		0			0			0	
	Left-Right		0			0			0	
WESTBOUND	Left	228	2	125	0	2	**77**	94	2	**52**
	Left-Through		0			0			0	
	Through	765	3	**255**	0	3	82	290	3	97
	Through-Right		0			0			0	
	Right	0	0	0	0	0	0	0	0	0
	Left-Through-Right		0			0			0	
	Left-Right		0			0			0	
CRITICAL VOLUMES			*North-South:*	148		*North-South:*	403		*North-South:*	455
			East-West:	418		*East-West:*	462		*East-West:*	548
			SUM:	566		*SUM:*	865		*SUM:*	1003
VOLUME/CAPACITY *(V/C)* RATIO:				0.397			0.577			0.704
V/C LESS ATSAC/ATCS ADJUSTMENT:				0.297			0.477			**0.604**
LEVEL OF SERVICE (LOS):				**A**			**A**			**B**

Version: 1i Beta; 8/4/2011

Tesoro Los Angeles Refinery
Year 2020 With Project Operations
AM Peak Hour

Scenario Report

Scenario:	2020 Ops AM
Command:	2020+Ops-AM
Volume:	2020 AM
Geometry:	2017
Impact Fee:	Default Impact Fee
Trip Generation:	Const-AM
Trip Distribution:	Default Trip Distribution
Paths:	Default Path
Routes:	Default Route
Configuration:	2020+Ops-AM

Tesoro Los Angeles Refinery
Page 1

2020+Ops_AM.out
Year 2020 With Project Operations
AM Peak Hour

Impact Analysis Report
Level Of Service

Intersection	Base LOS	Base Del/ Veh	Base V/ C	Future LOS	Future Del/ Veh	Future V/ C	Change in
# 1 Wilmington Ave / I-405 NB Ramp	C	21.7	0.512	C	21.7	0.512	+ 0.001 D/V
# 2 Wilmington Ave / I-405 SB Ramp	C	21.8	0.364	C	21.8	0.365	+ 0.026 D/V
# 4 Alameda Ave / I-405 NB Ramps	C	23.4	0.687	C	23.4	0.687	+ 0.029 D/V
# 9 I-405 SB Ramps / 223rd St	C	23.5	0.484	C	23.5	0.484	+ 0.012 D/V

2020+Ops_AM.out
Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)
****
Intersection #1 Wilmington Ave / I-405 NB Ramps
****
Cycle (sec): 100 Critical Vol./Cap.(X): 0.512
Loss Time (sec): 8 (Y+R=4.0 sec) Average Delay (sec/veh): 21.7
Optimal Cycle: 39 Level Of Service: C
****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Permitted			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0 0	2	0 1	0 0	3	0 0	0 0	0	0 0	2 0	0	0 1
Volume Module:												
Base Vol:	0	371	34	0	402	0	0	0	0	710	0	496
Growth 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
Initial Bse:	0	371	34	0	402	0	0	0	0	710	0	496
Added Vol:	0	0	1	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	0	371	35	0	402	0	0	0	0	710	0	496
User 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
PHF Adj:	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PHF Volume:	0	414	39	0	449	0	0	0	0	792	0	554
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	0	414	39	0	449	0	0	0	0	792	0	554
PCE 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
MLF 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
FinalVolume:	0	414	39	0	449	0	0	0	0	792	0	554
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	1.00	0.95	0.85	1.00	0.91	1.00	1.00	1.00	1.00	0.59	1.00	0.85
Lanes:	0.00	2.00	1.00	0.00	3.00	0.00	0.00	0.00	0.00	2.00	0.00	1.00
Final Sat.:	0	3610	1615	0	5187	0	0	0	0	2226	0	1615
Capacity Analysis Module:												
Vol/Sat:	0.00	0.11	0.02	0.00	0.09	0.00	0.00	0.00	0.00	0.36	0.00	0.34
Crit Moves:		****								****		
Green/Cycle:	0.00	0.33	0.33	0.00	0.14	0.00	0.00	0.00	0.00	0.59	0.00	0.59
Volume/Cap:	0.00	0.35	0.07	0.00	0.61	0.00	0.00	0.00	0.00	0.60	0.00	0.58
Delay/Veh:	0.0	25.4	23.0	0.0	41.7	0.0	0.0	0.0	0.0	14.0	0.0	13.8
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	0.0	25.4	23.0	0.0	41.7	0.0	0.0	0.0	0.0	14.0	0.0	13.8
LOS by Move:	A	C	C	A	D	A	A	A	A	B	A	B
HCM2kAvgQ:	0	5	1	0	6	0	0	0	0	9	0	11

****
Note: Queue reported is the number of cars per lane.
****

Tesoro Los Angeles Refinery
Year 2020 With Project Operations
AM Peak Hour

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)
****

```
Intersection #2 Wilmington Ave / I-405 SB Ramps
********************************************************************************
Cycle (sec):         100                 Critical Vol./Cap.(X):        0.365
Loss Time (sec):      12 (Y+R=4.0 sec)  Average Delay (sec/veh):       21.8
Optimal Cycle:        40                 Level Of Service:                C
********************************************************************************
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Permitted        Protected         Permitted        Permitted
Rights:          Include          Include           Include          Include
Min. Green:     0    0     0    0    0     0    0    0     0    0    0     0
Lanes:        0  0  2  1  1   2  0  3  0  0   0  1  0  1  0   0  0  0  0  0
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:       0  311   368   144  928     0   126    0   168     0    0     0
Growth 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
Initial Bse:    0  311   368   144  928     0   126    0   168     0    0     0
Added Vol:      0    1     0     0    0     0     0    0     1     0    0     0
PasserByVol:    0    0     0     0    0     0     0    0     0     0    0     0
Initial Fut:    0  312   368   144  928     0   126    0   169     0    0     0
User 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
PHF Adj:     0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95
PHF Volume:     0  330   389   152  981     0   133    0   179     0    0     0
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:    0  330   389   152  981     0   133    0   179     0    0     0
PCE 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
MLF 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
FinalVolume:    0  330   389   152  981     0   133    0   179     0    0     0
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  1.00 0.84  0.84  0.92 0.91  1.00  0.71 0.95  0.71  1.00 1.00  1.00
Lanes:       0.00 2.00  2.00  2.00 3.00  0.00  1.00 0.00  1.00  0.00 0.00  0.00
Final Sat.:     0 3178  3178  3502 5187     0  1353    0  1353     0    0     0
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.10  0.12  0.04 0.19  0.00  0.10 0.00  0.13  0.00 0.00  0.00
Crit Moves:                        ****                    ****
Green/Cycle: 0.00 0.21  0.21  0.39 0.61  0.00  0.27 0.00  0.27  0.00 0.00  0.00
Volume/Cap:  0.00 0.48  0.57  0.11 0.31  0.00  0.36 0.00  0.48  0.00 0.00  0.00
Delay/Veh:    0.0 34.7  35.8  19.4  9.6   0.0  29.5  0.0  30.9   0.0  0.0   0.0
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:   0.0 34.7  35.8  19.4  9.6   0.0  29.5  0.0  30.9   0.0  0.0   0.0
LOS by Move:   A    C     D     B    A     A     C    A     C     A    A     A
HCM2kAvgQ:      0    5     7     2    5     0     4    0     5     0    0     0
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************

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2020 Ops AM                Tue Dec 2, 2014 13:55:36                  Page 5-1
--------------------------------------------------------------------------------
                         Tesoro Los Angeles Refinery
                      Year 2020 With Project Operations
                                AM Peak Hour
--------------------------------------------------------------------------------
                      Level Of Service Computation Report
            2000 HCM Operations Method (Future Volume Alternative)
********************************************************************************
Intersection #4 Alameda Ave / I-405 NB Ramps
********************************************************************************
Cycle (sec):         100                 Critical Vol./Cap.(X):        0.687
```

Loss Time (sec): 12 (Y+R=4.0 sec) Average Delay (sec/veh): 23.4
Optimal Cycle: 58 Level Of Service: C

****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0 0 2 0 1			1 0 2 0 0			0 0 0 0 0			1 0 0 0 1		
Volume Module:												
Base Vol:	0	571	48	51	860	0	0	0	0	473	0	320
Growth 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
Initial Bse:	0	571	48	51	860	0	0	0	0	473	0	320
Added Vol:	0	0	0	0	0	0	0	0	0	1	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	0	571	48	51	860	0	0	0	0	474	0	320
User 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
PHF Adj:	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
PHF Volume:	0	614	52	55	925	0	0	0	0	510	0	344
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	0	614	52	55	925	0	0	0	0	510	0	344
PCE 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
MLF 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
FinalVolume:	0	614	52	55	925	0	0	0	0	510	0	344
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	1.00	0.95	0.85	0.95	0.95	1.00	1.00	1.00	1.00	0.77	1.00	0.85
Lanes:	0.00	2.00	1.00	1.00	2.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
Final Sat.:	0	3610	1615	1805	3610	0	0	0	0	1461	0	1615
Capacity Analysis Module:												
Vol/Sat:	0.00	0.17	0.03	0.03	0.26	0.00	0.00	0.00	0.00	0.35	0.00	0.21
Crit Moves:	****				****					****		
Green/Cycle:	0.00	0.32	0.32	0.06	0.37	0.00	0.00	0.00	0.00	0.51	0.00	1.01
Volume/Cap:	0.00	0.54	0.10	0.54	0.69	0.00	0.00	0.00	0.00	0.69	0.00	0.21
Delay/Veh:	0.0	28.7	24.2	51.5	28.0	0.0	0.0	0.0	0.0	21.4	0.0	0.1
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	0.0	28.7	24.2	51.5	28.0	0.0	0.0	0.0	0.0	21.4	0.0	0.1
LOS by Move:	A	C	C	D	C	A	A	A	A	C	A	A
HCM2kAvgQ:	0	9	1	2	13	0	0	0	0	13	0	0

****

Note: Queue reported is the number of cars per lane.

****

2020 Ops AM Tue Dec 2, 2014 13:55:36 Page 6-1

Tesoro Los Angeles Refinery
Year 2020 With Project Operations
AM Peak Hour

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

****

Intersection #9 I-405 SB Ramps / 223rd St

****

Cycle (sec): 100 Critical Vol./Cap.(X): 0.484
Loss Time (sec): 16 (Y+R=4.0 sec) Average Delay (sec/veh): 23.5
Optimal Cycle: 48 Level Of Service: C

****

```
                              2020+Ops_AM.out
Approach:     North Bound      South Bound      East Bound       West Bound
Movement:    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:      Split Phase      Split Phase       Protected        Protected
Rights:          Include          Include          Include          Include
Min. Green:   0    0     0    0    0     0    0    0     0    0    0     0
Lanes:       0  0  1! 0  0    1  0  0  1  0    2  0  2  1  0    1  0  2  1  0
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:       1    1     5    56    0   126   362  309     4     3  857    33
Growth 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
Initial Bse:    1    1     5    56    0   126   362  309     4     3  857    33
Added Vol:      0    0     0     0    0     0     1    0     0     0    0     0
PasserByVol:    0    0     0     0    0     0     0    0     0     0    0     0
Initial Fut:    1    1     5    56    0   126   363  309     4     3  857    33
User 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
PHF Adj:     0.88 0.88  0.88  0.88 0.88  0.88  0.88 0.88  0.88  0.88 0.88  0.88
PHF Volume:     1    1     6    64    0   143   412  351     5     3  973    37
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:    1    1     6    64    0   143   412  351     5     3  973    37
PCE 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
MLF 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
FinalVolume:    1    1     6    64    0   143   412  351     5     3  973    37
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  0.90 0.90  0.90  0.95 1.00  0.85  0.92 0.91  0.91  0.95 0.90  0.90
Lanes:       0.14 0.14  0.72  1.00 0.00  1.00  2.00 2.96  0.04  1.00 2.89  0.11
Final Sat.:   244  244  1218  1805    0  1615  3502 5110    66  1805 4965   191
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.00  0.00  0.04 0.00  0.09  0.12 0.07  0.07  0.00 0.20  0.20
Crit Moves:             ****               ****  ****                  ****
Green/Cycle: 0.01 0.01  0.01  0.18 0.00  0.18  0.24 0.63  0.63  0.02 0.40  0.40
Volume/Cap:  0.48 0.48  0.48  0.19 0.00  0.48  0.48 0.11  0.11  0.11 0.48  0.48
Delay/Veh:   70.1 70.1  70.1  34.9  0.0  37.9  32.9  7.4   7.4  49.9 22.2  22.2
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  70.1 70.1  70.1  34.9  0.0  37.9  32.9  7.4   7.4  49.9 22.2  22.2
LOS by Move:   E    E     E     C    A     D     C    A     A     D    C     C
HCM2kAvgQ:      1    1     1     2    0     4     6    2     2     0    9     9
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************

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```

Tesoro Los Angeles Refinery
Year 2020 With Project Operations
PM Peak Hour

Scenario Report

Scenario:	2020 Ops PM
Command:	2020+Ops-PM
Volume:	2020 PM
Geometry:	2017
Impact Fee:	Default Impact Fee
Trip Generation:	Const-PM
Trip Distribution:	Default Trip Distribution
Paths:	Default Path
Routes:	Default Route
Configuration:	2020+Ops-PM

Tesoro Los Angeles Refinery

2020+Ops_PM.out
Year 2020 With Project Operations
PM Peak Hour

Impact Analysis Report
Level Of Service

Intersection	Base LOS	Base Del/ Veh	Base V/C	Future LOS	Future Del/ Veh	Future V/C	Change in
# 1 Wilmington Ave / I-405 NB Ramp	B	18.4	0.420	B	18.4	0.420	+ 0.001 D/V
# 2 Wilmington Ave / I-405 SB Ramp	B	15.7	0.362	B	15.8	0.363	+ 0.063 D/V
# 4 Alameda Ave / I-405 NB Ramps	C	23.5	0.681	C	23.6	0.682	+ 0.038 D/V
# 9 I-405 SB Ramps / 223rd St	B	19.1	0.514	B	19.1	0.514	-0.002 D/V

```
                              2020+Ops_PM.out
                      Level Of Service Computation Report
                2000 HCM Operations Method (Future Volume Alternative)
********************************************************************************
Intersection #1 Wilmington Ave / I-405 NB Ramps
********************************************************************************
Cycle (sec):         100                  Critical Vol./Cap.(X):         0.420
Loss Time (sec):       8 (Y+R=4.0 sec)  Average Delay (sec/veh):         18.4
Optimal Cycle:        28                  Level Of Service:                  B
********************************************************************************
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Protected         Permitted         Permitted         Permitted
Rights:           Include           Include           Include           Include
Min. Green:     0    0     0     0    0     0     0    0     0     0    0     0
Lanes:        0  0  2  0  1    0  0  3  0  0    0  0  0  0  0    2  0  0  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:       0  289   155     0  886     0     0    0     0   438    0   309
Growth 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
Initial Bse:    0  289   155     0  886     0     0    0     0   438    0   309
Added Vol:      0    0     1     0    0     0     0    0     0     0    0     0
PasserByVol:    0    0     0     0    0     0     0    0     0     0    0     0
Initial Fut:    0  289   156     0  886     0     0    0     0   438    0   309
User 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
PHF Adj:     0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95
PHF Volume:     0  305   164     0  934     0     0    0     0   462    0   326
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:    0  305   164     0  934     0     0    0     0   462    0   326
PCE 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
MLF 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
FinalVolume:    0  305   164     0  934     0     0    0     0   462    0   326
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  1.00 0.95  0.85  1.00 0.91  1.00  1.00 1.00  1.00  0.59 1.00  0.85
Lanes:       0.00 2.00  1.00  0.00 3.00  0.00  0.00 0.00  0.00  2.00 0.00  1.00
Final Sat.:     0 3610  1615     0 5187     0     0    0     0  2234    0  1615
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.08  0.10  0.00 0.18  0.00  0.00 0.00  0.00  0.21 0.00  0.20
Crit Moves:  ****                    ****                          ****
Green/Cycle: 0.00 0.43  0.43  0.00 0.43  0.00  0.00 0.00  0.00  0.49 0.00  0.49
Volume/Cap:  0.00 0.20  0.24  0.00 0.42  0.00  0.00 0.00  0.00  0.42 0.00  0.41
Delay/Veh:    0.0 17.9  18.4   0.0 20.1   0.0   0.0  0.0   0.0  16.5  0.0  16.5
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:   0.0 17.9  18.4   0.0 20.1   0.0   0.0  0.0   0.0  16.5  0.0  16.5
LOS by Move:   A    B     B     A    C     A     A    A     A     B    A     B
HCM2kAvgQ:      0    3     3     0    7     0     0    0     0     5    0     6
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************

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2020 Ops PM                Tue Dec 2, 2014 13:55:46                  Page 4-1
--------------------------------------------------------------------------------
                          Tesoro Los Angeles Refinery
                       Year 2020 With Project Operations
                                 PM Peak Hour
--------------------------------------------------------------------------------
                      Level Of Service Computation Report
                2000 HCM Operations Method (Future Volume Alternative)
********************************************************************************
```

```
Intersection #2 Wilmington Ave / I-405 SB Ramps
*******************************************************************************
Cycle (sec):          100                 Critical Vol./Cap.(X):         0.363
Loss Time (sec):       12 (Y+R=4.0 sec)  Average Delay (sec/veh):         15.8
Optimal Cycle:         34                 Level Of Service:                  B
*******************************************************************************
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Permitted        Protected         Permitted         Permitted
Rights:          Include          Include           Include           Include
Min. Green:     0    0     0    0    0     0    0    0     0    0    0     0
Lanes:        0  0  2  1  1   2  0  3  0  0    0  1  0  1  0    0  0  0  0  0
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:       0  416   491   345  910     0    27    0    84     0    0     0
Growth 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
Initial Bse:    0  416   491   345  910     0    27    0    84     0    0     0
Added Vol:      0    1     0     0    0     0     0    0     1     0    0     0
PasserByVol:    0    0     0     0    0     0     0    0     0     0    0     0
Initial Fut:    0  417   491   345  910     0    27    0    85     0    0     0
User 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
PHF Adj:     0.98 0.98  0.98  0.98 0.98  0.98  0.98 0.98  0.98  0.98 0.98  0.98
PHF Volume:     0  426   502   353  930     0    28    0    87     0    0     0
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:    0  426   502   353  930     0    28    0    87     0    0     0
PCE 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
MLF 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
FinalVolume:    0  426   502   353  930     0    28    0    87     0    0     0
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  1.00 0.84  0.84  0.92 0.91  1.00  0.75 0.95  0.75  1.00 1.00  1.00
Lanes:       0.00 2.00  2.00  2.00 3.00  0.00  1.00 0.00  1.00  0.00 0.00  0.00
Final Sat.:     0 3178  3178  3502 5187     0  1431    0  1431     0    0     0
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.13  0.16  0.10 0.18  0.00  0.02 0.00  0.06  0.00 0.00  0.00
Crit Moves:             ****  ****                          ****
Green/Cycle: 0.00 0.43  0.43  0.28 0.71  0.00  0.17 0.00  0.17  0.00 0.00  0.00
Volume/Cap:  0.00 0.31  0.36  0.36 0.25  0.00  0.11 0.00  0.36  0.00 0.00  0.00
Delay/Veh:    0.0 18.5  19.1  29.3  5.1   0.0  35.3  0.0  37.5   0.0  0.0   0.0
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:   0.0 18.5  19.1  29.3  5.1   0.0  35.3  0.0  37.5   0.0  0.0   0.0
LOS by Move:   A    B     B     C    A     A     D    A     D     A    A     A
HCM2kAvgQ:      0    5     6     5    4     0     1    0     3     0    0     0
*******************************************************************************
Note: Queue reported is the number of cars per lane.
*******************************************************************************

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-------------------------------------------------------------------------------

                          Tesoro Los Angeles Refinery
                       Year 2020 With Project Operations
                                 PM Peak Hour
-------------------------------------------------------------------------------

                      Level Of Service Computation Report
            2000 HCM Operations Method (Future Volume Alternative)
*******************************************************************************
Intersection #4 Alameda Ave / I-405 NB Ramps
*******************************************************************************
Cycle (sec):          100                 Critical Vol./Cap.(X):         0.682
```

```
Loss Time (sec):      12 (Y+R=4.0 sec)  Average Delay (sec/veh):       23.6
Optimal Cycle:        57                Level Of Service:                 C
*******************************************************************************
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Protected        Protected        Protected         Permitted
Rights:           Include          Include          Include          Include
Min. Green:     0    0     0    0    0     0    0    0     0    0    0     0
Lanes:        0  0  2  0  1   1  0  2  0  0   0  0  0  0  0   1  0  0  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:       0  944   195   82  773     0    0    0     0  393    0   108
Growth 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
Initial Bse:    0  944   195   82  773     0    0    0     0  393    0   108
Added Vol:      0    0     0    0    0     0    0    0     0    1    0     0
PasserByVol:    0    0     0    0    0     0    0    0     0    0    0     0
Initial Fut:    0  944   195   82  773     0    0    0     0  394    0   108
User 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
PHF Adj:     0.96 0.96  0.96 0.96 0.96  0.96 0.96 0.96  0.96 0.96 0.96  0.96
PHF Volume:     0  982   203   85  804     0    0    0     0  410    0   112
Reduct Vol:     0    0     0    0    0     0    0    0     0    0    0     0
Reduced Vol:    0  982   203   85  804     0    0    0     0  410    0   112
PCE 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
MLF 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
FinalVolume:    0  982   203   85  804     0    0    0     0  410    0   112
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900 1900 1900  1900 1900 1900  1900 1900 1900  1900
Adjustment:  1.00 0.95  0.85 0.95 0.95  1.00 1.00 1.00  1.00 0.77 1.00  0.85
Lanes:       0.00 2.00  1.00 1.00 2.00  0.00 0.00 0.00  0.00 1.00 0.00  1.00
Final Sat.:     0 3610  1615 1805 3610     0    0    0     0 1461    0  1615
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.27  0.13 0.05 0.22  0.00 0.00 0.00  0.00 0.28 0.00  0.07
Crit Moves:       ****       ****                                ****
Green/Cycle: 0.00 0.40  0.40 0.07 0.47  0.00 0.00 0.00  0.00 0.41 0.00  0.82
Volume/Cap:  0.00 0.68  0.31 0.68 0.48  0.00 0.00 0.00  0.00 0.68 0.00  0.08
Delay/Veh:    0.0 26.2  20.9 59.8 18.4   0.0  0.0  0.0   0.0 27.3  0.0   1.7
User DelAdj: 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
AdjDel/Veh:   0.0 26.2  20.9 59.8 18.4   0.0  0.0  0.0   0.0 27.3  0.0   1.7
LOS by Move:   A    C     C    E    B     A    A    A     A    C    A     A
HCM2kAvgQ:      0   14     4    4    9     0    0    0     0   11    0     1
*******************************************************************************
Note: Queue reported is the number of cars per lane.
*******************************************************************************

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2020 Ops PM                Tue Dec 2, 2014 13:55:46                 Page 6-1
-------------------------------------------------------------------------------
                          Tesoro Los Angeles Refinery
                       Year 2020 With Project Operations
                                  PM Peak Hour
-------------------------------------------------------------------------------
                       Level Of Service Computation Report
            2000 HCM Operations Method (Future Volume Alternative)
*******************************************************************************
Intersection #9 I-405 SB Ramps / 223rd St
*******************************************************************************
Cycle (sec):         100                Critical Vol./Cap.(X):        0.514
Loss Time (sec):      16 (Y+R=4.0 sec)  Average Delay (sec/veh):       19.1
Optimal Cycle:        50                Level Of Service:                 B
*******************************************************************************
```

2020+Ops_PM.out

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Split Phase			Split Phase			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0 0 1! 0 0			1 0 0 1 0			2 0 2 1 0			1 0 2 1 0		
Volume Module:												
Base Vol:	3	6	3	128	2	37	860	817	18	4	355	79
Growth 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
Initial Bse:	3	6	3	128	2	37	860	817	18	4	355	79
Added Vol:	0	0	0	0	0	0	1	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	3	6	3	128	2	37	861	817	18	4	355	79
User 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
PHF Adj:	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
PHF Volume:	3	6	3	135	2	39	908	862	19	4	374	83
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	3	6	3	135	2	39	908	862	19	4	374	83
PCE 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
MLF 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
FinalVolume:	3	6	3	135	2	39	908	862	19	4	374	83
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.95	0.95	0.95	0.95	0.86	0.86	0.92	0.91	0.91	0.95	0.89	0.89
Lanes:	0.25	0.50	0.25	1.00	0.05	0.95	2.00	2.94	0.06	1.00	2.45	0.55
Final Sat.:	453	907	453	1805	84	1547	3502	5060	111	1805	4128	919
Capacity Analysis Module:												
Vol/Sat:	0.01	0.01	0.01	0.07	0.03	0.03	0.26	0.17	0.17	0.00	0.09	0.09
Crit Moves:		****		****			****				****	
Green/Cycle:	0.01	0.01	0.01	0.15	0.15	0.15	0.50	0.67	0.67	0.01	0.18	0.18
Volume/Cap:	0.51	0.51	0.51	0.51	0.17	0.17	0.51	0.25	0.25	0.25	0.51	0.51
Delay/Veh:	66.4	66.4	66.4	41.2	37.8	37.8	16.8	6.5	6.5	57.1	37.8	37.8
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	66.4	66.4	66.4	41.2	37.8	37.8	16.8	6.5	6.5	57.1	37.8	37.8
LOS by Move:	E	E	E	D	D	D	B	A	A	E	D	D
HCM2kAvgQ:	1	1	1	4	1	1	10	4	4	0	5	5

Note: Queue reported is the number of cars per lane.

APPENDIX F

McGOVERN REPORT

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SJMcGovern Report for South Coast Air Quality Management District
Tesoro Los Angeles Refinery Integration and Compliance Project

By: Dr. Stephen J McGovern, PE

Date: October 12, 2015

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Contents

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I have been retained by the South Coast Air Quality Management District (SCAQMD) in connection with the SCAQMD's review of the Tesoro Los Angeles Refinery Integration and Compliance Project (the LARIC project) under the California Environmental Quality Act.

I have worked in and around the petroleum refining and/or renewable fuels industries for over 40 years. I have a Doctorate in Chemical Engineering from Princeton University and am a licensed Professional Engineer in New Jersey. I have recently served on two different National Research Council Committees regarding conventional and alternative fuels. I teach industry recognized courses on various aspects of refining technology. My Curriculum Vitae is attached as Appendix A.

The SCAQMD is preparing an Environmental Impact Report (EIR) for the proposed Tesoro Los Angeles Refinery Integration and Compliance (LARIC) Project at the Tesoro Los Angeles Refinery pursuant to the California Environmental Quality Act (CEQA) and has asked me to consider the following specific questions posed by SCAQMD as well as other issues as they may arise:

1. Does the proposed LARIC Project provide the ability to change the slate of crude oil that could be delivered and processed at the Tesoro Los Angeles Refinery?

2. If so, how would those qualities change and what effect could they have in the blending and crude processes (even if the permits for those processes are not changing)? Would the crudes be significantly heavier (have lower American Petroleum Institute (API) gravities) and/or contain more sulfur and be more acidic than the crudes they would replace? Would the crudes delivered to the Tesoro Los Angeles Refinery be significantly lighter and/or contain more volatile organic hydrocarbons than the crudes they would replace?

3. If the Tesoro Los Angeles Refinery modifications would facilitate refining a different slate of crude oil, would that change in slate cause an increase in criteria air pollutants, toxic air contaminants or GHG emissions from the Tesoro Los Angeles Refinery during the refining process?

4. If the Tesoro Los Angeles Refinery modifications would facilitate refining a different slate of crude oil, would that change in slate cause an increase in the risk of upset (increase in the potential for accidents that could lead to emergency events)?

Before answering these questions, we must define how the term “slate” as applied to crude oil input to a refinery is used in the petroleum industry. As used in this context “slate” can refer to a list of potential crude oils that the refiner can choose to purchase and be delivered as input to the refinery or it can refer to the blend of crude oils actually purchased and processed in a refinery. This report will address both definitions.

In short, my conclusions are summarized in the following numbered paragraphs. For detailed information that provides the basis for the following conclusions, the reader is referred to sections I, II, III, and IV.

1. The LARIC project will not change the modes by which Tesoro receives crude oil into the refinery complex. As such, the LARIC project will not allow Tesoro to access crudes that are not currently available to the refinery. The LARIC project will make minor changes to crude oil refining capabilities of the Tesoro Los Angeles Refinery, but will not increase the refinery's ability to process higher sulfur crudes or significantly change the refinery's ability to process lighter or heavier crudes. Therefore, the average quality of the crudes processed by the refinery will not change significantly as a result of the LARIC project. The quality of the crudes that Tesoro currently processes varies widely, from very heavy sour crudes to very light sweet crudes. Tesoro will continue to decide which crudes to purchase in the future at any given time based on a variety of factors, such as the quality and price of crudes on the market, the market demand for different products such as gasoline, jet fuel, or diesel fuel, the market prices for different products, and the refinery's configuration. It is difficult to predict with certainty what crudes Tesoro will purchase at any given time in the future because of changes in the world market forces. However, certain limitations applicable to the crudes currently received and processed will continue to apply in the future, as summarized in the following item and explained in more detail later in this report. Therefore, the LARIC project will not change the slate of crude oil that could be delivered to and processed at the Los Angeles refinery.

2. Certain aspects of the Tesoro Los Angeles Refinery's processing configuration limit the instantaneous quality of the crude mix that can be processed. These aspects of the refinery processing configuration will not be changed significantly by this project. Tesoro will continue to purchase crudes of varying quality to match the refinery's existing limitations in API gravity and sulfur content before processing them. Tesoro will continue to purchase crudes within the current range after implementation of the LARIC project, regardless of any change in the sources of crudes. Therefore, the air pollutant emissions from process equipment attributable to varying crude types will remain substantially the same.

3. Although some of the units in the Tesoro Los Angeles Refinery are being modified and new units are being added, the slate of crude oils available to the refinery will not change and the minor changes in average crude oil quality that might result would not cause an increase in operating emissions of criteria air pollutants, toxic air contaminants or GHG emissions after the mitigation methods that are part of the LARIC are applied.

4. The changes being made as a result of this project will not allow the refinery to

process a different slate of crude oil. As such, there will be no crude oil changes that make the refinery more prone to upset or potential leaks of hazardous or toxic substances. Although the LARIC project will not change the slate of crude oil processed in the refinery, some of the other changes proposed in this project will most likely reduce the probability of the release of toxic or hazardous substance within SCAQMD.

Information included in this document was provided both by Tesoro and through publically available sources. However, detailed information concerning the quality and potential sources of crude oil both processed in the past and contemplated to be processed in the future at Tesoro's Los Angeles Refinery are business confidential information and therefore are not included in the EIR or this report. Furthermore, detailed information describing the Tesoro Los Angeles Refinery's processing capabilities, other than information included in operating permits and other public documents is also confidential and not included in this report.

I. To What Extent Will the LARIC Project Change the Quality of Crudes Delivered to the Refinery?

A. How Do Refiners Decide Which Crudes to Purchase?

Crude oil is a complex mixture of thousands of individual chemical compounds (molecules). An oil refinery separates and transforms these complex mixtures into the different, saleable, specification products that consumers demand such as gasoline, jet fuel, diesel fuel, asphalt and lubricating oils. Refineries also produce byproducts such as liquefied petroleum gas (LPG), petroleum coke, and sulfur.

The "oil industry" consists of producers of crude oil, refiners of crude oil and distributors, transporters and marketers of crude oil and finished products. Very few US oil companies perform all of these tasks. For example, Tesoro is an independent oil refiner, but does not drill for or produce crude oil. It purchases its crude oil through both short and long term contracts and on the spot market. As such, Tesoro must rely on other entities (oil producing companies and countries) to ensure that the quality of the crude oil it purchases meets specifications. Crude oils are produced and sold by various entities including governmental organizations such as member nations of the Organization of Petroleum Exporting Countries (OPEC), private companies under license to various governments and private companies producing oil from privately owned land.

Crude oils are generally categorized based on weight or "gravity" and sulfur content. Gravity (API gravity) is an indirect measure of the amount of gasoline and distillate (diesel fuel, jet fuel and home heating oil are collectively referred to as distillates) boiling range material that exist in the crude as it is delivered to the refinery. Lower gravity crudes contain less gasoline and distillate and larger amounts of heavy tar-like components that require more complex refineries to convert these heavy molecules into gasoline and distillate. Current governmental regulations require gasoline and diesel fuel to be essentially sulfur free, so processing higher sulfur crudes also requires more complex refineries and additional costs to remove the sulfur from the final product. Since it requires less refinery equipment and operating expenses to convert light sweet crudes into gasoline and distillates than it does to convert heavy sour crudes, light sweet crudes are generally more valuable (higher priced) than heavy sour crudes. Crude traders generally price crude oils based on their relative weight and sulfur content. The Energy Information Administration of the US Department of Energy publishes monthly average costs of imported crude oils as a function of API gravity. Lower gravity crudes generally cost less for refineries to purchase than higher gravity crudes, but require more complex and expensive refineries to convert them into saleable products.

Gasoline typically has an API gravity of about 50, while diesel has an API gravity of about 35. Vacuum gas oil (VGO) and residue (the other major components of crude oil) have gravities of about 22 and 10 respectively. The gasoline that is naturally found in crude oil has a low octane and must be “reformed” in a naphtha catalytic reformer unit to increase its octane. The vacuum gas oil is “cracked” in a Fluid Catalytic Cracking (FCC) unit or hydrocracking unit to convert most of it to gasoline and diesel fuel. The residue is either sold as asphalt or heavy fuel oil or is cracked in a coker to produce additional gasoline and diesel fuel and pet coke. Lower gravity crudes with more VGO and residue require more processing in more complex and expensive refineries.

When a refinery is first built, the types and sizes of the various process units are chosen to match the characteristics of the specific “design” crude oil based on a detailed crude assay of the design oil or mix of oils. As new crude sources become available and sources of the design crude decline, refiners must purchase different crudes and blend them together to match refinery processing capabilities as closely as possible. Refiners also add new processing units or modify existing units to either handle the new crude oil mix, produce a different product mix or meet new product or emission specifications. Refiners evaluate these required configurational changes and crude oil purchases with computer programs know as LPs. (Linear Programing Optimization Routines).

Linear Programing is a complex mathematical tool that can be purchased from several different companies. Many refiners use the PIMS model offered by AspenTech. These models have mathematical representations of each refinery process unit and track essentially every major input, intermediate stream and product stream within the refinery. The basic model is licensed from AspenTech, but the refiner must then modify it to include all of the capabilities and constraints of the specific refinery being modeled. The constraints include operational, economic, logistical and environmental factors. The unit-specific information only changes when hardware or environmental requirements change. Product demand and pricing, as well as crude oil price and availability can change every day.

The refinery and the corporate planning groups run these LP models every day. The models are used to determine the optimal crude mix the refinery should purchase from the crudes that are available to it. Once the crudes arrive at the refinery (this could be several weeks or months after the purchase decision is made), the model is run again to determine the most profitable product mix that can be made from the crudes "on-hand", given "today's" prices and product demands. The models are also used as longer term planning tools to determine if an investment such as the LARIC project will be beneficial to the refinery.

There are many different crude oils available on the world market. The "slate" of crude oils available to any refinery is a subset of the world market that is defined by transportation and delivery modes available to the refinery. In addition to gravity and sulfur, samples of each crude are analyzed in more detail by both producers and refiners. These detailed analyses are called crude assays. A crude assay on a single sample of crude oil can cost anywhere from $5,000 to more than $100,000. The cost of the crude assay increases with the level of detail desired. Refiners use these more detailed crude assays to determine the blends of various crudes that can be economically processed in their refinery.

LP models use available crude assay information to represent the crude oil input into the refinery. The refiners must either develop the crude assay information themselves or purchase the information from other sources. Some limited crude assay information is available from open sources, but the detailed information that is required to run a refinery LP is often copyrighted and cannot be distributed to the public without compensating the copyright owner. Detailed crude assays developed by refiners for use in their own LP modeling have competitive value and are therefore considered trade secret and business confidential information.

Although each crude oil has a specific name and generally accepted quality, every cargo is a blend of various oils produced from a number of individual wells, each well producing a slightly different quality oil. Therefore, a single crude assay is only an approximation of the actual quality of crude oil delivered to a refinery. For example, Crude Oil Quality, Inc. maintains a website (www.crudemonitor.ca) that publishes limited analytical data on shipments of a number of Canadian crude oils. Figures 1 and 2 show the variability in Gravity, Sulfur, Total Acid Number (TAN) and Benzene of Western Canadian Select and Christina Dilbit. These are two, high volume, heavy, sour Canadian export crudes. The LARIC project will not change the availability of these crudes to the Tesoro Los Angeles refinery. This information is only included in this report to show typical crude oil quality variability. For example, the API gravity of Western Canadian Select has varied almost annually between about 19.5 and 21.5 API. Higher gravity occurs in the winter when more diluent is required to reduce viscosity.

Figure 1: Selected Properties of Western Canadian Select

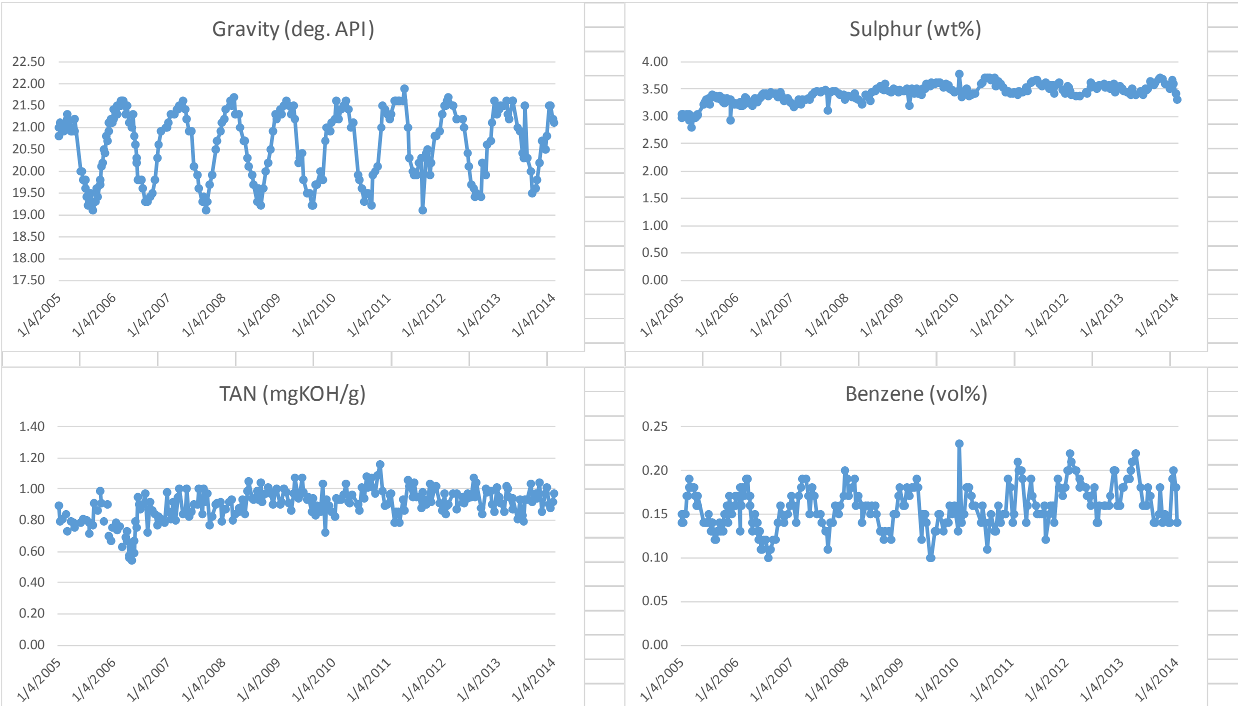
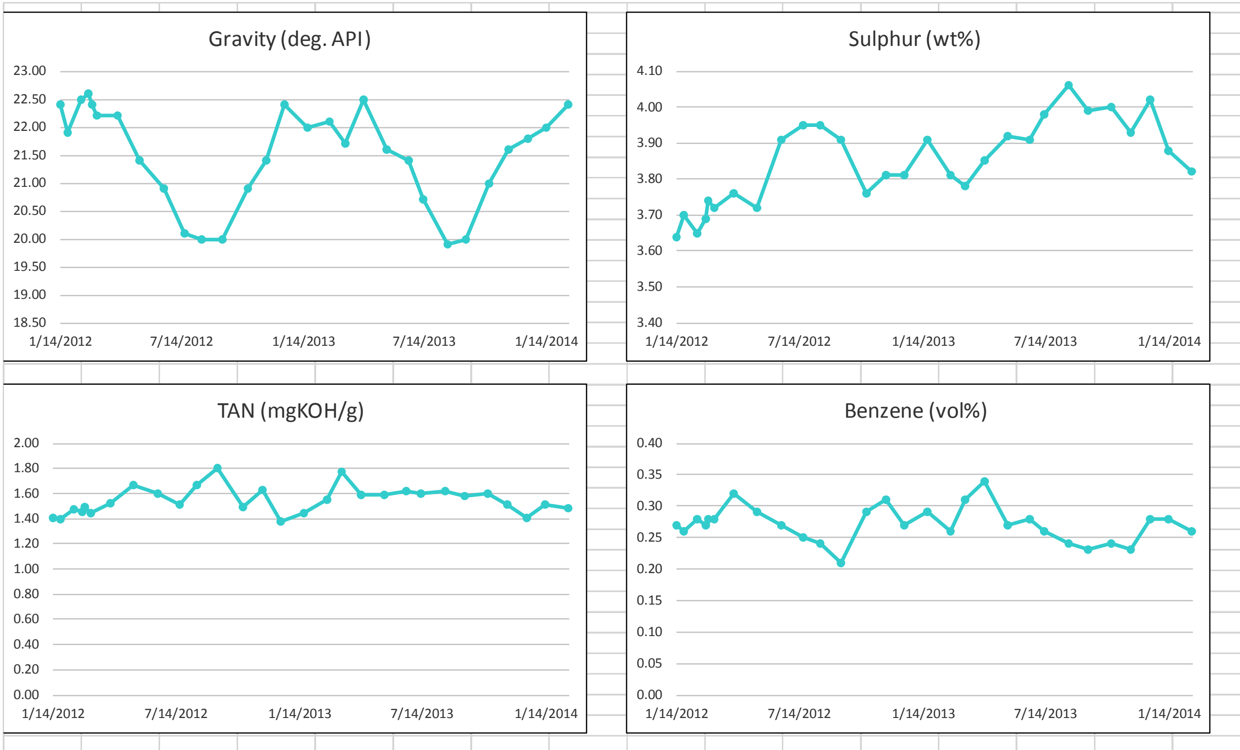


Figure 2: Selected Properties of Christina Dilbit



LP modeling, which includes refinery configuration and economic considerations (crude price, relative product prices and operating costs), determines the actual crude mix and crude rates that the refinery will run to maximize profits. Each refinery has a different configuration and therefore is limited in the types of crude that can be economically processed in that particular refinery.[1] The major processing units typically found in most refineries include: crude unit, vacuum tower, naphtha pretreater and reformer, jet fuel treating, distillate desulfurization units, fluid catalytic cracking unit, alkylation unit and a gas recovery/treating facility. Some refineries might also have a hydrocracker, a heavy gas oil (FCC feed) hydrotreater, a coker, a catalytic polymerization unit, a propane treating unit, a hydrogen plant, lube oil and/or asphalt production facilities as well as other specialty units such as an isomerization unit or benzene conversion unit.[2] Each of these units operates on a different fraction of the crude oil. The exact refinery configuration and the processing capabilities of the individual units determine the crude oils that the refinery is capable of processing. For example, the lifting capabilities of

[1] Both the US Department of Energy (DOE) and the Oil and Gas Journal publish annual listings of the processing capacities of every US refinery and the major processing units within each refinery. The DOE listing is available for download from the EIA website, free of charge. The Oil and Gas Journal survey is available for a nominal fee.

[2] Refineries also have support facilities to generate steam and electricity, to produce boiler feed water, to recover and produce elemental sulfur. A refinery also includes units whose specific function is to minimize the release of potential contaminants into the environment. A schematic of a typical complex oil refinery can be found in AP-42 Figure 5.1.1 on the EPA website and is reproduced herein as Figure 3. A schematic of the existing Carson and Wilmington Operations of the Tesoro Refinery is shown in Figure 2-8 of the EIR for the proposed Project.

the crude unit and the size of the naphtha reformer limit the average naphtha content of the crude oil that the refinery can process. Most of the sulfur that enters a refinery with the crude oil is removed by the various processing units and converted to elemental sulfur by the sulfur plant. The size of the sulfur plant relative to the crude processing capacity of the refinery determines the maximum **average** crude sulfur content that the refinery can process. The size of the FCC unit, hydrocrackers and coker determine the amounts of VGO and residue that the refinery can process and therefore the heaviness of the crude that can be processed.

Based on the size of the various processing units in the Tesoro Los Angeles Refinery as reported in the U.S. DOE Energy Information Administration website, the maximum average crude oil sulfur content that the Tesoro Los Angeles Refinery complex can remove from its products at full capacity is about 1.5 wt%. Some sulfur also leaves the refinery with the various products, so the actual **average** crude sulfur content that can be processed is slightly higher than this value and is about 1.9 wt%. This is an average value. Individual crudes with sulfur contents above 3% can be processed in the refinery. Also, running the refinery at lower than maximum capacity allows a higher average sulfur crude slate to be processed.

The LARIC project will not increase the sulfur plant capacity nor the ability of the refinery to run a higher average crude sulfur content. A new jet fuel treating unit is being added to improve jet fuel quality but not increase jet fuel production or sulfur content. The coke drums are not being modified as part of this project, so the coke production capacity and hence the amount of sulfur that leaves the refinery with the coke is not expected to change significantly. Thus, the Tesoro Los Angeles refinery complex will not be able to process a significantly higher sulfur content crude slate following the LARIC project.

A refinery does not always run crude oils with sulfur contents that “fill” its sulfur removal/recovery capabilities. Crude oil sulfur content is one of many factors that impact the price and “processibility” of a crude oil. The yield structure and properties of the various fractions of the crude also impact its relative value to any given refinery. Thus, the sulfur content of the crude being run in the refinery on any given day is usually less than the maximum refinery capabilities. The scheduled or unscheduled shutdown of various refinery units can also change the maximum sulfur content of the crudes that can be processed on any given day.

The capacities of the Cokers, hydrocrackers and FCC units (the units that upgrade the heaviest portions of the crude) will be modified as a result of the LARIC project. The Wilmington FCC will be shut down. The Wilmington coker heater permit will be modified to allow an approximately 20% higher maximum heater firing rate. The Wilmington coker only processes a small fraction of the total input of the refinery and only processes heavy crudes. Since the coke drums are not increasing in capacity, this increase in furnace duty associated with the coker heater permit change is expected to provide at most a 2% (6,000 barrels per day) increase in crude oil throughput capacity mostly in the distillate and VGO range boiling range.

The coker fractionator processes some of the Wilmington crude in addition to the coker products. The "worst case scenario" from an overall emissions perspective is to utilize this additional capability to process additional crude. This is the case that was evaluated in the EIR, so the emission increases associated with an increase in coker furnace permit will be relatively minor (see Table 4.2-4 in the EIR for the LARIC project).

The hydrocrackers and hydrotreating units are being modified to recover more ultra-low sulfur diesel (ULSD) and accept the lightest portions of the feeds that are currently processed in the Carson and Wilmington FCC units. These modifications allow the shutdown of the Wilmington FCC and the elimination of the emissions associated with the operation of the Wilmington FCC. Since the capacities of the cokers are not increasing and the FCC capacity is decreasing, the amount of heavy low gravity crude that the refinery can process will also not increase as a result of the LARIC project.

The average gravity of crude processed will also not increase because the LARIC project's refinery **product** slate would shift somewhat, producing less gasoline and more distillate. FCC units primarily produce gasoline, while hydrocracking units can be operated to produce primarily distillates. The production of more distillate and less gasoline requires less energy, resulting in a lower GHG footprint. Data in the California Air Resources Board (CARB) Low Carbon Fuel Standard (LCFS) lookup table lists the GHG footprint of CARBOB as 99.18 gram (g) CO_2/megajoules (MJ) and that of ULSD as 98.03 g CO_2/MJ. ULSD has a higher molecular weight than gasoline, so less "cracking" or molecular weight reduction is required to produce diesel from heavy crudes than to produce gasoline from heavy crudes. The modifications to the Tesoro hydrocrackers would allow this shift to less gasoline and more distillate.

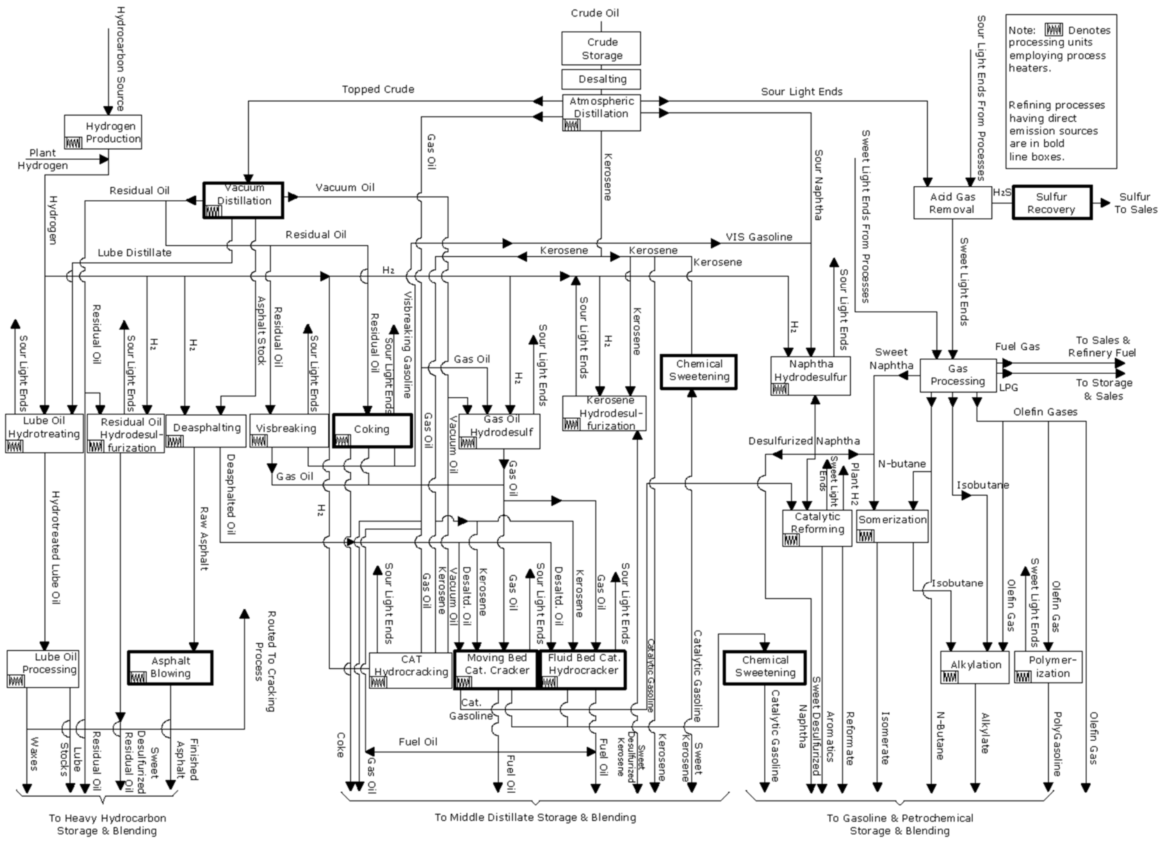
Hydrocrackers that produce distillate rather than gasoline also consume less hydrogen in the cracking reactions because the molecular weight reduction is smaller.

The capacity of the naphtha reformers will not change as a result of the LARIC project. The "lifting" capabilities of the crude units will not increase, so the amount of light, high gravity crude that the refinery can process will also not increase as a result of the LARIC project.

B. What Crudes are Currently Delivered to the Tesoro Los Angeles Refinery?

The Wilmington and Carson refineries were originally designed to refine California crude oils. The Carson refinery was later expanded to also refine Alaskan North Slope Oil and other imported crude oils. Because of the declining production from the Alaska and California oil fields and the captive use of this production by the various producers, Tesoro currently buys crude on the open market as a substitute for the original design crude oils in accordance with the information generated by the LP model. Some of this purchased crude is domestic production and some is imported from as far away as the Middle-East. According to U.S. DOE information, West Coast refineries processed 877 million barrels of oil in 2014. A little over half of this crude oil was imported into the U.S. and about 10% came from Canada.

Figure 3: Schematic of a Complex Oil Refinery

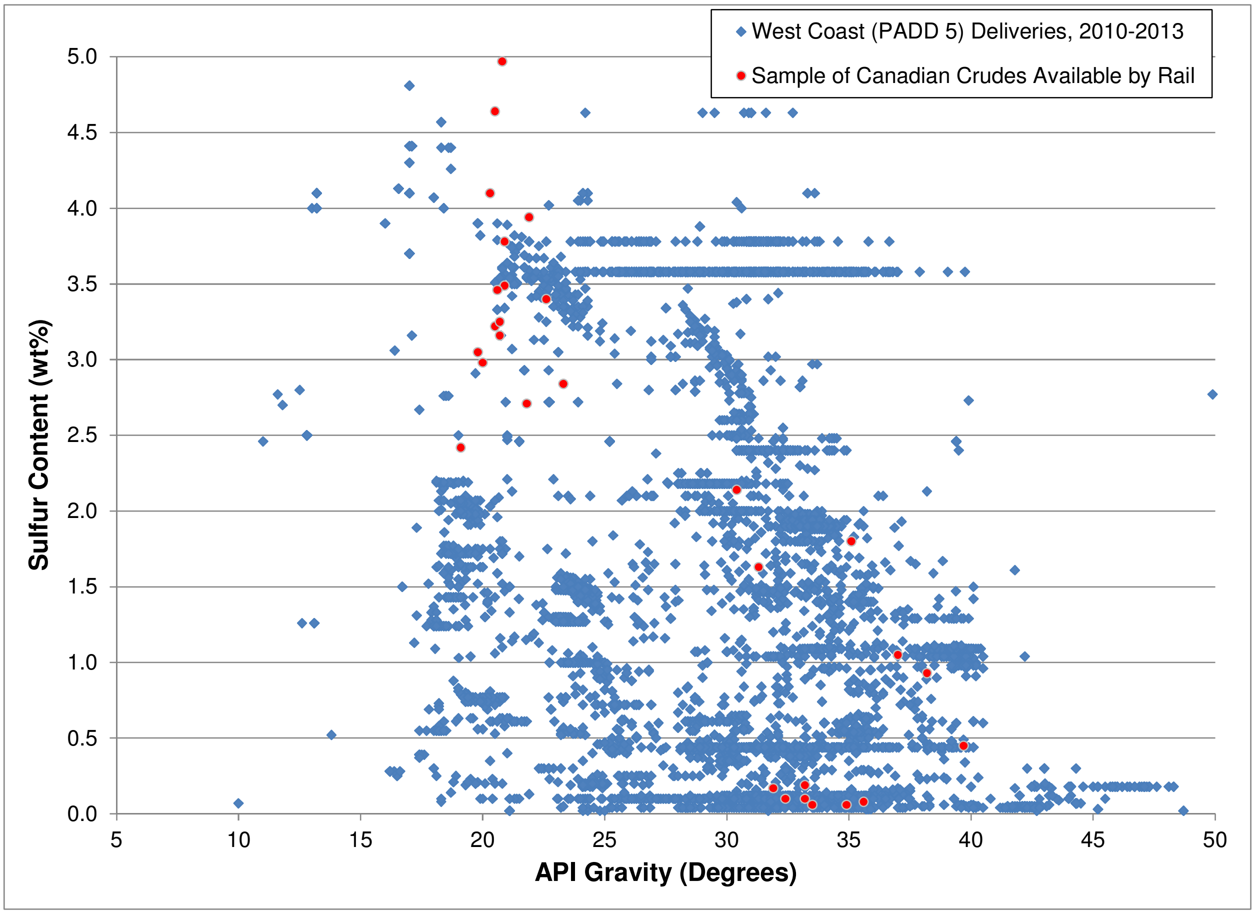


Source: EPA AP-42, Chapter 5 Petroleum Refining

The Energy Information Administration of the US Department of Energy publishes much information concerning the types of crudes that are imported into the US, produced within the US and processed within US refineries. The information, however, is aggregated to avoid revealing the input to individual refineries. DOE recognizes that the crudes purchased and processed by individual refineries is valuable company confidential information and does not release this information.

Figure 4 shows the gravity and sulfur contents of crudes that have been delivered to West coast (PADD 5) refineries in the recent past, along with the same properties of various Canadian crudes that could be available as reported by Crude Oil Quality, Inc.

Figure 4: West Coast Refinery Crude Quality



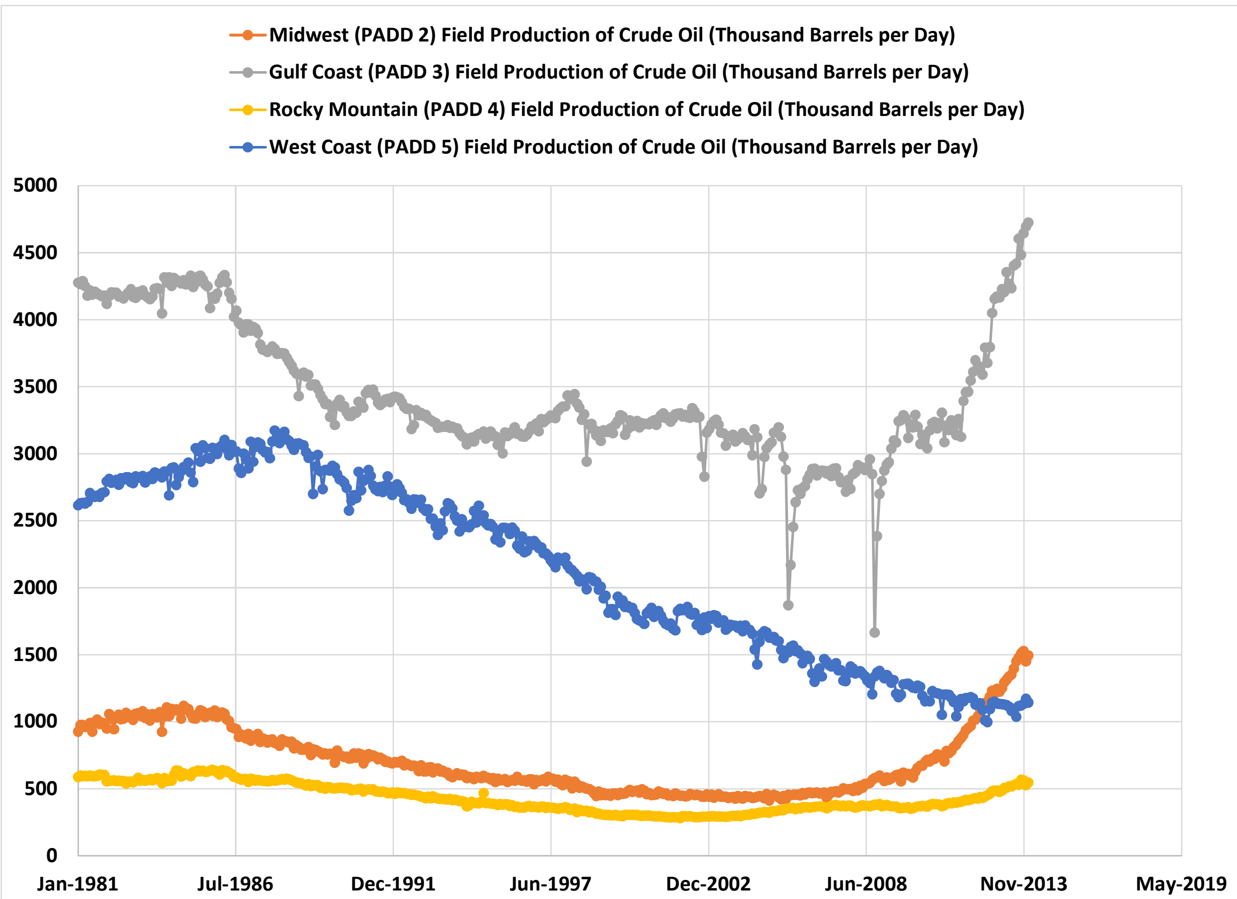
Tesoro Los Angeles currently receives some California and other crude oils via pipeline. It also receives both light sweet and heavy sour crudes via ship. The Tesoro Los Angeles Refinery does not have facilities to receive crude by rail and the LARIC project will not change modes of importing crude to the refinery so the slate of available crude oils will not change. The processing of these various crudes within the refinery is scheduled to match the operating constraints of the refinery.

C. What Crudes Will Be Delivered to the Los Tesoro Angeles Refinery as a Result of the LARIC Project?

The major operating constraints of the refinery are not being changed by the LARIC project. The ability of the crude units to "lift" more light material is not being increased. The ability to convert heavier crude fractions into lighter products is not increasing. The sulfur removal capabilities of the refinery are not increasing, so the **limits** in the quality of the crude blends that can be processed within the refinery will not change. The sources of the crudes actually purchased can change and the refinery will still have the ability to run "below the existing physical constraints". The actual **average** crude quality that the refining complex can run in the future will not change significantly.

In recent years, increasingly large volumes of crude oil have become available both domestically and from Canada. Processing more "local" crudes decreases the cost and carbon footprint associated with transporting crude oil to a refinery. Figure 5 shows historic crude oil production rates from various parts of the US. It is easy to see that West Coast crude production continues to decline while production from the mid-continent and gulf coast of the US is rapidly increasing. This increased production is mostly lighter crudes such as Bakken, WTI and WTS. This new production has upset the world crude oil market and resulted in a significant and unanticipated reduction in crude oil prices throughout the world, changing the relative values of different crudes.

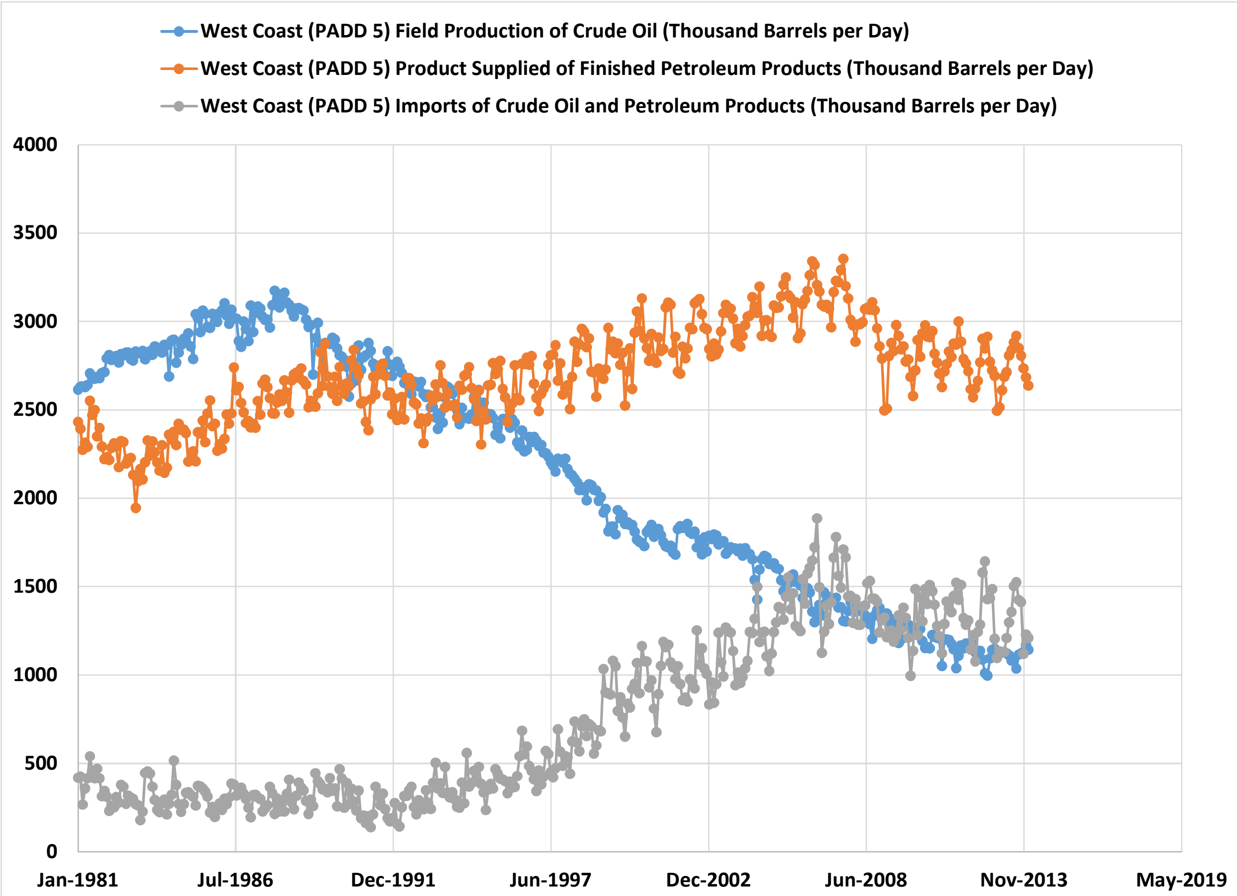
Figure 5: US Crude Oil Production



Through the mid-1990's PADD 5 was a net exporter of oil products to other parts of the US, Figure 6. Since then, the west coast and especially California has been a net importer of petroleum. Much of this oil has come from other countries.

The Tesoro Los Angeles Refinery currently receives crude oil by pipeline and by marine vessel at the Port of Long Beach. The LARIC project will not change the mode of transportation by which the Tesoro Los Angeles Refinery receives crude oil. The LARIC project does not include construction of new facilities to receive crude oil by rail. Tesoro will continue to receive crude oil by pipeline and waterborne cargoes. The size of the crude oil storage tanks that receive waterborne crude will increase, but as will be discussed in a subsequent section, this change in storage capacity will not impact the types of crudes that can be imported and processed and is expected to actually decrease VOC emissions associated with crude oil reception (during vessel hoteling in the port) and transfer. The sources of crude available by pipeline are currently and will continue to be determined by the pipeline operators. Tesoro's crude oil purchase decision mechanism based on LP modeling of the refinery will not change as a result of the LARIC project.

Figure 6: PADD 5 Petroleum Balance



II. Would Any Changes in Crude Sources Result in Increased Emissions?

There are several potential sources of emissions from an oil refinery:

- Point source emissions from furnaces and other process stacks. These point source emissions operate under and are limited by emission permits. Stack permits are being modified, which have the potential to increase emissions, but the shutdown of the Wilmington FCC more than offsets these minor increases. Although the processing capabilities of some of the other units are increasing, this is mostly being accomplished via energy efficiency improvements. As explained in the EIR, additional heat exchangers are being added to several units. These heat exchangers recover heat that is currently rejected and use it to provide additional capacity in some of the various conversion and separation processes in the refinery. These new heat exchangers will improve the overall energy efficiency of the complex.
- Fugitive emissions from pumps, valves, flanges, etc. The slight (~2% or up to 6,000 barrels per day) increase in potential crude processing rate will slightly increase the net

flow through much of the refinery piping and increase the potential for higher fugitive VOC emissions. The potential for fugitive VOC emission increases from higher flow rates is very small. New and modified VOC emission sources are subject to best available control technology (BACT) requirements, so fugitive VOC emissions from the LARIC project would be controlled via use of low leakage types of equipment, using welded connections in place of flanges and properly sealing flanges if weld joints are not possible. An active and effective leak detection and repair (LDAR) program pursuant to SCAQMD Rule 1173 – Control of Volatile Organic Compound Leaks and Releases from Components at Petroleum Facilities and Chemical Plants, also reduces VOC emissions from potential fugitive VOC sources. As discussed above, the type of crude oil processed is not expected to be lighter or have higher vapor pressure. Furthermore, the refinery will be producing less gasoline and more distillate, so the vapor pressure of the average product mix and the material moving through the piping system within the refinery will decrease, lessening the potential for VOC emissions.

- VOC emissions from crude storage tanks during filling and unloading. New or modified crude storage tanks would also be subject to BACT requirements, so fugitive VOC emissions would be minimized by use of closed tank vent systems, vapor recovery systems, floating roof tanks for medium volatility oils and pressurized tanks for high volatility material. Replacing several smaller fixed roof tanks with fewer, larger internal floating roof tanks will decrease VOC emissions from the transfer operations. However, the analysis in the EIR did not take credit for VOC emission reductions during crude transfer, so, overall the EIR shows an increase in fugitive VOC emissions from the new tanks (see EIR Table 4.2-4).
- VOC emission from LPG rail car unloading facilities. LPG rail car unloading facilities will be modified at Carson Operations to allow increased deliveries of approximately 4,000 bbl/day of Alkylation Unit feedstocks (LPG including propane, propylene, etc.). The increase in VOC emission caused by the increase in LPG imports and exports from the complex is addressed in the EIR (see EIR Table 4.2-4).

As already noted, the sources of crude oil currently received by the Tesoro Los Angeles Refinery constantly change based on a variety of factors and are expected to continue changing regardless of whether or not the LARIC project is implemented. However, the average gravity and sulfur contents of the future crude mix must still fall within Tesoro's existing feasible operating window. Figures 2-6 and 2-7 in the EIR (attached as Appendix B) show the blended crude API gravity and sulfur contents of the crude oil blends that have been processed in the Carson and Wilmington Operations of the Tesoro Los Angeles Refinery in the three years from 2012 to 2014. The Tesoro Los Angeles Refinery has 4 different crude units with different capabilities, three crude units in Carson and one in Wilmington. The Wilmington coker also processes some crude oil, so there are 5 different units that can each process crude oil directly. Each of the 5 units has different crude throughput and lifting capabilities as well as different metallurgy to handle different levels of sulfur and acidity.

During the past three years, the Tesoro Los Angeles Refinery complex processed some crude oils with sulfur contents over 3 wt% and API gravities ranging from 10 to 35. Although this is a very wide range of properties, physical unit limitations and economic considerations resulted in average total crude oil properties for that period of slightly under 28 API and about 1.5 wt% sulfur. Based on U.S. DOE data, the average crude oil processed by west coast refineries during the same time period was about 28 API and 1.4 wt% sulfur. The average crude oil input quality to the Tesoro Los Angeles refinery is in line with other west coast refineries.

Tesoro Los Angeles's configuration of process units determines the range of crude oil qualities that can be processed in the facility. As discussed above, its ability to remove sulfur from the various refinery products and air pollutant emission streams limits the maximum sulfur content of the total crude oil blend that can be processed to about 1.8wt%. Processing blends with less than about 0.5 wt% sulfur although feasible causes inefficient operation of the refinery's equipment and is unlikely to occur.

The Tesoro Los Angeles Refinery must also operate within a relatively narrow range of blended crude gravities. At full crude rate, the Tesoro Las Angeles refinery must operate with an average crude API gravity between 23 and 32 API. Each of the 4 crude units can individually run crude outside this envelope, but the weighted average crude quality must stay within these bounds at full crude rate. The refinery can also run lighter or heavier crude mixes at a reduced rate.

The capacities of the coker and FCC, as determined by the physical constraints of the operating equipment, limit the amounts of heavy crude with high quantities of low gravity tar-like substances that can be run without producing excessive amounts of very low value heavy fuel oil. The capacities of these units determine the ability of the refinery to convert these tar-like crude fractions into specification gasoline and distillates. Excess low gravity material must be blended with distillate and exported as high sulfur heavy fuel oil. Not only is the world market for high sulfur heavy fuel oil continuing to decline, producing high sulfur heavy fuel oil reduces distillate production making the production and sale of high sulfur heavy fuel oil very unprofitable.

The rated capacities of the naphtha reformers at the Tesoro Los Angeles Refinery are not being increased. The lifting capabilities of the atmospheric distillation portions of the crude units are also not being increased. Therefore, additional light crudes cannot be processed effectively. Crude oils with higher API gravity will contain more naphtha and distillates that must be distilled (lifted) from the crude oil. Furthermore, the naphtha must be upgraded in a naphtha reformer. Since the LARIC project does not change the capacity of the refinery's naphtha reformers, the refinery will not have the capacity to recover or upgrade additional naphtha. Furthermore, the impending Tier 3 gasoline sulfur regulations could require processing additional cracked naphtha in the light HDS units reducing their capacity to desulfurize naphtha recovered from crude oil. Crude blends with lighter gravities can exceed the capacity of the naphtha reformers and light stream hydrodesulfurization units at full refinery utilization. The refinery must then either export the excess intermediate streams to other refineries at distressed prices or reduce crude run to bring the refinery back into balance. Both of these options reduce refinery profitability and are highly unlikely.

Even though the “hard” operating limits are defined by physical equipment limitations, most of the actual crude blends that have been processed in the past three years at the Tesoro Los Angeles Refinery are well within these limits. The refinery requires some amount of operating “cushion” to ensure that it does not violate any true operating permit limits or other hard physical constraints such as tower flooding. Furthermore, operating at a minimum or maximum sulfur or gravity “limit” does not always produce the most profitable operation. The optimal crude mix, as determined by the LP model, is a function of the price and availability of various crudes as well as the price and demand for the various products.

Dilbits are a class of heavy crudes that have been available on the world market for more than 40 years, have been processed in many US refineries including some of the west coast refineries and are sold under a variety of names. They are one of many types of heavy, high sulfur crudes that are available throughout the world. They are produced as a blend of a high gravity, low viscosity diluent (dil) and a low gravity, high viscosity bitumen (bit). The diluents range from natural gas condensates to light sweet crudes such as Bakken. Dilbit are nothing more than pre-blended crudes to adjust overall properties to facilitate transport and refining. Most dilbits are shipped by pipeline, but some are also transferred to tankers for waterborne shipment. Of the approximately 1 billion barrels of Canadian crude imported into the US in 2014, only about 7% or just over 200 thousand barrels per day went to all of the west coast refineries combined, including those outside of California.

Large volumes of Bakken-type crude have recently become available from the north central United States and southern Canada. Unlike the heavy, high sulfur Canadian crudes, the Bakken crudes are light, sweet (low sulfur) crudes. Currently, most Bakken crude is shipped by rail. Since the Tesoro Los Angeles Refinery does not have facilities to receive crude oil by rail, it is unlikely that this refinery will process large volumes of Bakken crude. It must first be transferred to pipelines or ships or barges to be received by the refinery. Furthermore, as stated earlier in the report, the LARIC project will not allow the refinery to process a significantly lighter crude slate. Even if Bakken type crudes are available to the refinery, they could not be processed in volumes that would impact the average crude properties.

Neither Bakken, nor the heavy Canadian crudes could be profitably run by themselves at the

Tesoro Los Angeles Refinery. The refinery could not run at full capacity on either crude alone. When running pure Bakken, the refinery would be limited by its ability to lift and process the amount of naphtha contained in the crude and the units designed to process the heavy portion of the crude would be under-utilized. When running pure heavy Canadian crude, such as Christina Dilbit or Western Canadian Select, the refinery would be limited in its ability to handle the sulfur and residue in the crude and the units designed to process the lighter portions of the crude would be under-utilized. Information provided by the LP model is designed to avoid both of these scenarios.

All refinery units have minimum practical as well as maximum permitted operating limits. If a unit reaches its minimum operating limit it must be shut down. Thus, there are limits to how light or heavy a crude mix any refinery can run. Crudes like Bakken or heavy Canadian crudes, e.g., Western Canadian Select or Christina Dilbit, must be blended together with other crudes to optimize the refinery operation. By blending these crudes with other crudes, the refinery can run more efficiently and profitably at higher sustained rates than on either crude alone.

Table 1, extracted from a presentation given by John Auers of Turner, Mason & Co. at the Platts Crude Marketing Conference in Houston, TX on March 1, 2013 shows how two crude oils, with vastly different properties can be blended together to approximate the properties of a third crude oil. Table 1 shows how a blend of Western Canadian Select and Bakken crudes can give the same yields of the various refinery intermediate streams as Alaskan North Slope (ANS) crudes. Thus, refineries that were designed for ANS can substitute blends of WCS and Bakken for ANS. This table also shows that the light hydrocarbons (those contributing most to VOCs) in the blend are lower than those in ANS. Although the sulfur content of the blend is higher, this blend, if processed would only be a portion of the total crude fed to the refinery and the balance of the crude must be lower sulfur to remain within the appropriate limits.

Table 1: Crude oil comparison

Yield, vol%	Alaskan North Slope	WCS/Bakken Blend
API Gravity	32.1	32.1
Sulfur, wt%	0.9	1.4
TAN, mgKOH/g	0.6	0.1
Butanes and Lighter	4	3
Naphtha	26	26
Kero/Diesel	27	27
Gas Oil (FCC feed)	27	27
Residue (Coker feed or Asphalt)	16	16

Concerns have been raised for other refinery projects in California that any refinery project might allow an increase in the benzene content or the acidity of the crudes run in the refinery or potentially increase the VOC emissions from lighter crudes. The benzene content of Alaskan North Slope, a high volume west coast crude, has been reported as 0.33% while two Canadian crudes suspected of having elevated benzene contents (Figures 1 and 2) on average actually have a lower benzene content than ANS. Crude Oil Quality, Inc. also reports the benzene content of Canadian light sweet crudes as less than 0.25%, again less than ANS, a high volume west coast crude. The benzene content of gasoline is limited by law. The Tesoro Los Angeles Refinery has a benzene saturation unit to reduce the benzene content of the finished gasoline. Like all refinery units, the benzene saturation unit has processing limits which are not being modified by the LARIC project. Thus, the refinery cannot substantially increase the amount of benzene it receives as input to the refinery.

The acidity of the Canadian crudes is also lower than that of typical California crudes and other heavy sour crudes. As noted earlier, the Carson and Wilmington Operations were originally designed to process California crudes. San Joaquin Valley crudes have acidities above 2 (as shown in the California Energy Commission report attached as Appendix C), while Figures 1 and 2 show values below 2 for heavy Canadian crudes. The acidity of the light sweet Canadian crudes is not reported because of its low value. Tesoro actively monitors and controls the acidity of the crudes it purchases and the blends it processes to stay within equipment capabilities. Tesoro also conducts an equipment inspection program that exceeds state and federal requirements. A more detailed explanation of the Tesoro corrosion monitoring program is included in Appendix D.

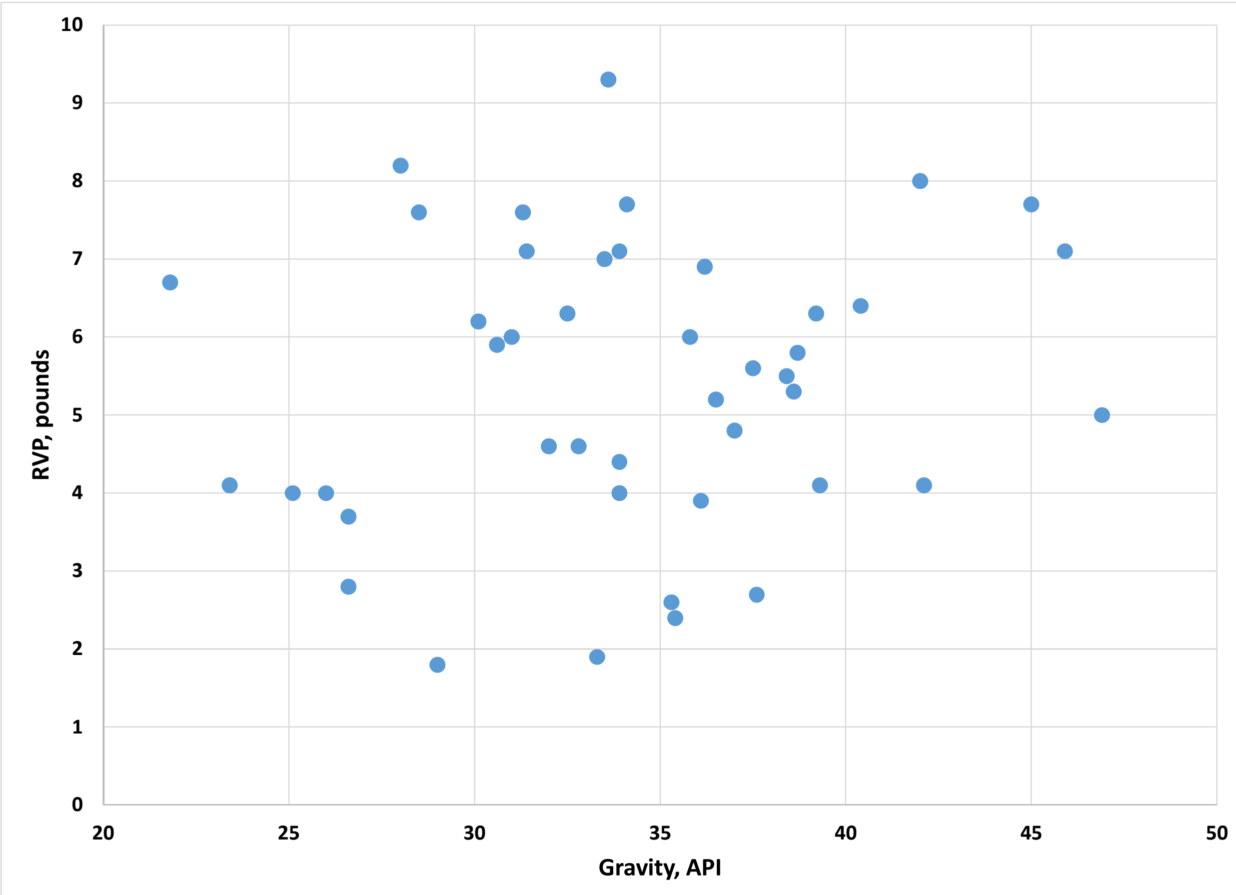
Crude oil volatility (vapor pressure or potential VOC emissions) has recently received increased scrutiny by various governmental agencies. Most of the focus has been on proper labeling/classification of crude oil shipped by rail from the Bakken formation and the use of proper rail cars for transport. Crude oil is a flammable liquid as defined by the Code of Federal Regulations (CFR) Title 46 (30.10) for Marine shipments and Title 49 (172.101) for land and air shipments. Both CFR sections define three subclasses of flammable liquids although the definitions are slightly different. Title 46 defines Grades A, B and C based on Reid Vapor Pressures (RVP, ASTM D323) of > or = to 14 pounds, under14 and over 8.5 pounds and less than or equal to 8.5 pounds, respectively. Title 49 defines three Packing Groups based on initial boiling point by ASTM D86 distillation and flash point. These are: Packing Groups I, II and III based on IBP<95 F (PG I), IBP >95F and Flash Point <73F (PG II) and Flash Point >73F and <149F and IBP>95F (PG III).

In addition to these shipping requirements, refiners also limit the volatility of crude they purchase. Most of the volatility or vapor pressure of crude oil is due to the small amounts of propane, butanes and pentanes (light paraffinic hydrocarbons) that are dissolved in the crude oil. Refineries are very limited in their ability to convert these light paraffinic hydrocarbons into gasoline. CARB gasoline has a Reid Vapor Pressure (RVP) limit of 7 pounds, so much of the light paraffinic hydrocarbons contained in the crude oil must be sold at a loss as LPG. Wholesale LPG spot prices are typically much less than CARB gasoline prices, providing an economic incentive for Tesoro to control the vapor pressure of the crude it purchases.

Tesoro is expanding their facilities to unload additional quantities of higher value olefinic light hydrocarbons (propylene and butylenes). These olefinic light hydrocarbons can be upgraded to a high value CARB gasoline blending component in the alkylation unit. The shutdown of the Wilmington FCC unit reduces the amount of light olefins produced in the refinery. Both olefinic and paraffinic light hydrocarbons are often called LPG, although they have much different values.

There is no universal relationship between crude gravity and volatility or vapor pressure of the crude oil as shown in Figure 7 for 45 different crude oils. Based on the factors discussed above, there is no valid reason to believe that the crudes that arrive after the LARIC project will be higher volatility than those currently processed. Tesoro has financial incentives to minimize the volatility of crudes that it purchases.

Figure 7: Crude oil volatility



As discussed in the EIR, the replacement of smaller crude oil storage tanks with new larger tanks will decrease the time required to unload a tanker and reduce hoteling emissions from the tanker during the overall unloading process. Of potential concern is whether or not these larger tanks will reduce the ability of the refinery to optimize crude purchases and therefore result in lighter or heavier average crude slates. It is my opinion that the larger tanks will not impact the ability of the refinery to blend various crudes to meet the refinery targets as explained below.

These new larger tanks only impact the waterborne crudes that arrive by tanker or barge. These are generally large cargoes that are purchased in advance, allowing the refinery adequate time to plan for their arrival and purchase complementary crudes. As explained in the EIR, the cargo size is set by the vessel size, not the tank size. The larger tanks will make the vessel unloading more efficient while not changing refinery operations.

The LARIC project will replace several fixed roof crude oil storage tanks that are currently connected to a vapor recovery system and are considered BACT with internal floating roof tanks. Although both tanks are considered BACT, the internal floating roof tanks generally generate lower VOC emissions than fixed roof tanks. The lower emissions were not fully comprehended in the overall VOC emissions estimates in the EIR.

The proposed LARIC project is not expected to result in changes to the future crude slate processed in the Tesoro Los Angeles Refinery compared to what is currently processed at the refinery. Therefore, the average sulfur content and acidity of the crude is not expected to increase. These are the most corrosive elements of the crude, so there should be no increased risk of equipment failure due to corrosion.

The Wilmington FCC unit is a complex, circulating fluidized bed process unit. Although a typical FCC unit has few upsets, it has a relatively higher probability of upset than typical fixed bed units. Shutting down the Wilmington FCC unit will eliminate the overall risk of upset from this unit.

The operation of the hydrocracking units is being modified to decrease naphtha yield and increase distillate yield. It is well known to those in the industry that hydrocrackers that produce distillate are less at risk for upsets than those that produce naphtha. The analysis of risk of upset impacts from the modified hydrocracking units at both the Carson and Wilmington Operations concluded that hazards associated with the proposed modifications would result in a reduction in hazard impacts (see EIR Table 4.3-2).

The installation of the sulfuric acid regeneration unit will definitely reduce the risk of potential releases of fresh and spent sulfuric acid during the transport outside the refinery, because spent sulfuric acid would be regenerated and reused onsite, thus, eliminating fresh and spent sulfuric acid transport trips as explained in the EIR.

What Information Must Tesoro Keep Confidential?

Preparation of this report relied on information included in the EIR, as well as other publicly available information. Some additional information was provided to the author by Tesoro Los Angeles Refinery as business confidential information. Some information is copyrighted information with restrictive rights that limit its public dissemination without proper compensation. The following information is treated as business confidential:

- The specific North American crudes that Tesoro plans to purchase;
- The properties (weight, sulfur content, vapor pressure, and acidity) of specific crudes delivered to Tesoro in the past;
- The properties (weight, sulfur content, vapor pressure, and acidity) of specific crude blends processed at the refinery;
- Data purchased by Tesoro showing the weight and sulfur content of specific crudes, including North American crudes;

- Data generated by Tesoro showing the weight and sulfur content of specific crudes, including North American crudes;
- Detailed information regarding the weight and sulfur content of crude blends suitable for processing at the Tesoro Los Angeles Refinery based on the refinery's unique configuration; and
- Detailed daily measurements of the weight and sulfur content of crude blends processed at the Tesoro Los Angeles Refinery in the past.

Basic properties of most Canadian crudes such as gravity, sulfur, benzene and acidity are available on www.crudemonitor.ca. Representative data have been included in this report. Detailed properties on Bakken crude could not be found in public documents. Crude assay compositional data can be purchased from companies such as AspenTech; however, this information is copyrighted and cannot be distributed to the general public. Other detailed information concerning the capabilities of the various refinery process units, the crudes that have been and will be run in the refinery and the planning tools that the refinery uses to make crude purchase decisions, is also considered to be confidential and, thus, not publicly available.

As discussed above, the U.S. DOE has determined that refineries do not have to release specific crude purchase information to the public nor do they have to release detailed information on the capabilities of the various processing units within the refinery. It is sufficient to release only unit capacities aggregated by unit type. This information is available on the DOE website and also by purchase through the Oil and Gas Journal. Although the refineries report more detailed information on crude purchases to the DOE and CARB, the agencies aggregate the data prior to publication to avoid revealing company confidential information.

Crude oils are a commodity that is heavily traded by oil companies as well as trading companies. Publishing what specific crudes Tesoro purchases or intends to purchase allows competitor refiners to bid on similar crudes and allows traders to purchase futures of these crudes. Both of these actions would increase the price Tesoro would then pay for future cargoes of these specific crudes. Releasing information on the specific crudes that Tesoro intends to purchase would put it at a disadvantage against it competitors.

The planning tools that a refinery uses can be purchased by anyone; however, they are copyrighted and cannot be redistributed without compensating the copyright owner. Furthermore, much of the value of these programs comes from configuring them and customizing them to closely match the capacities, capabilities, limitations and performance of the individual units in a particular refinery. This latter type of information would be of particular value to a competitor and is business confidential information.

All of the conclusions and opinions set forth above are made to a reasonable degree of professional certainty.

Oct 12 2015

Date

Stephen J. McGovern, P.E., PhD

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Appendix A

Curriclum Vitae

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Stephen J. McGovern
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Bear, DE 19701
Cell: 856-371-3463
Email: sjmcgovern@hotmail.com

Transportation Fuels and Refining Technology Expert

Over 40 years of experience in many aspects of petroleum refining technology and management, especially Hydroprocessing, Catalytic Cracking, Biofuels, Economics and Emissions. Outstanding record of fundamental research, process/project development and implementation as well as technical service and technical training.

Experience Summary:

PetroTech Consultants 2000- present
Principal of consulting firm specializing in Petroleum and Biofuels Refining Technology
Mobil Corporation 1973-2000
Senior Technical Expert in Refining Process Technology with special emphasis on Catalytic Cracking, Hydroprocessing and reactor design and emissions. Past Manager of Corporate Hydroprocessing Research and Technical Service group. Provided world-wide technical service and troubleshooting, technical input into laboratory experimental programs and the process design of new commercial units along with environmental and economic advice.

Recent Accomplishments

- Member of two US National Research Council committees evaluating the economic and environmental impacts of increasing biofuels production and alternate vehicle and fuels technologies
- Provided technology guidance to DARPA for the production of HEFA type bio based jet fuels
- Provided technical guidance to several commercial bio and alternative fuels companies
- Provided process designs for several Hydrocracking and ULSD units.
- Developed design for commercial biofuels hydrotreater
- Coordinated technology evaluation pilot unit studies for multiple clients
- Prepared a detailed assessment of the US refining industry's capabilities to produce ULSD.
- Prepared a detailed technical and economic assessment of solid acid alkylation technologies
- Evaluated technical and economic feasibility for producing 10 and 30ppm sulfur gasoline.
- Diagnosed performance problems of commercial hydroprocessing and FCC units.
- Assisted client in troubleshooting and improving novel fluid bed technology.
- Consulted on FCC emissions issues
- Provided expert testimony for FERC on refining economics
- Prepared expert reports on refinery environmental and technical issues
- Currently teach several refining technology courses for Refining Process Services.

Education

Ph. D. Chemical Engineering, Princeton University, Princeton, New Jersey 1985
M. A. Chemical Engineering, Princeton University, Princeton, New Jersey 1982
M. S. Chemical Engineering, Drexel University, Philadelphia, Pennsylvania, 1976
B. S. Chemical Engineering, Drexel University, Philadelphia, Pennsylvania, 1973
New Jersey Professional Engineer, License No. 24GE26348

Other Accomplishments

Process Consultant, FCC and Clean Fuels Technology – Senior technical expert in refining process technology.

- Initiated the development of Mobil's Cyclofine FCC third stage separator technology.
- Initiated the development of Mobil's improved FCC stripper technology.
- Designed and coordinated an extensive FCC pilot unit program to better understand the effects of feed quality on FCC yields and product properties.
- Provided guidance to various refineries regarding Air Emissions Compliance and Testing.
- Managed the rapid commercialization of Mobil's Octgain process for producing low sulfur gasoline.
- Provided technical and economic guidance for several major FCC and HDP revamps.
- Provided on-site FCC turnaround and troubleshooting support.
- Provided "cold eyes" and Value Engineering reviews of major projects.
- Participated in several refinery yield improvement surveys.
- Evaluated adsorption technology for removing sulfur from gasoline.
- Responsible for overseeing Mobil's FCC and Hydrocracking modeling efforts.
- Improved the FCC and HDP representations in refinery planning and operational LP's.
- Developed process for upgrading Sasol's Fischer-Tropsch liquids.
- Commercialized Mobil's Xylene Isomerization technology

Papers

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US5360532 Gasoline Upgrading Process, - Fletcher, David L., McGovern, Stephen J., Sauer, John E.

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US4555328 Method and Apparatus for Injecting Liquid Hydrocarbon Feed and Steam into a Catalytic Cracking Zone, - Krambeck, Frederick J., McGovern, Stephen J., Sauer, John E.

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Appendix B

Crude Oil API Gravity and Sulfur Content Graphs

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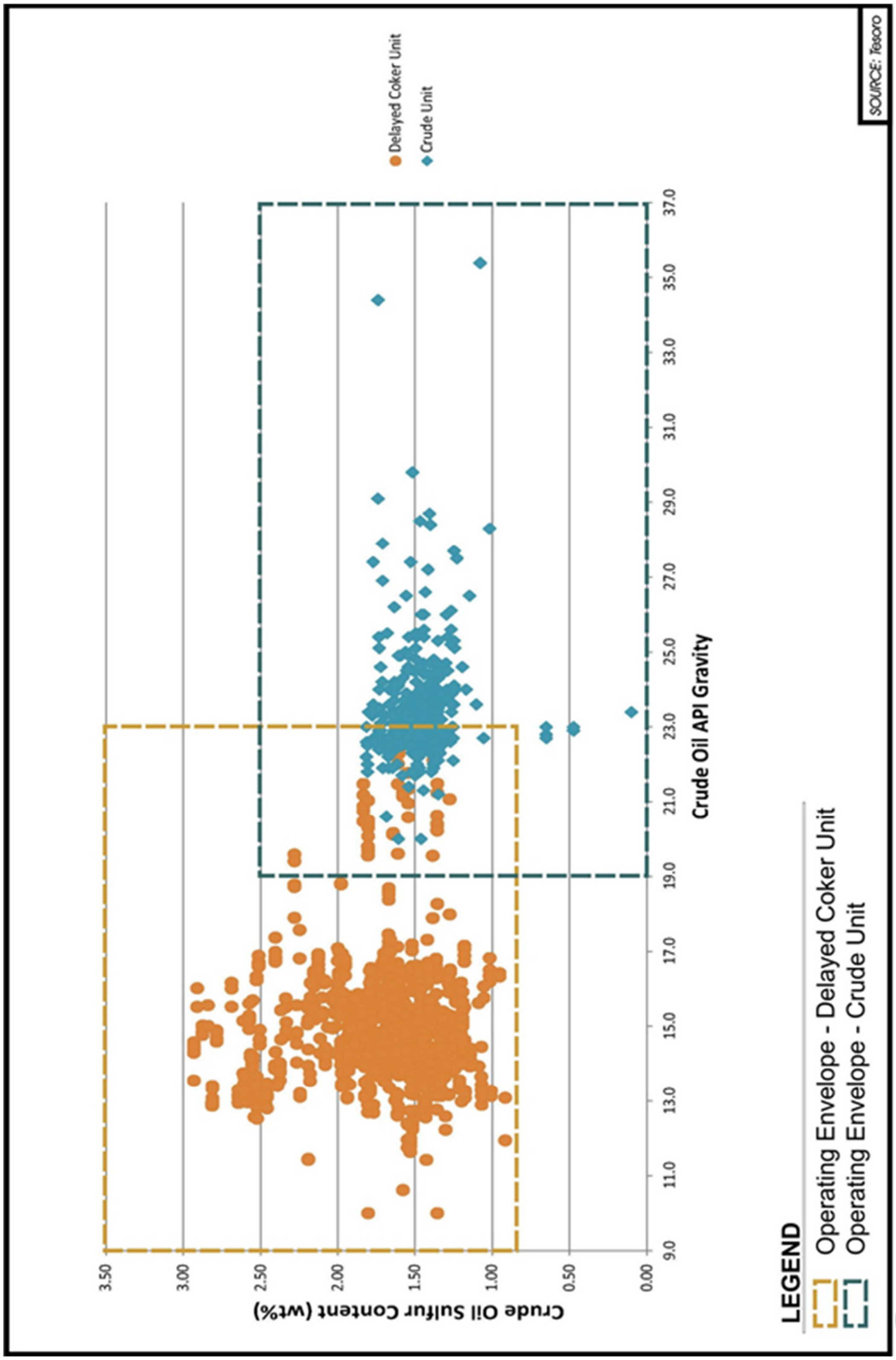

FIGURE 2-6
OPTIMAL CRUDE OIL SLATES
WILMINGTON OPERATIONS
TESORO LOS ANGELES REFINERY

Project No. 2844
N:\2844\Crude Mix Wilmington (rev 3).cdr

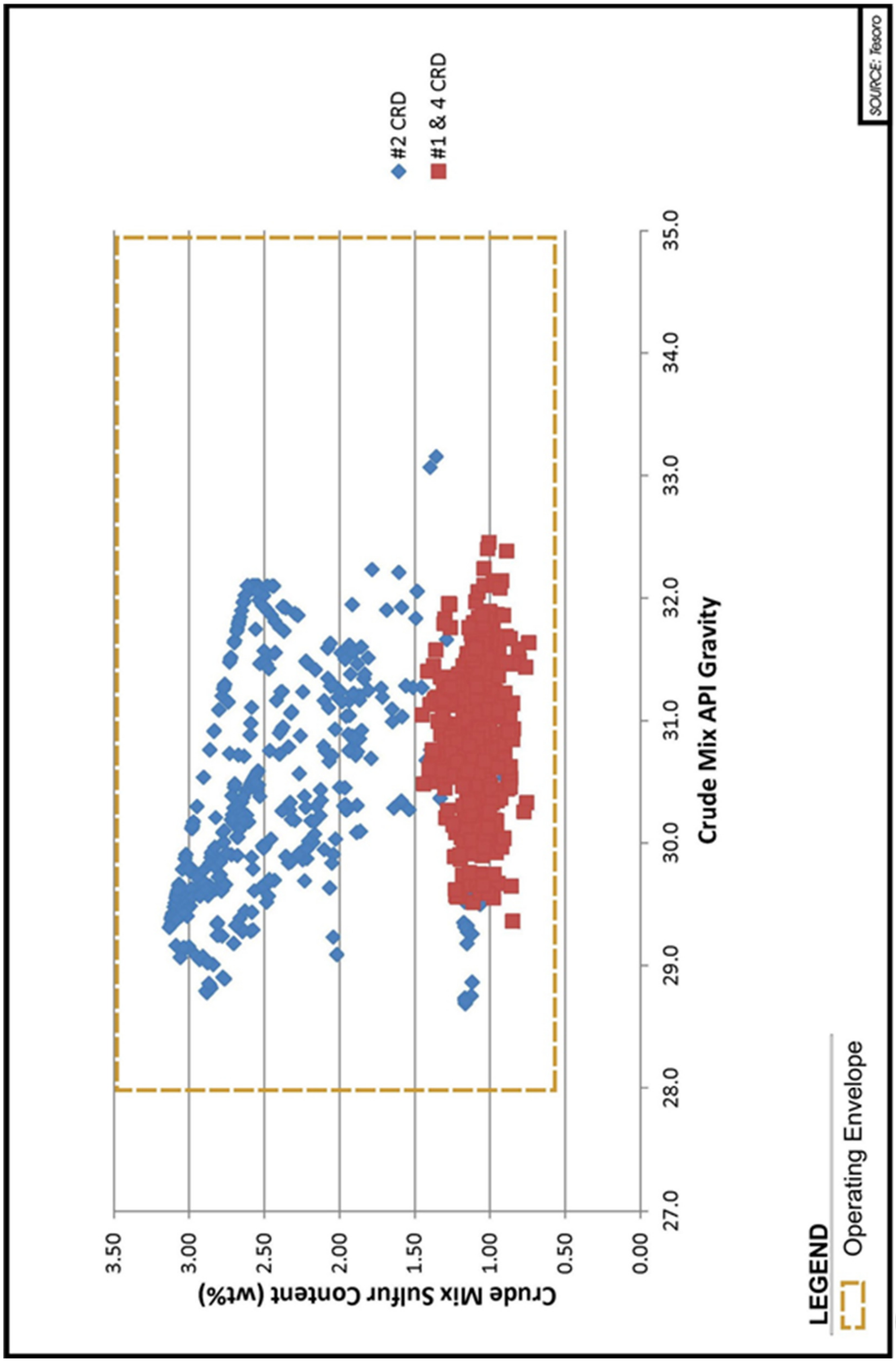

FIGURE 2-7
OPTIMAL CRUDE OIL SLATES
CARSON OPERATIONS
TESORO LOS ANGELES REFINERY

Project No. 2844
N:\2844\Crude Mix Carson (rev 2).cdr

Appendix C

California Energy Commission Report

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CALIFORNIA CRUDE OIL PRODUCTION AND IMPORTS

STAFF PAPER

Margaret Sheridan
Fossil Fuels Office
Fuels and Transportation Division
California Energy Commission

DISCLAIMER

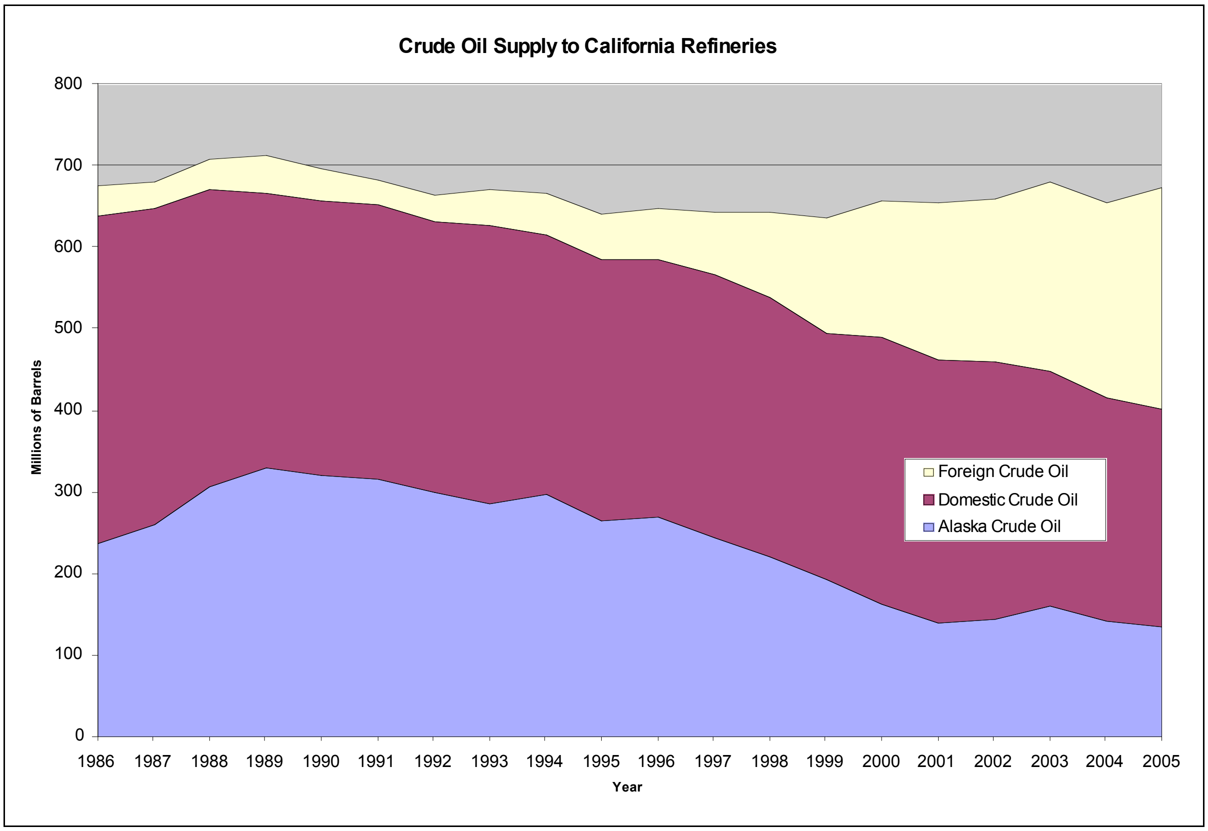
APRIL 2006
CEC-600-2006-006

CALIFORNIA CRUDE OIL PRODUCTION AND IMPORTS

Introduction

Californians consume nearly 44 million gallons of gasoline and 10 million gallons of diesel every day.[1] California refineries produce these fuels and other products from crude oil and blending components. Transportation fuel production in California depends on the availability and quality of the crude oils used by refineries in the state. Figure 1 shows the average annual refinery receipts of crude oil from 1986 to 2005. The supply of crude oil to California refineries has changed substantially in the last 10 years. Most notably, receipts of foreign crude oil have increased as production sources from California and Alaska have continued to decline.

Figure 1



Source: Petroleum Industry Information Reporting Act

Historically, California has been relatively self-reliant in petroleum supplies. However, crude oil production in California has decreased by 23 percent since 1996.[2] This decline of supply in the state has increased reliance on foreign and domestic imports. Starting in 1994, California refineries received more imported crude oil than in-state sources. In 2005, California crude oil accounted for approximately 37 percent of the total receipts.

The quality of the crude oil used by the refinery in conjunction with the complexity of processing units dictates the percentages of products produced. For example, lower quality crude oil is more difficult to refine into lighter products, such as motor and aviation gasoline. Refineries have minimum crude oil quality requirements that are determined by the processing units in the plant.

This paper presents information on crude oil characteristics, California crude oil production trends, and their possible impact on future transportation fuel production.

Crude Oil Characteristics

The quality of crude oil is determined by a number of characteristics that affect the proportions of transportation fuels and petroleum products produced when the oil is refined. The two most common measurements of crude oil quality are the specific gravity (which is measured in degrees) and the sulfur content of the oil. Acid content is also a factor in determining the corrosive properties of the crude oil entering the refinery.

Specific Gravity

The specific gravity is typically measured using the American Petroleum Institute (API) standard or the API gravity of the crude oil. The API gravity is the measure of the weight of crude oil in relation to the weight of water (water has an API gravity of 10 degrees). Crude oil is characterized as heavy, intermediate, or light with respect to its API gravity.

- Heavy Crude: Crude oils with API gravity of 18 degrees or less is characterized as heavy. The oil is viscous and resistant to flow, and tends to have a lower proportion of volatile components. Fifty one percent of California crude oil has an average API of 18 degrees or less.

- Intermediate Crude: Crude oils with an API greater than 18 and less than 36 degrees are referred to as intermediate. Forty eight percent of California crude oil has an average API between 18 and 36 degrees.

- Light Crude: Crude oils with an API gravity of 36 degrees or greater. Light crude oil produces a higher percentage of lighter, higher priced premium products.

Sulfur Content

Crude oil is defined as “sweet” if the sulfur content is 0.5 percent or less by weight and “sour” if the sulfur content is greater than 1.0 percent. Sulfur compounds in crude oil are chemically bonded to hydrocarbon molecules in the oil. Additional equipment in the refinery is required to remove the sulfur from crude oil, intermediate hydrocarbon feedstocks, and finished products. Transportation fuel specifications require extremely low sulfur contents, usually less than 80 parts per million (ppm).

Acid Content

Another characteristic of crude oil is the total acid number (TAN). The TAN represents a composite of acids present in the oil and is measured in milligrams (mg). A TAN number greater than 0.5 mg is considered high.[3] As an example, Wilmington and Kern crude oil have a TAN ranging from 2.2 to 3.2 mg, respectively.[4] However, some acids are relatively inert. Thus, the TAN number does not always represent the corrosive properties of the crude oil. Further, different acids will react at different temperatures – making it difficult to pinpoint the processing units within the refinery that will be affected by a particular high TAN crude oil. Nonetheless, high TAN crude oils contain naphthenic acids, a broad group of organic acids that are usually composed of carboxylic acid compounds. These acids corrode the distillation unit in the refinery and form sludge and gum which can block pipelines and pumps entering the refinery.[5]

The impact of corrosive, high TAN, crude oils can be overcome by blending higher and lower TAN oils, installing or retrofitting equipment with anticorrosive materials, or by developing low temperature catalytic decarboxylation processes using metal catalysts such as copper. Many California refineries already process high TAN crude. High TAN oils are sold on the market at a discount compared to higher quality crude oils.

High TAN oils account for an increasing percentage of the global crude oil market. Crude oil with a TAN greater than 1.0 mg increased in the world market from 7.5 percent in 1998 to 9.5 percent in 2003.[6]

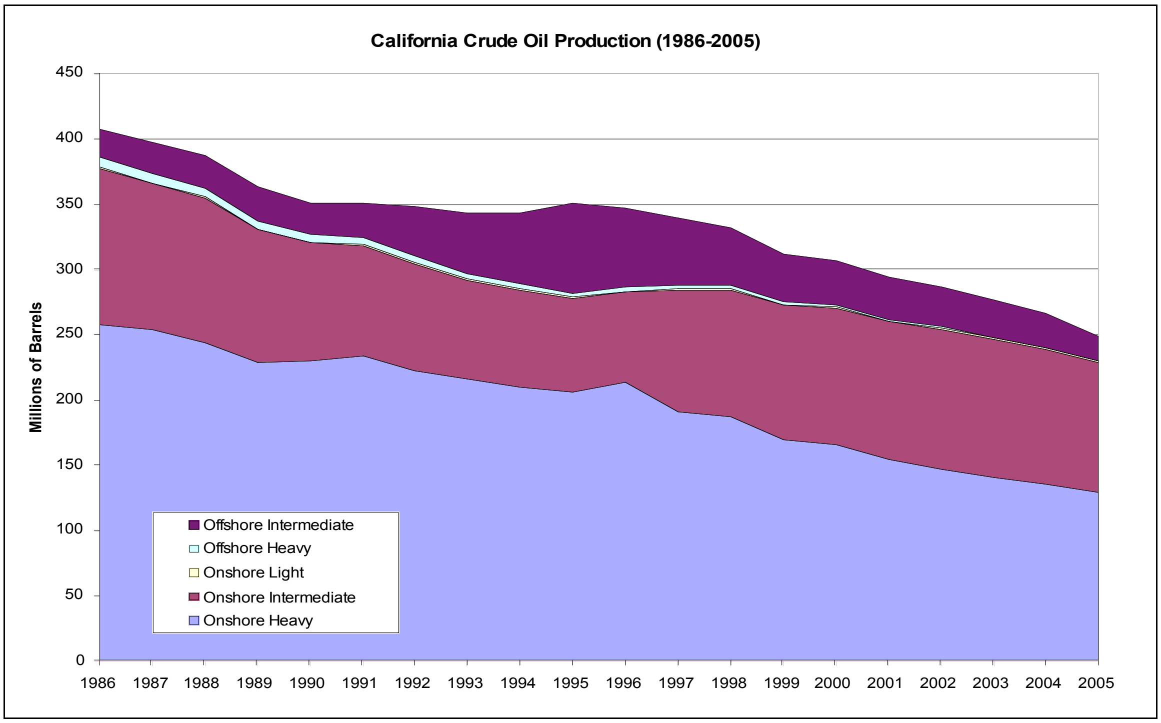
California Crude Oil Production

The discovery of oil in Kern County in the late 19th century heralded a long history of oil production in California. At the turn of the 20th century, crude oil was valued primarily for the heavier products and refining was oriented towards the production of heating oil and lubricants. In the early 1900s, with growing automobile use, gasoline became a more important commodity.

California is currently ranked fourth in the nation among oil producing states, behind Louisiana, Texas, and Alaska, respectively. Crude oil production in California averaged 731,150 barrels per day in 2004, a decline of 4.7 percent from 2003. Statewide oil production has declined to levels not seen since 1943.[7]

Figure 2 shows California onshore and offshore crude oil production over the last 20 years. The production of heavy, intermediate, and light crude oil production are broken out for onshore and offshore (or Outer Continental Shelf [OCS]) areas.

Figure 2



Sources: California Department of Conservation, Minerals Management Service

Production peaked in California in 1983. Production has declined at an average rate of 2.4 percent per year in the last 10 years.

Figure 2 shows a constant decline in onshore heavy crude oil production from 1986 through 2005 of 6.8 million barrels per year, or approximately 3.5 percent per year. Intermediate onshore oil production remained relatively flat. Offshore crude oil production peaked at 72 million barrels in 1995 and has declined by around 4.3 million barrels per year - or 10.2 percent per year - from 1995 through 2004.

The three major regions of California crude oil production are Kern County, the Los Angeles Basin, and the Outer Continental Shelf (OCS).

- **Kern County:** In 2004, oil from Kern County accounted for 77 percent of California's total onshore production and over 69 percent of the state's total oil production.[8] Approximately 58 percent of the crude oil has an API of 18 degrees or less. The Kern River oil field, located in the eastern San Joaquin Valley, accounts for approximately 24 percent of Kern County oil. Kern River oil is characteristically heavy and sour with an API of 13.4 degrees and a sulfur content of 1.2 percent.[9]

- **Los Angeles Basin:** The Los Angeles Basin is a sedimentary plain extending from central Los Angeles south through the Long Beach area. The two largest fields by area in this region are the Wilmington and the Huntington Beach fields with average APIs of 17.1 and 19.4 degrees, and average sulfur contents of 1.7 and 2.0 percent, respectively.

- **Outer Continental Shelf:**[10] The Federal Minerals Management Service oversees crude oil rigs located three nautical miles or greater from the coast. The OCS rigs accounted for 10.2 percent of the total California production in 2004. Many of these rigs are leased to commercial companies with pipelines extending to onshore processing facilities. The quality of OCS crude oil varies by field. Both sweet and sour OCS crude oils have API gravities ranging from 14 to 38 degrees.[11] Intermediate crude oil with an API gravity between 18 and 36 degrees accounted for 96.6 percent of the OCS production in 2004.

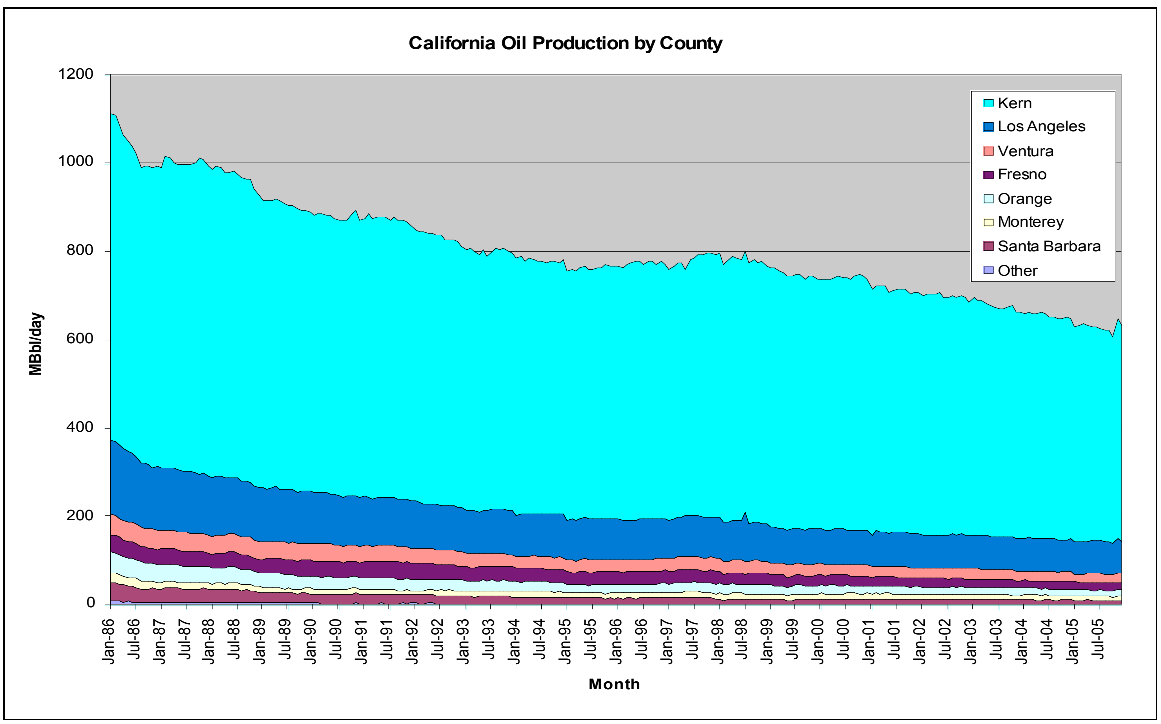
Table 1 shows an assay of selected California crude oils.[12] The table provides the percentages of 2005 production to show the relative importance of the field. The distillation breakdown of each crude oil provides a general guideline of the refining product suite that would result after the initial crude distillation has been completed. The actual ratio of finished refined products will vary depending on the complexity of the refinery. Note that unrecoverable gas losses occur in the assay, resulting in distillation product summations of less than 100 percent.

Table 1

County	Field	Percent of 2005 Production	API Gravity & Sulfur	Distillation breakdown (percent per volume): Total Gasoline & Naptha	Middle Distillates	Residuum	Lubes
Kern & San Luis Obispo	Midway Sunset	18.47%	12.6, 1.6%	0.00%	12.00%	50.30%	34.80%
Kern	Kern River	14.36%	13.3, 1.1%	0.00%	15.80%	56.10%	28.10%
Kern	Elk Hills	7.91%	34.6, 0.8%	34.30%	23.30%	25.00%	15.90%
Los Angeles	Wilmington	6.49%	17.1, 1.7%	9.50%	18.20%	52.80%	19.40%
Kern	Lost Hills	4.96%	18.4, 1.0%	7.60%	23.50%	42.70%	23.20%
Ventura	Ventura	1.75%	30.2, 1.0%	30.20%	20.80%	31.30%	16.30%
Kern	Belridge N. Lt.	1.63%	31.3, 0.3%	25.70%	25.70%	26.30%	20.90%
Monterey	San Ardo	1.52%	12.2, 2.3%	2.10%	14.50%	62.50%	20.50%
Los Angeles	Inglewood	1.24%	21.0, 1.8%	12.90%	27.60%	39.10%	19.40%
Orange	Huntington Beach	1.07%	19.4, 2.0%	12.00%	19.70%	48.90%	19.40%
Los Angeles	Long Beach	0.65%	25.0, 1.3%	18.90%	23.10%	40.60%	17.40%
Kern	Mount Poso	0.26%	16.0, 0.7%	0.00%	13.40%	52.00%	34.00%

Figure 3 shows the onshore production by county.

Figure 3



Source: Dept. of Conservation

California commonly uses Thermally Enhanced Oil Recovery (TEOR) techniques to help maintain crude oil production, because heavy, viscous crude oil requires heating to move the oil to the pump. Direct injection steaming and intermittent steaming are two types of TEOR. California crude oil production is also enhanced by injection of water (water flooding) and even carbon dioxide (CO_2) to help maintain sufficient pressure in the crude oil field. In the absence of more aggressive use of TEOR, California's crude oil production is expected to continue to decline at a rate of 3.5 percent per year through 2019.[13]

Well activity provides an indication of potential production in the state. In 2004, drilling increased to 2,451 wells, a 6.7 percent increase from 2003. The number of plugged wells decreased to 2,039 from 2,501 in 2003. Drilling and plugging activities in the state have fluctuated by more than 900 wells from year to year; however, the general trend is relatively flat.

Alaska North Slope Crude Oil

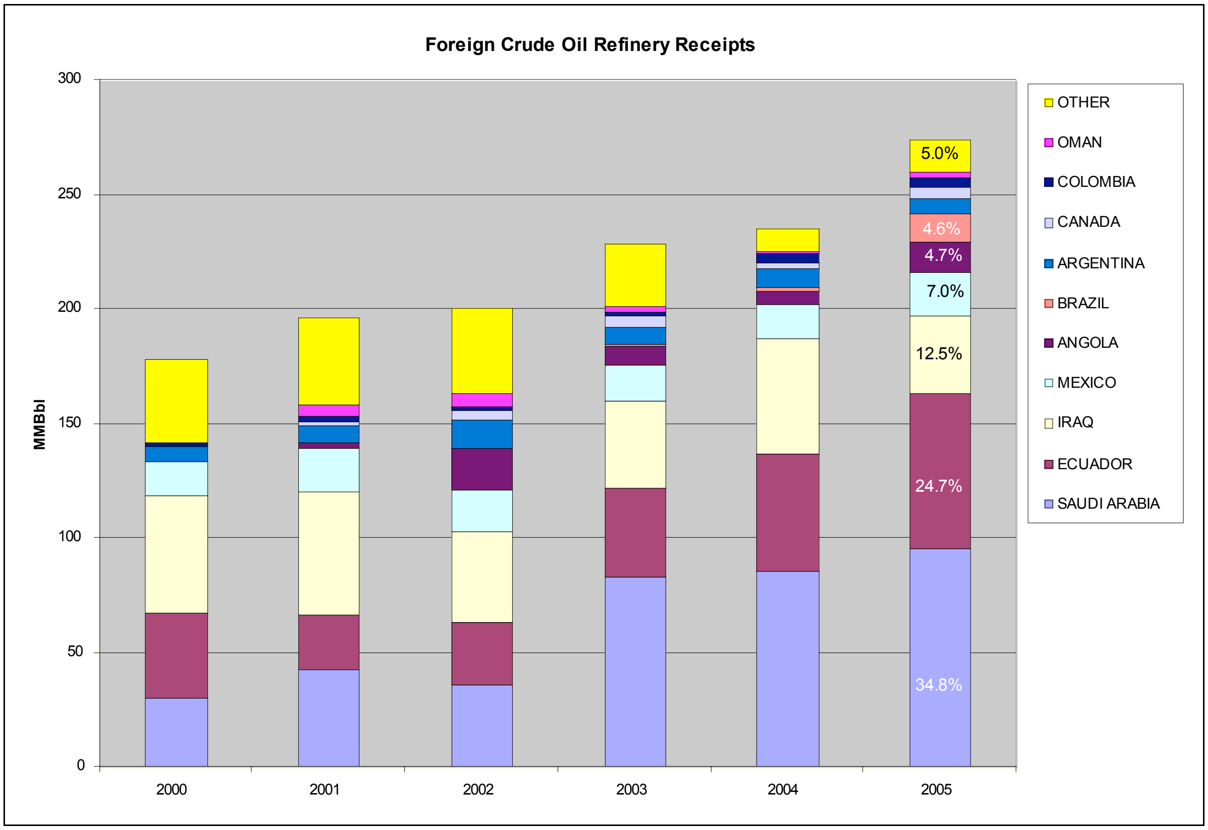
In 2005, California imported 21 percent of its total crude oil supply from Alaska. Oil fields in Alaska's North Slope produce a wide range of crude oils. API gravities from different fields range from 22 to 40 degrees. Alaskan refineries located along the Trans Alaska Pipeline System (TAPS) "top" the crude oil to produce light petroleum products and return residual products to the line. The resulting blended crude oil stream is referred to as Alaska North Slope oil (ANS). The ANS is an intermediate sour crude with an average API gravity of 29-29.5 degrees and sulfur content of 1.1 percent.

Like California crude oils, ANS production has been declining in the last 10 years. The average annual rate of decline in ANS production is approximately 5 percent per year.

Foreign Crude Oil Imports

The majority of crude oil imports to California are from the Middle East, Central America, and South America. Figure 4 shows a six year history of imports by region.

Figure 4



Source: Energy Information Administration

Crude oil imported from countries with volatile political and social structures leaves California vulnerable to changing world events. For example, attacks on Nigerian oil industry personnel led to the recent shutdown of nearly 9 percent of Nigeria's total oil production, which could impact global oil availability and increase feedstock costs for California refineries. Also, the growing political tension between the U.S. and Iranian governments over Iran's nuclear program could impact California's crude oil supply if the U.S. decides to impose sanctions on Iran.

Table 2 shows approximate crude oil characteristics for several imported crude oils.[14]

Table 2

Crude source	Paraffins Percent Volume)	Aromatics (Percent Volume)	Naphthenes (Percent Volume)	Sulfur (Percent Weight)	API gravity (Approx.)	Napht. yield (Percent Volume)	Octane No. (Typical)
Nigerian - Light	37	9	54	0.2	36	28	60
Saudi - Light	63	19	18	2	34	22	40
Saudi - Heavy	60	15	25	2.1	28	23	35
Venezuela - Light	35	12	53	2.3	30	2	60
Venezuela - Heavy	52	14	34	1.5	24	18	50
North Sea - Brent	50	16	34	0.4	37	31	50

Source: Office of Safety and Health Administration

The API gravity of refinery imports reported to the Energy Commission through the Petroleum Industry Information Reporting Act (PIIRA)[15] show an increase of 0.27 API per year from 1996 to 2005 for larger refineries. Smaller refineries show a relatively flat API during the same time period, predominantly because these smaller refineries solely use crude oil from California sources.[16]

Crude Oil Supply and Distribution to California Refineries

The distribution of domestic and imported crude oils is dependent on the port, pipeline, truck, and rail transport infrastructure within the state. All ANS and imported crude oils enter the state through ports in Los Angeles, Long Beach, and the Bay Area.

Water depth limits access to Bay Area ports. The water depth of these ports is typically between 32 to 45 feet, which is too shallow for large crude oil carriers. As an example, a carrier with a capacity of 1.3 million barrels will require a minimum water depth of at least 66 feet. For shallower ports, large vessels will anchor in a designated zone outside of the ports and smaller barges will transfer oil to the ports, a practice referred to as “lightering.” This practice adds to the delivery cost of crude oil to the refinery and increases the risk of accidental release of crude oil into the environment.

Another complication for the Bay Area ports is silting in the bays. Dredging of the bays is controversial in that habitat is disturbed and dredged material must be disposed of in an environmentally sound manner. For example, approximately 4 million cubic yards of sediment are dredged from the Central and South Bay per year.[17]

Pipeline networks tie the San Joaquin Valley crude oil production with refineries in both the Los Angeles and the Bay Area. Figure 5 shows the major crude oil pipelines in California.

Figure 5

Source: California Energy Commission

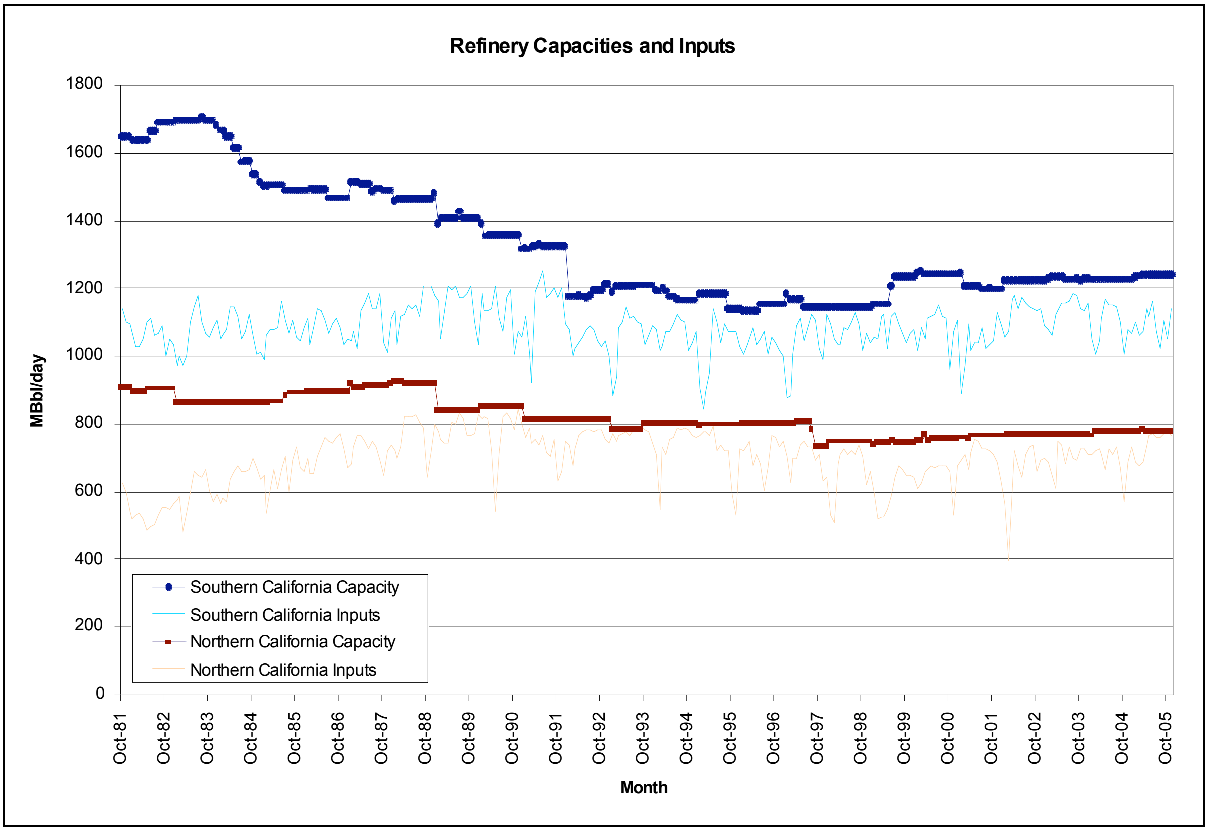
In California, 51 percent of the crude oil produced in the state is heavy crude. The transport of heavy crude through pipelines is complicated by the viscosity and inertia of the oil. Thus, some of the crude oil pipeline systems throughout the state require external heating. Booster stations are placed at intervals on the line where heating and/or pumping units facilitate the flow of the crude through the line. The proximity of booster stations is determined by the viscosity of the crude and by the average heat loss from the pipes from ambient weather conditions. Heavier crude oils are also blended with lighter crude oils to reduce viscosity, allowing transportation through pipelines without any heating.

Inland California crude oils are typically first piped to local refineries (Bakersfield and Santa Maria) because they are nearby and do not have port access. The balance of inland crude oils are piped to Northern and Southern California refineries.

Refinery Operations

In the last two decades, California refineries have been running increasingly closer to capacity levels. Figure 6 shows the total crude oil throughput refining capacity and the throughput oil inputs to the refinery by area.

Figure 6



Source: Petroleum Industry Information Reporting Act

The steady decline in refinery capacity during the 1980s and early 1990s is followed by a noticeable creep upward in the late 1990s and early 2000s. With refinery creep and greater import capabilities in the Los Angeles area, southern refineries are less constrained than their Bay Area and Central California counterparts. Southern California refineries also show an increasing level of crude oil imports.

Refinery operations must also consider recent diesel regulations by the U.S. Environmental Protection Agency (EPA) and the California Air Resources

Board (ARB). The EPA regulation lowers the allowable amount of sulfur in on-road diesel fuel from less than 500 parts per million (ppm) to less than 15 ppm. This requirement will take effect on June 1, 2006. The sulfur content and API gravity of crude oil input to the refinery in conjunction with the complexity of process units will affect the quantity of ultra-low sulfur diesel produced by the facility.

The hydrocracking and hydrotreater units remove sulfur within the refinery. Hydrocracking units break hydrocarbon molecules into lighter compounds in the presence of hydrogen. Hydrotreatment involves the chemical reaction of hydrocarbon compounds with hydrogen in the presence of a catalyst such as cobalt or alumina.[18]

Refineries throughout the U.S. are currently upgrading their desulfurization processes in order to meet the new diesel sulfur standards. This upgrade typically involves techniques such as changing the catalyst in the hydrotreater or installing booster pumps to force more feedstock through the unit. Both hydrocrackers and hydrotreaters also remove heavy metals and aromatics from the feedstock. This is particularly important in California where lower aromatic standards will be required along with the new ultra low sulfur diesel standards.

Findings

- The declining crude oil production in South-Central California has resulted in higher crude oil costs because of reliance on higher priced imported crude oils.

- Pipeline utilization rates are decreasing and the procurement of crude oil to inland refineries is becoming increasingly difficult as local supplies decline.

Current and Future Work

Additional reporting requirements in the Energy Commission’s new petroleum industry data collection regulations will greatly enhance the agency’s understanding of crude oil and finished product movements within the state. The addition of port, terminal, and pipeline information will provide the details needed to track infrastructure use within the state. This additional information will be essential in: assessing near-term petroleum infrastructure demand shifts, reviewing project expansion plans, and completing contingency studies.

Research and analysis should focus, in particular, on the following areas:

- Crude oil quality: The growing dependence of California refineries on imported crude oils requires a more detailed look at the characteristics of overseas crude oils entering ports in the state. The general trend of international crude oil production reflects an increase in low API, high sulfur content crude oil. However, overall API gravity in California refineries has increased primarily from the decline in heavy California crude oil production. The examination of supply information from secondary sources and from PIIRA reporting data will help to identify areas of constraint in the state.

- Total Acid Number (TAN): The increase in world production of heavy, sour, and high TAN crude oils will impact California refineries. An assessment of the crude oil processing capabilities of California refineries is needed to understand the potential implications of future changes in the global crude oil market.

- Crude oil pipelines: The decrease in crude oil production in the state has led to changes in the utilization rates of some crude oil pipelines. Modifying current pipeline systems and/or making new investments in distribution infrastructure may be necessary to provide more stable sources of crude oil for refineries without port access.

Endnotes

[1] California State Board of Equalization data for 2004. Taxable gasoline figures amounted to an average of 43.5 million gallons per day, while taxable diesel fuel sales figures have been adjusted upward to reflect an estimated 22 percent distribution of exempt and refund diesel sales that are excluded from their taxable gallons.

[2] Based on data compiled from the California Department of Conservation database production files, http://www.conservation.ca.gov/DOG/prod_injection_db/index.htm and MMS Offshore data, http://www.gomr.mms.gov/homepg/pubinfo/pacificfreeasci/product/pacificfreeprod.html.

[3] http://rru.worldbank.org/Documents/publicpolicyjournal/275-bacon-tordo.pdf.

[4] http://www.pacificenergypier400.info/pdfs/CRUDESUP/PACIFICP.PDF.

[5] http://www.ornl.gov/sci/fossil/Publications/RECENT%20PUBS/DDSum2003.pdf.

[6] Anne Shafizadeh, Gregg McAteer, and John Sigmon, *High-Acid Crudes*, paper presented at Crude Oil Quality Group meeting, New Orleans, January 30, 2003, [http://www.coqg.org/20030130special.asp]

[7] ftp://ftp.consrv.ca.gov/pub/oil/annual_reports/2004/PR06_Annual_2004.pdf.

[8] California Department of Conservation database production files, http://www.conservation.ca.gov/DOG/prod_injection_db/index.htm.

[9] Van Vector, Samuel, *Pricing Royalty Crude Oil*, http://www.econ.com/apijan00.pdf.

[10] MMS data for 2004 is approximately 95 percent complete. December 2005 data not yet posted.

[11] Jokuty, P.; Whiticar, S.; Wang, Z.; Fieldhouse, B.; and Fingas, M.; *A Catalogue of Crude Oil and Oil Product Properties for the Pacific Region,* 264p 1999.

[12] http://www.econ.com/apijan00.pdf.

[13] http://www.energy.ca.gov/2005_energypolicy/documents/2005-0516_workshop/presentations/Baker%20&%20OBrien%20Presentation%205-16-05.pdf.

[14] OSHA Technical Manual – Section IV: Chapter 2, http://www.osha-slc.gov/dts/osta/otm/otm_iv/otm_iv_2.html.

[15] PIIRA: the Petroleum Industry Information Reporting Act, Public Resources Code 25350 et seq.

[16] Large and small refineries are defined here as refineries with crude oil receipts in 2005 greater than or less than 5 percent of the total for the state, respectively.

[17] http://www.spn.usace.army.mil/ltms/chapter2.pdf.

[18] http://www.bp.com/genericarticle.do?categoryId=2013107&contentId=2019673.

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Appendix D

Tesoro Corrosion Monitoring Program

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Appendix D: Brief Description of the Tesoro Corrosion Monitoring Program

The Los Angeles Refinery has an Inspection Manual that describes the minimum technical and administrative requirements for the inspection of all refinery equipment. It defines the authority and responsibility of individuals, and provides the system by which activities are conducted in accordance with regulations, codes and policies specified by the California Division of Occupational Safety and Health (Cal OSHA). Tesoro implements additional inspection programs, beyond regulatory requirements, to ensure the integrity of its refinery equipment. The Refinery's Inspection Supervisor is responsible for the administration and implementation of the Inspection Manual. To ensure the highest degree of reliability and integrity of refinery equipment, the Refinery uses a variety of inspection techniques and methods. These inspection practices meet or exceed applicable industry standards, such as the Recommended Practices of the American Petroleum Institute.

To ensure the continued integrity of equipment testing and inspection at its facilities, the Los Angeles Refinery follows company inspection standards which focus on the following core processes:
• Organizational Capability and Competency
• Inspection Documentation
• Inspection Planning and Execution
• Continuous Improvement
• Performance Management Assurance
Testing methods used for inspections include visual examination, non-destructive evaluation (e.g. ultrasonic thickness measurements), and performance evaluations (e.g. hydrostatic testing).

The inspection and testing program at the refinery is conducted on an established schedule. A database of required inspection dates is maintained. An inspection report is provided to Tesoro Refining leadership each month.
Managing inspection in crude distillation units includes focus on damage mechanisms such as Sulfidation, Wet H2S Damage, and Naphthenic Acid Corrosion. The Corrosion Engineer or knowledgeable person establishes predicted or historical damage mechanisms and predicted corrosion rate for each system or area of a process unit. These damage mechanisms are used by the Inspector to select the appropriate inspection method. Inspection plans are developed for all applicable damage mechanisms following company and industry standards for refinery inspection. Methods of establishing piping inspection criteria are described in industry and company standards in which the frequency and extent of inspections are based on a consequence of failure classification and established or predicted corrosion rates (likelihood of failure). The following industry standards are used to establish the inspection program:

- API 510 Pressure Vessel Inspection Code: In-Service Inspection, Rating, Repair, and Alteration
- API 570, Piping Inspection Code
- API 574 Recommended Practice, Inspection Practices for Piping Systems Components
- API RP 571, Damage Mechanisms Affecting Fixed Equipment in the Refining Industry
- API RP 580 Risk-Based Inspection API Publication
- 581, Risk-Based Inspection Resource Document
- API RP 939-C, Guidelines for Avoiding Sulfidation Corrosion Failures in Oil Refineries

- NBI NB-23 National Board Inspection Code (NBIC)

In addition, implementation and monitoring of Integrity Operating Windows (IOW) is in progress and control of crude changes follows a rigorous management of change (MOC) process that has been a common practice for many years. Positive Material Identification and Low Silicon carbon steel surveys have been completed on the crude distillation units for piping in high temperature sulfidation service.

In addition to equipment integrity management programs, Tesoro employs operating practices to monitor and mitigate corrosion in these systems. These practices include obtaining routine laboratory analysis of hydrocarbon and water samples from the crude and vacuum units to monitor corrosive species or corrosion products and working with chemical vendors to provide corrosion inhibitors, passivators or chemical additives to reduce corrosion and fouling in the towers and associated feed and product piping and equipment. Operating envelopes or restrictions and alarms are used, for example on stream acid and sulfur content, to keep operations within boundaries and assure long term equipment reliability.