

CHAPTER 4

Environmental Setting, Impacts, and Mitigation Measures

4.0 Approach to the Analysis of Impacts

Organized by environmental resource area, this chapter provides an integrated discussion of the environmental setting (including the regional, local and/or Project setting; regulatory setting; and Project baseline) and environmental consequences (including environmental impacts and mitigation measures for potentially significant impacts) associated with the construction, operation, and maintenance of the Project.

4.0.1 CEQA Requirements

The California Environmental Quality Act (CEQA) and the CEQA Guidelines require that the environmental analysis for an Environmental Impact Report (EIR) must evaluate impacts associated with a project and identify mitigation measures for any potentially significant impacts. All phases of a project are evaluated in the analysis. The CEQA Guidelines state:

- *An EIR shall identify and focus on the significant environmental effects of the proposed project. In assessing the impact of a proposed project on the environment, the lead agency should normally limit its examination to changes in the existing physical conditions in the affected area as they exist at the time the notice of preparation [NOP] is published, or where no notice of preparation is published, at the time environmental analysis is commenced. Direct and indirect significant effects of the project on the environment shall be clearly identified and described, giving due consideration to both the short-term and long-term effects. The discussion should include relevant specifics of the area, the resources involved, physical changes, alterations to ecological systems, and changes induced in population distribution, population concentration, the human use of the land (including commercial and residential development), health and safety problems caused by the physical changes, and other aspects of the resource base such as water, historical resources, scenic quality, and public services. The EIR shall also analyze any significant environmental effects the project might cause by bringing development and people into the area affected (CEQA Guidelines Section 15126.2[a]).*
- *The EIR shall discuss any inconsistencies between the proposed project and applicable general plans, specific plans, and regional plans. Such regional plans include, but are not limited to, the applicable air quality attainment or maintenance plan or State Implementation Plan, area-wide waste treatment and water quality control plans, regional transportation plans, regional housing allocation plans, regional blueprint plans, plans for*

the reduction of greenhouse gas emissions, habitat conservation plans, natural community conservation plans and regional land use plans for the protection of the Coastal Zone, Lake Tahoe Basin, San Francisco Bay, and Santa Monica Mountains (CEQA Guidelines Section 15125[d]).

- *An EIR shall describe feasible measures which could minimize significant adverse impacts, including where relevant, inefficient and unnecessary consumption of energy (CEQA Guidelines Section 15126.4[a]). Mitigation measures must be fully enforceable through permit conditions, agreements, or other legally-binding instruments (CEQA Guidelines Section 15126.4[a][2]). Mitigation measures are not required for effects which are not found to be significant (CEQA Guidelines Section 15126.4[a][3]).*

4.0.2 Section Contents and Definition of Terms

Chapter Organization

Chapter 4 is organized into the following 11 environmental resource or issue areas:

- | | |
|------------------------------|-------------------------------------|
| 4.1 Air Quality | 4.7 Hazards and Hazardous Materials |
| 4.2 Biological Resources | 4.8 Hydrology and Water Quality |
| 4.3 Cultural Resources | 4.9 Land Use and Planning |
| 4.4 Energy Conservation | 4.10 Noise |
| 4.5 Geology and Soils | 4.11 Transportation and Traffic |
| 4.6 Greenhouse Gas Emissions | |

Section Contents

Sections 4.1 through 4.11 include this basic information:

- **Regional, Local, and/or Project Setting:** provides an overview of the physical environmental conditions in the area at the time of, or prior to, the publication of the NOP, that could be affected by implementation of the Project in accordance with State CEQA Guidelines Section 15125.
- **Regulatory Setting:** identifies the laws, regulations, ordinances, plans, and policies that are relevant to each resource area.
- **Project Baseline:** identifies the actual existing physical conditions to provide a point of comparison between pre-project conditions (the baseline) and post-project conditions in order to determine whether the change in the environment caused by the Project is significant under CEQA. The baseline is tailored to each resource area, and is predicated on the significance criteria under which the impacts are assessed. For most resource areas, the baseline is the same as the “environmental setting,” i.e., the physical environmental conditions in the vicinity of the Project as they existed in the spring of 2013 when the Initial Study / Mitigated Negative Declaration (IS/MND) was prepared for the Project (see Appendix A). (CEQA Guidelines §§ 15125(a), 15126.2(a)). In sections where this is not the case, the baseline used and the reasoning for the baseline are discussed in detail.
- **Significance Criteria:** provides the criteria used in this document to define the level at which an impact would be considered significant in accordance with CEQA. Significance

criteria are based on CEQA Guidelines Section 15064.5, Appendix F, and the checklist presented in Appendix G; factual or scientific information and data; and regulatory standards of the City of Benicia, and federal, State, and local agencies.

- **Impact Identification:** each section identifies and lists impacts sequentially. An impact statement precedes the discussion of each impact and provides a summary of the impact topic. Each impact is categorized as one of the following:
 - **No Impact:** would not cause any change in the environment as measured by the applicable significance criterion; therefore, no mitigation would be required.
 - **Less than Significant:** would not cause a substantial adverse change in the environment as measured by the applicable significance criterion; therefore, no mitigation would be required.
 - **Less than Significant with Mitigation:** would cause a substantial adverse change in the physical conditions of the environment; one or more feasible mitigation measures would reduce the environmental effects to a less-than-significant level.
 - **Significant and Unavoidable:** would cause a substantial adverse change in the physical conditions of the environment; there is either no feasible mitigation available or, even with implementation of feasible mitigation measures, the project would cause a significant adverse effect on the environment.
- **Mitigation Measures:** recommended where feasible to avoid, minimize, rectify, reduce, or compensate for potential significant, adverse impacts of the Project in accordance with CEQA Guidelines Section 15126.4. Each mitigation measure is identified numerically to correspond with the number of the impact it addresses.

4.0.3 Other Impact Analysis

Cumulative impacts resulting from a combination of the Project's impacts with impacts from other closely related past, present, and reasonably foreseeable probable future projects are discussed in Chapter 5, *CEQA Statutory Sections*. Chapter 6, *Analysis of Alternatives*, analyzes the impacts of alternatives to the Project for each resource area, as compared to the impacts of the Project.

4.0.4 Geographic Scope of Analysis

CEQA requires the City to consider and discuss the Project's impacts on the environment, including any impacts of the Project that might be felt outside the Project area. Impacts felt outside the Project area, however, may be discussed in less detail if they are indirect and/or difficult to predict. The City is not required to speculate, and may limit its analysis to impacts that are reasonably foreseeable.

Some of the Project's potential impacts would be felt only within the Refinery complex, such as any geological impacts. Other impacts might, at least potentially, extend into the Refinery's immediate vicinity. Examples include impacts in the areas of aesthetics, biological resources, hydrology and water quality, land use and planning. Other Project impacts could, at least

potentially, be felt beyond the Refinery's immediate vicinity. Examples include impacts in the areas of air quality, greenhouse gas emissions, hazards, and transportation.

The analysis in each environmental resource area below includes a discussion of any Project impacts that might be felt outside the Project area and/or outside the Project's immediate vicinity. Project impacts that are indirect and/or difficult to predict are discussed in less detail than direct impacts that can be predicted with reasonable certainty.

4.1 Air Quality

4.1.1 Introduction

Air quality depends on the balance between the rate and location of pollutant emissions and the meteorological conditions and topographic features that disperse those pollutants. Atmospheric conditions such as wind speed, wind direction, and air temperature gradients interact with the physical features of the landscape to determine the movement and dispersal of air pollutants, and consequently affect air quality. This section analyzes and evaluates the potential impacts of the Project on regional and local air quality from both stationary and mobile sources of air emissions. Mitigation measures are presented to reduce these impacts to less than significant levels. Analysis of potential impacts with regard to greenhouse gases is provided in Section 4.6, *Greenhouse Gas Emissions*.

4.1.2 Setting

This setting description provides an overview of region-specific information related to climate and meteorology, air pollutants of concern, existing air quality conditions, sensitive receptors, and the regulatory setting pertaining to the Project area.

4.1.2.1 Climate and Meteorology

The Valero Benicia Refinery (Refinery) is located in the City of Benicia within the San Francisco Bay Area Air Basin (Bay Area Basin). The Bay Area Basin encompasses the nine-county region including all of Alameda, Contra Costa, Santa Clara, San Francisco, San Mateo, Marin, and Napa Counties, and the southern portions of Solano and Sonoma Counties. The climate of the greater Bay Area, including Benicia, is a Mediterranean-type climate characterized by warm, dry summers and mild, wet winters. The climate is determined largely by a high-pressure system that is almost always present over the eastern Pacific Ocean off the west coast of North America. High-pressure systems are characterized by an upper layer of dry air that warms as it descends, restricting the mobility of cooler marine-influenced air near the ground surface, and resulting in the formation of subsidence inversions. In winter, the Pacific high-pressure system shifts southward, allowing storms to pass through the region. During summer and fall, emissions generated within the Bay Area can combine with abundant sunshine under the restraining influences of topography and subsidence inversions to create conditions that are conducive to the formation of photochemical pollutants, such as ozone and secondary particulates, such as sulfates and nitrates.

The air pollution potential is lowest for those regions closest to the Bay, due largely to good ventilation and less influx of pollutants from upwind sources. The occurrence of light winds in the evenings and early mornings occasionally results in elevated pollutant levels. Wind flow patterns are controlled by air circulation in the atmosphere, which is affected by air pressure and the variable topography of the coastal areas adjacent to the Carquinez Strait, the only sea-level gap between San Francisco Bay and the Central Valley. Prevailing winds in the Project area are from the southwest

passing through the Carquinez Strait. During the summer and fall months, high pressure offshore coupled with low pressure in the Central Valley causes marine air to flow northeastward through the Carquinez Strait. Sometimes atmospheric conditions cause air to flow from the east. East winds usually contain more pollutants than the cleaner marine air from the west. In the summer and fall months, this can cause elevated pollutant levels to move into the central Bay Area through the Carquinez Strait. These high-pressure periods are usually accompanied by low wind speeds, shallow mixing depths, higher temperatures, and little or no rainfall.

Temperature fluctuations in the Project area tend to be small because of the strong marine influence on the climate. However, on certain occasions, offshore continental airflow can bring more extreme variations in temperature. The mean annual temperature in Benicia is 63 degrees Fahrenheit with prevailing winds from west to southeast. Annual rainfall averages 19 inches and falls mostly from December through April (City of Benicia, 2013).

4.1.2.2 Air Pollutants of Concern

The U.S. Environmental Protection Agency (USEPA) has identified criteria air pollutants that are a threat to public health and welfare. These pollutants are called “criteria” air pollutants because standards have been established for each of them to meet specific public health and welfare criteria (see Section 4.1.2.5, *Regulatory Setting*). Below are descriptions of criteria pollutants that are a concern in the Project area.

Ozone

Ozone is a respiratory irritant and an oxidant that increases susceptibility to respiratory infections and that can cause substantial damage to vegetation and other materials. Ozone is not emitted directly into the atmosphere, but is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving precursor organic compounds (POC) and nitrogen oxides (NO_x). POC and NO_x are known as precursor compounds for ozone. Significant ozone production generally requires ozone precursors to be present in a stable atmosphere with strong sunlight for approximately three hours.

Ozone is a regional air pollutant because it is not emitted directly by sources, but is formed downwind of sources of POC and NO_x under the influence of wind and sunlight. Ozone concentrations tend to be higher in the late spring, summer, and fall, when the long sunny days combine with regional subsidence inversions to create conditions conducive to the formation and accumulation of secondary photochemical compounds, like ozone.

Nitrogen Dioxide

Nitrogen dioxide (NO_2) is an air quality pollutant of concern because it acts as a respiratory irritant. NO_2 is a major component of the group of gaseous nitrogen compounds commonly referred to as NO_x . A precursor to ozone formation, NO_x is produced by fuel combustion in motor vehicles, industrial stationary sources (such as industrial activities), ships, aircraft, and rail transit. Typically, NO_x emitted from fuel combustion is in the form of nitric oxide (NO) and NO_2 . NO is often converted to NO_2 when it reacts with ozone or undergoes photochemical reactions in the atmosphere.

Carbon Monoxide

Carbon monoxide (CO) is a non-reactive pollutant that is a product of incomplete combustion and is mostly associated with motor vehicle traffic. High CO concentrations develop primarily during winter when periods of light winds combine with the formation of ground level temperature inversions (typically from the evening through early morning). These conditions result in reduced dispersion of vehicle emissions. Motor vehicles also exhibit increased CO emission rates at low air temperatures. When inhaled at high concentrations, CO combines with hemoglobin in the blood and reduces the oxygen-carrying capacity of the blood. This results in reduced oxygen reaching the brain, heart, and other body tissues. This condition is especially critical for people with cardiovascular diseases, chronic lung disease, or anemia.

Particulate Matter

Particulates less than 10 microns in diameter (PM₁₀) and particulates less than 2.5 microns in diameter (PM_{2.5}) can be inhaled into air passages and the lungs and can cause adverse health effects. Particulate matter in the atmosphere results from many kinds of dust- and fume-producing industrial and agricultural operations, fuel combustion, and atmospheric photochemical reactions. Some sources of particulate matter, such as demolition and construction activities, are more local in nature, while others, such as vehicular traffic, have a more regional effect. Very small particles of certain substances (e.g., sulfates and nitrates) can cause lung damage directly, or can contain adsorbed gases (e.g., chlorides or ammonium) that may be injurious to health. According to a study by the California Air Resources Board (CARB), exposure to ambient PM_{2.5} can be associated with approximately 14,000 to 24,000 premature annual deaths statewide (CARB, 2009). Particulates can also damage materials and reduce visibility.

Other Criteria Pollutants

Sulfur dioxide (SO₂) is a combustion product of sulfur or sulfur-containing fuels such as coal. SO₂ is also a precursor to the formation of atmospheric sulfate and particulate matter (both PM₁₀ and PM_{2.5}) and contributes to potential atmospheric sulfuric acid formation that could precipitate downwind as acid rain. Lead has a range of adverse neurotoxic health effects, and was formerly released into the atmosphere primarily via the combustion of leaded gasoline. The phase-out of leaded gasoline in California resulted in decreasing levels of atmospheric lead.

4.1.2.3 Existing Air Quality

The Bay Area Air Quality Management District (BAAQMD) operates a regional monitoring network that measures the ambient concentrations of criteria pollutants. Existing and probable future general levels of air quality in the Project area can generally be inferred from ambient air quality measurements conducted by BAAQMD at its monitoring stations. The major criteria pollutants of concern in the Bay Area (i.e., ozone, PM₁₀, PM_{2.5}, CO, NO₂, and SO₂) are monitored at a number of locations. Background ambient concentrations of pollutants are determined by pollutant emissions in a given area, and wind patterns and meteorological conditions for that area. As a result, background concentrations can vary among different locations within Solano County. However, areas located close together and exposed to similar wind conditions can be expected to have

similar background pollutant concentrations. The closest BAAQMD monitoring station to Benicia is the Tuolumne Street station in Vallejo. The Vallejo station is located about 5.5 miles northwest of the Refinery and monitors ozone, CO, NO₂, and PM_{2.5}. Because Benicia and the Vallejo station are close and are exposed to similar wind locations, these areas can be expected to have similar background pollutant concentrations.

The fact that the results from the Vallejo monitoring station are representative of emissions in Benicia is confirmed by the results of an air monitoring study conducted just west of the Refinery from 2007-2008. In April 2007, the BAAQMD installed a temporary portable air monitoring station west of the refinery near East Second Street and collected approximately 18 months of data. Criteria pollutants (Ozone, NO_x, SO₂, CO and PM₁₀) were measured, as well as PM_{2.5} and other organic compounds. Results were shared with the community during a meeting in May 2009. The results of this portable air monitoring station correlated closely with the results from the monitoring stations in Vallejo and Concord. In fact, typical concentrations at the Vallejo and Concord stations were higher than the concentrations in Benicia. Benicia's CO, NO_x and benzene concentrations were among the lowest in the Bay Area. PM₁₀ and other organic compounds were well below the Bay Area average. Ozone concentrations in Concord were higher than in Benicia (BAAQMD, 2009a).

Table 4.1-1 shows a 5-year (2008 through 2012) summary of data collected at the Tuolumne Street station compared to National Ambient Air Quality Standards (NAAQS) and California Ambient Air Quality Standards (CAAQS), which are presented in more detail in Table 4.1-2.

As shown in Table 4.1-1, the State 1-hour ozone standard was exceeded once in 2008 and twice in 2009. The State 8-hour ozone standard was exceeded three times in 2008, once in 2009, and twice in 2010, while the national 8-hour ozone standard was exceeded only once in 2010. CARB estimates that in 2008, 2009, 2011, and 2012, the federal PM_{2.5} 24-hour standard was exceeded approximately seven times, five times, six times, and once per year, respectively, while there were no exceedances of the State or federal annual average standards during the entire 5-year summary period. As indicated in the table, no exceedances of the applicable CO or NO₂ standards were recorded at the Tuolumne Street station during the 5-year period (CARB, 2013).

4.1.2.4 Sensitive Receptors

Some receptors are considered more sensitive than others to air pollutants. The reasons for greater than average sensitivity include pre-existing health problems, proximity to emissions sources, or duration of exposure to air pollutants. Schools, hospitals, and convalescent homes are considered to be relatively sensitive to poor air quality because children, elderly people, and the infirm are more susceptible to respiratory distress and other air quality-related health problems than the general public. Residential areas are considered sensitive to poor air quality because people usually stay home for extended periods of time, with greater associated exposure to ambient air quality. Recreational uses are also considered sensitive due to the greater exposure to ambient air quality conditions because vigorous exercise associated with recreation places a high demand on the human respiratory system.

**TABLE 4.1-1
AIR QUALITY DATA SUMMARY (2008–2012) FOR THE PROJECT AREA**

Pollutant	State/ National Standards	Monitoring Data by Year				
		2008	2009	2010	2011	2012
Ozone, O ₃						
Highest 1-Hour Average, ppm	0.09 / --	0.109	0.104	0.091	0.090	0.085
Days over State 1-Hour Standard		1	2	0	0	0
Highest 8-Hour Average, ppm	0.070/0.075	0.075	0.074	0.081	0.070	0.063
Days over State/National 8-Hour Standards		3/0	1/0	2/1	0/0	0/0
Carbon Monoxide, CO						
Highest 8-Hour Average, ppm	9.0 / 9	2.31	2.23	1.94	2.41	2.24
Days over State 8-Hour Standards		0	0	0	0	0
Nitrogen Dioxide, NO ₂						
Highest 1-Hour Average, ppm	0.18 / 0.10	0.067	0.049	0.055	0.047	0.052
Days over State/National 1-Hour Standards		0	0	0	0	0
Annual Average, ppm	0.030/0.053	0.010	0.010	0.009	0.010	0.009
Exceed State/National Annual Standards?		0	0	0	0	0
Fine Particulate Matter, PM _{2.5}						
Highest 24-Hour Average, µg/m ³	- / 35 *	50.0	38.9	29.5	54.2	36.8
Est. days over National 24-Hour Standard		7.1	5.4	0.0	6.0	1.0
Annual Average, µg/m ³	12 / 12.0**	9.9	9.7	7.7	9.7	8.9
Exceed State/National Standards?		No	No	No	No	No

NOTES: All data were measured at the Vallejo-Tuolumne Street station. Generally, state standards are not to be exceeded and national standards are not to be exceeded more than once per year. Values in bold are in excess of applicable standard; ppm = parts per million; and µg/m³ = micrograms per cubic meter.

* The national PM_{2.5} 24-hour standard is 35 µg/m³, averaged over 3 years. There is no state PM_{2.5} 24-hour standard.

** The new national PM_{2.5} annual average standard was strengthened to 12.0 µg/m³ on December 14, 2012, but it was not in affect for the years sampled.

SOURCE: CARB, 2013

The Project is located within the Refinery in an area designated for General Industrial uses in the City of Benicia General Plan (City of Benicia, 1999). Sensitive uses are not immediately adjacent to the developed part of the Refinery. In general, the Refinery complex is bordered by 470 acres of mostly undeveloped Valero property to the south and west, and general industrial uses to the north and east. Residential uses are located to the south (Hillcrest neighborhood) and west (Southampton neighborhood) of the Valero buffer land boundaries. The closest sensitive receptors to the Project would be residences in neighborhoods northwest of the Refinery, approximately 2,100 feet northwest of the proposed northern extent of the new unloading tracks and approximately 2,250 feet northwest of the proposed northern extent of the new unloading racks. There are no sensitive receptors within 2,000 feet of any of the Project components. Land uses immediately northeast and southeast of the Refinery are also non-sensitive land uses, consisting of Interstate 680 and the Benicia Industrial Park.

4.1.2.5 Regulatory Setting

Criteria Air Pollutants

Regulation of air pollution is achieved through both national and State ambient air quality standards and emission limits for individual sources of air pollutants. As required by the federal Clean Air Act (CAA), the USEPA has identified criteria pollutants and has established NAAQS to protect public health and welfare. NAAQS have been established for ozone, CO, NO₂, SO₂, PM₁₀, PM_{2.5}, and lead. To protect human health and the environment, the USEPA has set “primary” and “secondary” maximum ambient standards for each of the criteria pollutants. Primary standards were set to protect human health, particularly sensitive individuals such as children, the elderly, and individuals suffering from chronic lung conditions such as asthma and emphysema. Secondary standards were set to protect the natural environment and prevent further deterioration of animals, crops, vegetation, and buildings.

The NAAQS are defined as the maximum acceptable concentration that may be reached, but not exceeded more than once per year. California has adopted more stringent ambient air quality standards for most of the criteria air pollutants. Table 4.1-2 presents both sets of ambient air quality standards (i.e., national and State) and the Bay Area Basin’s attainment status for each standard. California has also established State ambient air quality standards for sulfates, hydrogen sulfide, and vinyl chloride.

**TABLE 4.1-2
AMBIENT AIR QUALITY STANDARDS AND BAY AREA AIR BASIN ATTAINMENT STATUS**

Pollutant	Averaging Time	State Standard		National Standard	
		Concentration	Attainment Status	Concentration	Attainment Status
Ozone	1-Hour 8-Hour	0.09 ppm 0.070 ppm	Non-Attainment Non-Attainment	– 0.075 ppm	– Non-Attainment
Carbon Monoxide	1-Hour 8-Hour	20 ppm 9.0 ppm	Attainment Attainment	35 ppm 9 ppm	Attainment Attainment
Nitrogen Dioxide	1-Hour Annual	0.18 ppm 0.030 ppm	Attainment Attainment	100 ppb 0.053 ppm	– Attainment
Sulfur Dioxide	1-Hour 3-Hour 24-Hour Annual	0.25 ppm – 0.04 ppm –	Attainment – Attainment –	75 ppb 0.5 ppm * 0.14 ppm 0.030 ppm	Attainment Attainment Attainment Attainment
Respirable Particulate Matter (PM ₁₀)	24-Hour Annual	50 µg/m ³ 20 µg/m ³	Non-Attainment Non-Attainment	150 µg/m ³ –	Unclassified –
Fine Particulate Matter (PM _{2.5})	24-Hour Annual	– 12 µg/m ³	– Non-Attainment	35 µg/m ³ 12.0 µg/m ³ **	Non-Attainment Attainment**
Lead	30-Day Quarterly	1.5 µg/m ³ –	Attainment –	– 1.5 µg/m ³	– Attainment

NOTES: ppm = parts per million; ppb = parts per billion; µg/m³ = micrograms per cubic meter.

* Secondary National Standard.

** The new national PM_{2.5} annual average standard was lowered to 12.0 µg/m³ on December 14, 2012; attainment for this new standard has yet to be determined. The Bay Area was in attainment of the previous national PM_{2.5} standard of 15 µg/m³.

SOURCE: BAAQMD, 2014a.

As shown in the table, the Bay Area is currently classified as non-attainment for the 1-hour State ozone standard as well as for the federal and State 8-hour standards. Additionally, the Bay Area is classified as non-attainment for the State 24-hour and annual arithmetic mean PM₁₀ standards as well as the State annual arithmetic mean and the national 24-hour PM_{2.5} standards. The Bay Area is unclassified or classified as attainment for all other pollutants standards (BAAQMD, 2014a).

Toxic Air Contaminants

The Air Toxics “Hot Spots” Information and Assessment Act of 1987 (AB 2588) seeks to identify and evaluate risk from air toxics sources, but does not directly regulate air toxics emissions. Under the Act, toxic air contaminant (TAC) emissions from individual facilities are quantified and prioritized. “High-priority” facilities are required to perform a health risk assessment and, if specific thresholds are violated, are required to communicate the results to the public in the form of notices and public meetings. Depending on the risk levels, emitting facilities are required to implement varying levels of risk reduction measures. The BAAQMD implements AB 2588, and is responsible for prioritizing facilities that emit air toxics, reviewing health risk assessments, and implementing risk reduction procedure. Pursuant to the requirements of AB 2588, the BAAQMD publishes an air toxics emissions inventory that details the TAC emissions of facilities throughout the Bay Area.

Federal

USEPA is responsible for implementing the programs established under the federal CAA, such as developing and reviewing the NAAQS and judging the adequacy of State Implementation Plans (SIPs), but has delegated the authority to implement many of the federal programs to the states while retaining an oversight role to ensure that the programs continue to be implemented.

State of California

CARB is responsible for establishing and reviewing the State standards, compiling the California SIP and securing approval of that plan from USEPA, conducting research and planning, and identifying TACs. CARB also regulates mobile sources of emissions in California, such as construction equipment, trucks, and automobiles, and oversees the activities of California’s air quality management districts, which are organized at the county or regional level. Air quality management districts are primarily responsible for regulating stationary sources at industrial and commercial facilities within their geographic areas and for preparing the air quality plans that are required under the federal CAA and California CAA.

Bay Area Air Quality Management District

BAAQMD is the regional agency with jurisdiction over the nine-county region located in the Bay Area Basin. The Association of Bay Area Governments (ABAG) and the Metropolitan Transportation Commission (MTC), county transportation agencies, cities and counties, and various non-governmental organizations also join in the efforts to improve air quality through a variety of programs. These programs include the adoption of regulations and policies, as well as implementation of extensive education and public outreach programs. BAAQMD is also responsible for attaining and/or maintaining air quality in the Bay Area Basin within federal and

State air quality standards. Specifically, BAAQMD has the responsibility to monitor ambient air pollutant levels throughout the Bay Area and to develop and implement strategies to attain the applicable federal and State standards.

Authority to Construct/Permit to Operate

The BAAQMD requires that any person or facility that puts in place, builds, erects, installs, modifies, modernizes, alters, or replaces any article, machine, equipment, or other contrivance, the use of which may cause, reduce, or control the emission of air contaminants first secure written authorization from the BAAQMD in the form of an Authority to Construct Permit.¹ The BAAQMD implements the permit process through a pre-construction review and approval process that takes place after the equipment is designed, but before it is installed. The pre-construction review for new and modified sources applies to both stationary and portable sources of emissions that do not qualify for a permit exemption (BAAQMD, 2013). After an Authority to Construct has been issued and construction is complete, BAAQMD staff may inspect the facility in operation to verify that equipment performs as required. If it does, the BAAQMD issues a Permit to Operate, which may contain specific operating conditions for equipment. The permit must be renewed annually (BAAQMD, 2013). The Project would emit regulated, fugitive reactive organic gases (ROG) from unloading rack, pumps, and pipeline components, such as flanges and valves, and therefore the facility must obtain an Authority to Construct permit and Permit to Operate from the BAAQMD.

Title V Federal Operating Permit (Title V)

Title V of the 1990 federal CAA Amendments requires all major sources and some minor sources of air pollution to obtain an operating permit. A Title V permit grants a source permission to operate. The permit includes all air pollution requirements that apply to the source, including emissions limits and monitoring, record keeping, and reporting requirements. It also requires that the source report its compliance status with respect to permit conditions to the permitting authority. Under Title V of the federal CAA, any source that emits or has the potential to emit 100 tons per year or more of any criteria air pollutant is a major source and must obtain a Title V operating permit. Title V permits in the Bay Area are issued by the BAAQMD and implemented by Regulation 2, Rule 6 of the BAAQMD *Rules and Regulations*. The Refinery is a major facility and currently holds a Title V operating permit. Based on the BAAQMD's rules, the Project would qualify as a Minor Permit Revision of the Title V operating permit in accordance with Regulation 2-6-215 because it is not an administrative or significant permit revision. The proposed revisions are not considered to be administrative or significant because there are no proposed revisions that meet the definition for administrative revisions under Regulation 2-6-201 or that meet the definition for significant revisions under Section 2-6-226. Valero would submit a Title V permit modification application following receipt of the Authority to Construct permit for the Project.

New Source Review

New Source Review is a preconstruction permitting program established as part of the 1977 federal CAA Amendments. In the Bay Area, the BAAQMD has partial delegation to

¹ Unless the source is specifically excluded or exempt from permit requirements.

implement the New Source Review program. It applies to new and modified major sources requiring an Authority to Construct. It serves to ensure that air quality is not significantly degraded from the addition of new and modified stationary sources and that any large new or modified industrial source would be as clean as possible, using Best Available Control Technology (BACT), Best Available Control Technology for Toxics (TBACT), and emission offsets. The Bay Area Basin is currently a non-attainment area for state ozone, PM₁₀, and PM_{2.5} standards; accordingly, some of the requirements under the BAAQMD's policy are more stringent than federal policy.

Bay Area Air Quality Management District (CEQA) Guidelines

On June 2, 2010, the BAAQMD adopted CEQA thresholds of significance for air quality impacts within the BAAQMD (2010 Thresholds) (2010a). At that time, BAAQMD recommended that local lead agencies conducting air quality analysis under CEQA use these thresholds of significance. On November 29, 2010, the California Building Industry Association filed a petition for writ of mandate in Alameda County Superior Court challenging the 2010 Thresholds on various grounds. On March, 5, 2012 the court in that case ruled that the BAAQMD failed to comply with CEQA before adopting the 2010 Thresholds (Alameda Superior Court, 2012a). The Court ordered the BAAQMD to set aside its approval of the Thresholds and "cease dissemination and publication of the Thresholds" as thresholds of general application (Alameda Superior Court, 2012b). The Court did not find that the Thresholds themselves were invalid or unlawful for any reason other than the fact that the BAAQMD failed to comply with CEQA before adopting them (Alameda Superior Court, 2012a). Nor did the Court in any way restrain any lead agencies from relying on the same thresholds.

The BAAQMD appealed the Superior Court's decision and, on August 13, 2013, the First Appellate District reversed the trial court ruling (First Appellate District, 2013). The petitioner then filed a petition for review with the California Supreme Court. On November 26, 2013, the Supreme Court granted limited review (Supreme Court, 2013). The grant of review superseded the Court of Appeal opinion, such that the Superior's Court's ruling will remain in effect while the matter is pending before the Supreme Court (BAAQMD 2014b).

Because the Superior Court ruling remains in place, the BAAQMD "is no longer recommending that the Thresholds be used as a generally applicable measure of a project's significant air quality impacts" (BAAQMD 2014b). Lead agencies remain free, however, to apply any significance thresholds that are based on substantial evidence in the record. Lead agencies could, for example, use the significance thresholds set forth in the BAAQMD's December 1999 "CEQA Guidelines" (1999 Thresholds). Lead agencies may also use the 2010 Thresholds, as long as the decision to use a particular threshold is based on substantial evidence. The BAAQMD's "Revised Draft Options and Justification Report" cites a variety of evidence in support of the 2010 Thresholds.

Air Quality Plans

Air quality plans developed to meet federal requirements are referred to as State Implementation Plans (SIPs). The federal CAA and the California CAA require plans to be developed for areas designated as nonattainment (with the exception of areas designated as nonattainment for the

State PM₁₀ standard). At a public hearing on September 15, 2010, the BAAQMD Board of Directors adopted the final Bay Area 2010 Clean Air Plan (2010 CAP), and certified the Final Environmental Impact Report on the 2010 CAP. The 2010 CAP serves to update the 2005 Bay Area Ozone Strategy in compliance with the requirements of the Chapter 10 of the California Health & Safety Code. This plan includes ozone control measures and also considers the impacts of these control measures on particulate matter, air toxics, and greenhouse gas emissions in a single, integrated plan.

The 2010 CAP control strategy includes revised, updated, and new measures in the three traditional control measure categories: stationary sources measures, mobile source measures, and transportation control measures. In addition, the 2010 CAP identifies two new categories of control measures, including land use and local impact measures and energy and climate measures (BAAQMD, 2010b).

Air Toxics Program

The BAAQMD's Air Toxics Program integrates federal and State air toxics mandates with local goals that have been established by the BAAQMD's Board of Directors. The program consists of several elements that are designed to identify and reduce public exposure to TACs. Under the preconstruction review of new and modified sources program, proposed projects are reviewed for potential health impacts, with the requirement that significant new/modified sources use the Best Available Control Technology to minimize TAC emissions. All applications for new or modified permits are reviewed for air toxics impacts, in accordance with the BAAQMD's Risk Management Policy and by Regulation 2, Rule 5: New Source Review of Toxic Air Contaminants.

City of Benicia General Plan

The City of Benicia General Plan includes specific policies to preserve and enhance existing development and to provide for orderly and appropriate new development of the City of Benicia until approximately the year 2020. The following General Plan policies are relevant to air quality analysis of the project (City of Benicia, 1999):

Policy 4.8.1: Evaluate potential hazards and environmental risks to sensitive receptors before approving development;

Policy 4.9.1: Establish whether a significant air pollution problem exists in Benicia and the City's role in resolving it; and

Policy 4.10.1: Support implementation of the BAAQMD Clean Air Plan.

4.1.2.6 Project Baseline

Under CEQA, the project baseline is normally defined as the physical conditions of the environment as it exists at the time of publication of the Notice of Preparation of the project EIR or at the time the environmental analysis commenced. There are two important exceptions to this rule. First, the baseline for increased emissions from existing permitted equipment includes emissions associated with maximum operation of the equipment allowed under existing permits

if, and only if, the permits were issued in connection with prior CEQA review. Second, where an existing facility's operations regularly fluctuate over time, the lead agency may use an average of recent conditions rather than the conditions that happen to exist when environmental review begins.

The Project here would not result in any emissions increases from existing, permitted Refinery equipment. The Project would, however, result in emissions increases from locomotives traveling to and from the Refinery. The Project would also reduce emissions from ships traveling to and from the Refinery. For purposes of analyzing these transportation-related emissions, this analysis uses as the baseline the annual average of emissions over a three-year period. A three-year average is commonly used as the baseline for CEQA review of refinery modification projects to more accurately account for the cyclic nature of refinery operations. This is because while refineries tend to operate at capacity for extended periods of time, refineries also undergo periodic multi-week unit-specific and plant-wide shutdowns for scheduled maintenance (referred to as a turnaround). These scheduled maintenance activities can be as frequent as annually to as infrequent as once every six years. Market forces can also cause refineries to vary their production to meet market demand. For the reasons described, the annual average based on three previous years of operation is more representative of a facility's baseline operation than a single point in time. This approach is consistent with the project baseline defined in *Greenhouse Gas Emissions* (Section 4.6).

Annual average baseline emissions for the Project were estimated using a baseline period from December 2009, through November 2012. The applicant filed the Use Permit Application for this project in December 2012.

The three-year baseline includes emissions within the Bay Area Basin from ships that transport crude oil to the Refinery, and tugboats that escort the ships. Ship emissions include emissions from main engines, auxiliary engines, and auxiliary boilers during the round-trip between the sea buoy, 11 nautical miles west of the Golden Gate Bridge, and the Refinery marine terminal, and for vessel operation while docked at the Refinery marine terminal.

During public review of the IS/MND, some commenters opined that the Project would result in emissions increases from existing, permitted Refinery equipment. That is not the case (See Appendices C.1 and C.2). If the Project would result in emission increases from existing, permitted Refinery equipment, it is important to note that the baseline would include emissions from the maximum operation of the Refinery equipment within permit limits. The Valero Improvement Project (VIP) involved substantial modifications to the Refinery equipment and an increase in the Refinery's overall throughput limit. The City prepared and adopted an EIR for the VIP project, and the BAAQMD relied on this CEQA review in approving air quality permits for the Refinery as modified. Since these permits were issued in connection with CEQA review, the baseline includes the full scope of operation of existing equipment allowed under existing BAAQMD permits.

4.1.3 Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause adverse impacts to air quality if it would:

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

4.1.3.1 Analysis Methodology

Emission estimates for the Project presented in this section were prepared by Environmental Resource Management (ERM), a consultant of the Applicant, and independently reviewed by the City's consultant, Environmental Science Associates (ESA). Project-related construction and operation emissions within the BAAQMD were estimated and compared to significance thresholds recommended in the BAAQMD's *Revised Draft Options and Justification Report* (2009b). The justification report provides substantial evidence to support the recommended thresholds and, therefore, the City of Benicia has determined they are appropriate for use in this analysis. To analyze the long-term operational impact of the Project, the estimated operational emissions for the Project were evaluated relative to the annual average Project baseline emissions (see Section 4.1.2.6, *Project Baseline*). The total Project-related net change in emissions is then compared to the BAAQMD significance thresholds to determine the significance of the impacts. The details of data, calculations, and assumptions used to determine Project-related emissions and associated public health risks that would be caused by the Project are included in Appendix E.

The analysis herein focuses on air quality impacts within the jurisdiction of the BAAQMD and to a lesser extent within the jurisdictions of air districts in the Sacramento Valley Air Basin (Sacramento Basin) that would be effected by rail emissions, including the Yolo-Solano Air Quality Management District (YSAQMD), the Sacramento Metropolitan Air Quality Management District (SMAQMD), and the Placer County Air Pollution Control District (PCAPCD). While the Project may have some air quality impacts outside these air district jurisdiction boundaries, these impacts are indirect and difficult to predict given the speculative nature of the exact rail routes that would be used to transport the crude oil to the Union Pacific's J.R. Davis Yard in Roseville (Roseville Yard), and are discussed in more general terms.

For impacts within the BAAQMD, the analysis follows the BAAQMD's 2012 "California Environmental Quality Act Air Quality Guidelines."

Project-related air quality impacts within the Sacramento Basin are addressed by air district boundary based on guidance provided by YSAQMD in “Handbook for Assessing and Mitigating Air Quality Impacts” (YSAQMD, 2007), SMAQMD in “CEQA Guide December 2009” (SMAQMD, 2014), and PCAPCD in “CEQA Air Quality Handbook” (PCAPCD, 2012).

4.1.4 Discussion of No Air Quality Impacts

For the reasons set forth below, the Project would not conflict with or obstruct implementation of the applicable air quality plan.

a) Conflict with or obstruct implementation of the applicable air quality plan.

The most recently adopted air quality plan for the San Francisco Bay Area is the *Bay Area 2010 Clean Air Plan* (2010 CAP). The 2010 CAP is an update to the BAAQMD 2005 Ozone Strategy to comply with State air quality planning requirements. The 2010 CAP also serves as a multi-pollutant air quality plan to protect public health and the climate. The 2010 CAP control strategy includes revised, updated, and new measures in the three traditional control measure categories, including stationary source measures, mobile source measures, and transportation control measures. In addition, the 2010 CAP identifies two new categories of control measures, including land use and local impact measures, and energy and climate measures (BAAQMD, 2010b).

In order to determine whether a project would conflict with, or obstruct implementation of, an air quality plan, the BAAQMD recommends that a lead agency consider three questions (BAAQMD, 2012). First, the lead agency should consider whether the project supports the three primary goals of the 2010 CAP: 1) attain air quality standards; 2) reduce population exposure and protect public health; and 3) reduce greenhouse gas emissions and protect the climate. The lead agency may consider a project to be consistent with the 2010 CAP if the project would not result in any significant and unavoidable air quality impacts (BAAQMD, 2012). Second, the lead agency should consider whether the project includes any applicable control measures set forth in the 2010 CAP. The lead agency may consider a project to be consistent with the 2010 CAP if the project incorporates all control measures that are applicable and feasible. Third, the lead agency should consider whether the project would disrupt or hinder implementation of any control measures set forth in the 2010 CAP. If not, the lead agency may consider a project to be consistent with the 2010 CAP.

With respect to the first question, as explained below, the Project's construction and operational emissions would not exceed the 2010 Thresholds; therefore, the Project would support the primary goals of the 2010 CAP. With respect to the second question, there are no 2010 CAP control measures applicable to the Project. Mitigation Measure 4.1-1 (see Impact 4.1-1a discussion, below) would ensure that BAAQMD basic construction control measures identified by BAAQMD would be implemented. With respect to the third question, the Project would not disrupt or hinder implementation of any control measures set forth in the 2010 CAP. Therefore, the Project would not conflict with, or obstruct implementation of, the 2010 CAP.

Because the crude by rail trains cross other air districts between Benicia and the Roseville rail yards, indirect emissions from Project-related locomotives were analyzed in the YSAQMD, SMAQMD, and PCAPCD. As is discussed in Section 4.1.5 b), significant impacts for NO_x emissions from these locomotives were identified for both the YSAQMD and SMAQMD. Consequently, the Project would conflict with the each of these air districts air quality plans. See the Section 4.1.5 b) for additional information.

4.1.5 Discussion of Impacts and Mitigation Measures

b) Violate any air quality standard or contribute to an existing or projected air quality violation.

Impact 4.1-1a: Construction of the Project could contribute to an existing or projected air quality violation. (*Less than Significant with Mitigation*)

Based on the following, construction of the mitigated Project would not result in a violation of an air quality standard or contribute significantly to an existing or projected air quality violation. Therefore, the short-term construction impact would be less than significant with mitigation. However, long-term emissions that would be associated with the Project could contribute to air quality violations in the Sacramento Basin, which would be a significant impact.

Construction

The majority of Project-related exhaust emissions would be generated on-site due to the use of heavy-duty off-road equipment (such as excavators, graders, front loaders, dump trucks, cranes, and paving equipment) to relocate a portion of an existing spill containment berm, and to construct the proposed rail car unloading rack, unloading rail spurs, and ancillary facilities, such as an aboveground crude oil pipeline, spill containment structures, a firewater pipeline, groundwater wells, and a service road. Construction activities would occur each day with two 10-hour shifts, 7 days a week, for approximately 25 weeks. Exhaust emissions would also be generated by construction worker daily commutes and by heavy-duty diesel truck trips. It is assumed that up to 11,380 light-duty auto roundtrips would be required to transport workers to and from the site and up to 396 heavy-duty diesel truck roundtrips would be required to haul materials (e.g., concrete, asphalt) to the site over the entire construction period. Criteria pollutant and precursor exhaust emissions from construction equipment and vehicles would incrementally add to the regional atmospheric loading of these pollutants during construction of the Project.

Impacts related to the Project contributing to an existing or projected air quality violation are judged by comparing estimated direct and indirect Project exhaust emissions to the significance thresholds, which for short-term construction emissions are 54 pounds per day for reactive organic gases (ROG), nitrogen oxides (NO_x), and PM_{2.5}; and 82 pounds per day for PM₁₀. Only the exhaust portion of PM_{2.5} and PM₁₀ emissions are compared against the construction thresholds. BAAQMD recommends that analyses focus on implementation of dust control measures rather than comparing estimated levels of fugitive dust to a quantitative significance threshold. BAAQMD considers implementation of BAAQMD-recommended basic mitigation

measures for fugitive dust sufficient to ensure that construction-related fugitive dust is reduced to a less-than-significant level.

Table 4.1-3 shows the estimated total average daily exhaust emissions that would be associated with construction of the Project. As indicated in the table, the total average daily construction exhaust emissions would not exceed the BAAQMD's significance thresholds. Therefore, impacts that would be associated with construction-related exhaust emissions would be less than significant.

**TABLE 4.1-3
AVERAGE DAILY CONSTRUCTION EXHAUST EMISSIONS**

Sources	Average Daily Emissions (lb/day)					
	ROG	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}
Equipment Exhaust	6.96	26.6	49.7	0.06	2.56	2.35
On-site Vehicle Exhaust	0.18	1.63	0.79	0.00	3.57	0.38
Off-site Vehicle Exhaust	0.91	8.47	1.43	0.01	0.53	0.17
Fugitive ROG from Paving and Architectural Coatings	0.11	---	---	---	---	---
Total Emissions	8.17	36.7	51.9	0.08	6.65	2.91
Draft CEQA Threshold	54	None	54	None	82	54
Threshold Exceeded (Y/N)	No	---	No	---	No	No

SOURCE: ERM, 2013a, see Appendix E.1

In addition to exhaust emissions, emissions of fugitive dust would also be generated by Project construction activities associated with earth disturbance, travel on paved and unpaved roads, etc. With regard to fugitive dust emissions, the BAAQMD's *Revised Draft Options and Justification Report* recommends that lead agencies focus on implementation of dust control measures to ensure that impacts would be less than significant rather than comparing estimated levels of fugitive dust to quantitative significance thresholds. Therefore, BAAQMD basic control measures (BAAQMD, 2012), which are recommended for every construction project and contained in Mitigation Measure 4.1-1, would be implemented to ensure that impacts associated with fugitive dust emissions would be reduced to a less-than-significant level.

Mitigation Measure 4.1-1: Implement BAAQMD Basic Mitigation Measures. Valero and/or its construction contractors shall comply with the following applicable BAAQMD basic control measures during Project construction:

- All exposed dirt non-work surfaces (e.g., parking areas, staging areas, soil piles, and graded areas, and unpaved access roads) shall be watered two times a day.
- All haul trucks transporting soil, sand, or other loose material off-site shall be covered.
- All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.

- All vehicle speeds on unpaved roads shall be limited to 15 mph.
- Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to five minutes (as required by the California Airborne Toxics Control Measure Title 13, Section 2485 of California of Regulations). Clear signage shall be provided for construction workers at all access points.
- All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.
- A publicly visible sign with the telephone number and person to contact at the City of Benicia regarding dust complaints shall be posted throughout construction. Valero and/or contractor shall respond and take corrective action within 48 hours of notification by the City. The BAAQMD's phone number shall also be visible to ensure compliance with applicable regulations.

Significance after Mitigation: Less than significant.

Impact 4.1-1b: Operation of the Project could contribute to an existing or projected air quality violation. (*Significant and Unavoidable*)

Operations

The new unloading rack and associated piping that would be installed as part of the Project would generate fugitive ROG emissions. These emissions are the Project's only direct operational air quality emissions. The Project would also result in the generation of indirect operational emissions in the form of locomotive emissions from trains traveling to and from the Refinery. Project-related trains would generate locomotive emissions in the Bay Area Basin, the Sacramento Basin, and other locations in North America.

Direct Emissions. The equipment to be installed at the Refinery would generate approximately 1.88 tons per year of new fugitive ROG emissions from approximately 2,030 new flanges, connectors, valves, and pumps. In order to calculate the Project's *net* effect on air quality in the Bay Area Basin, however, one must take into account the reduction in maritime emissions that would occur if marine vessel trips to the Refinery were replaced with train trips. The Project would allow Valero to receive up to 70,000 barrels of crude oil per day by rail, thereby replacing delivery of the same amount by marine vessel. Using an average vessel capacity from the baseline period of 350,000 barrels, the Project would eliminate approximately 73 vessel trips per year (70,000 barrels per day x 365 days per year/350,000 capacity of one vessel). As shown in Table 4.1-5, the Project's 1.88 tons per year of new fugitive ROG emissions within the Bay Area Basin would be more than offset by reductions in maritime ROG emissions within the Bay Area Basin once crude oil deliveries by rail replace crude deliveries by ship.

The Project would not have any other direct operational impacts on air quality. The Project would not involve any physical modifications to the Refinery's existing equipment, or any changes in

Refinery throughput or the operation of the existing equipment. The Project does not involve any modifications to existing permits other than the inclusion of permits for the new equipment in the Refinery's Title V permit.

The Project would not result in any increases in emissions from crude oil processing. The Project would allow Valero to access North American crudes that, as of now, are not readily accessible in Benicia. The average weight and sulfur content of the crude oil blends processed at the Refinery, however, would remain the same. As explained above in Chapter 3, based on the optimal use of the Refinery's unique configuration, permit conditions, and operational constraints, Valero must blend crude feedstocks to a narrow range of weight and sulfur content before they can be processed into marketable products. Because the crude oil blends cannot become significantly heavier or lighter, nor contain significantly more sulfur, there would be no increase in processing emissions.

Nor would the Project cause any emissions increases from storage tanks. Currently, the Refinery stores crude oil delivered by ship and pipeline in eight existing storage tanks numbered 1701 through 1708. Crude oil delivered by rail would be stored in the same tanks. The tanks would not be modified, and would continue to be subject to the same throughput limits and other permit conditions.

Indirect Emissions. The Project would increase locomotive emissions in the Bay Area Basin, the Sacramento Basin, and other parts of North America along train routes to and from oil fields in Canada and/or the United States. These emissions would be generated by trains carrying crude oil to the Refinery, and returning to oil fields after making deliveries to the Refinery.

This analysis considers in detail Project-related locomotive emissions in the Bay Area Basin and the Sacramento Basin, and applies the relevant significance thresholds. The Bay Area Basin consists of the nine counties that surround the San Francisco Bay. Along the train route to and from the Refinery, the Bay Area Basin begins and ends at the border of Solano and Sacramento Counties. For purposes of calculating maritime emissions, this analysis assumes that the Basin extends westward to the Bar Pilot Station 11 nautical miles offshore. This approach is consistent with that taken by the BAAQMD in the past in connection with CEQA review of maritime emissions associated with other onshore projects (*See, e.g.* BAAQMD, 2011).

Impact Analysis. The analysis considers locomotive emissions in the Sacramento Basin because trains travelling to and from the Refinery would run between the BAAQMD border and the Roseville Yard. The Roseville Yard is in western Placer County, the furthest portion of the Sacramento Basin from the Refinery.

Tables 4.1-4 and 4.1-5 describe the relevant significance thresholds and the Project's net effect on air quality in the Bay Area Basin and the Sacramento Basin, respectively. The BAAQMD significance threshold for increases in ROG, NO_x, and PM_{2.5} (from engine exhaust) is 10 tons per year. The BAAQMD significance threshold for increases in PM₁₀ (from engine exhaust) is 15 tons per year. Significance thresholds have not been developed by BAAQMD for CO or SO₂ because the Bay Area has attained standards for these pollutants for a long period and it is not

foreseeable that land use development projects could result in exceedances of ambient air quality standards for these constituents (BAAQMD, 2009).

The applicable operational significance thresholds within the Sacramento Basin have been established by: YSAQMD for sources within Yolo County and the portion of Solano County not within the BAAQMD; SMAQMD for sources within Sacramento County, and the PCAPCD for sources within Placer County. The significance thresholds developed by these air districts were established based on substantial evidence to assess the significance of land use development projects within their respective jurisdictions. Although the land use development that would be associated with the Project would not be located within the jurisdictions of these Sacramento Basin air districts, for a conservative analysis, the City has elected to use these districts thresholds to determine the significance of the indirect emissions that would occur within their jurisdictions. The YSAQMD significance thresholds are 10 tons per year for ROG and NO_x, and 80 pounds per day for PM₁₀. The SMAQMD significance threshold for ROG and NO_x is 65 pounds per day and the PCAPCD significance threshold for ROG, NO_x, and PM₁₀ is 85 pounds per day.

For impacts in both basins, the estimates of locomotive emissions assume two daily round-trips of 50-car trains traveling between the Roseville Yard and the Refinery. The estimates include emissions from three types of operations: (1) a small line haul on two miles of railroad within the Refinery with 50 rail cars per train; (2) a large line haul from Roseville to the Refinery with 50 rail cars per train. The large line haul emission estimates are based on the following approximate railroad lengths by air district, 22 miles within the BAAQMD, 32 miles within YSAQMD, 15.5 miles within the SMAQMD, and 2.5 miles within PCAPCD; and (3) switching at the Refinery and Roseville Yard with 25 rail cars per train.

Table 4.1-5 compares the Project's direct and indirect emissions within the Bay Area Basin with the Project's reduction of maritime emissions in the basin. The baseline for maritime emissions in the Bay Area Basin consists of the annual average emissions over the three-year baseline period ending in November 2012. (For additional information about the air quality baseline associated with the Project, refer to Section 4.1.2.6, *Project Baseline* and Appendix E.2.) The total amount of crude oil delivered by marine vessel during the baseline period was 93,361,985 barrels, which equates to an annual average of approximately 31,120,662 barrels.

The Project would replace most, but not all, of the maritime emissions associated with Refinery operations by eliminating the maritime delivery of up to 25,550,000 barrels of crude oil per year, or 70,000 barrels per day. Table 4.1-4 describes the total maritime emissions associated with the Refinery over the 3-year baseline period, the annual average emissions over the baseline period, and the estimated maritime emissions that would be displaced by the Project.

**TABLE 4.1-4
BASELINE MARITIME EMISSIONS WITHIN THE BAY AREA AIR BASIN**

Baseline Emissions	ROG	NO_x	CO	SO_x	PM₁₀	PM_{2.5}
Total Emissions over 3-Year Baseline Period (pounds)	37,882	671,162	78,161	195,822	26,172	24,849
Annual Average Emissions over Baseline Period (tons/year)	6.31	111.89	13.03	32.64	4.36	4.14
Estimated Maritime Emissions Displaced by Project (tons/year)	5.18	91.84	10.69	26.79	3.58	3.40

SOURCE: ERM, 2014a, see Appendix E.2

Taking into account the increase in locomotive emissions and the reduction in maritime emissions, the net effect of the Project would be to reduce air emissions within the Bay Area Basin. Table 4.1-5 summarizes the net emissions reductions. It should be noted that the emissions reductions presented in this table represent the maximum amount of reductions that would occur. If less than 70,000 barrels per day of crude oil would be transported by rail, an additional volume of crude oil equivalent to the difference would be delivered by marine vessel, resulting in proportionately less emissions reductions within the Bay Area Basin. Regardless, long-term operations of the Project would result in a beneficial impact to air quality in the BAAQMD as compared with the baseline. Therefore, the impact relative to the potential for the Project to contribute to an existing or projected air quality violation in the Bay Area Basin would be less than significant.

**TABLE 4.1-5
ANNUAL NET OPERATIONAL EXHAUST EMISSIONS WITHIN THE BAY AREA AIR BASIN**

Sources	Project Emissions, Net Change from Baseline (tons/yr)					
	ROG	NO_x	CO	SO_x	PM₁₀	PM_{2.5}
Unloading Rack and Pipeline Fugitive Components	1.88	---	---	---	---	---
Locomotives	1.70	33.04	5.6	0.02	0.83	0.81
Marine Vessels (Displaced Baseline)	-5.18	-91.84	-10.69	-26.79	-3.58	-3.40
Total Net Emissions	-1.61	-58.80	-5.09	-26.77	-2.75	-2.59
Significance Threshold	10	10	None	None	15	10
Threshold Exceeded (Y/N)	No	No	---	---	No	No

SOURCES: ERM, 2014a, 2013b, and 2013c; See Appendix Sections E.2 for baseline marine emissions, E.3 for locomotive emissions, and E.4 for unloading rack and pipeline fugitive components emissions.

With regard to emissions that would be generated within the Sacramento Basin, the Project-related increase in locomotive emissions would increase air pollutant emissions within each of the applicable air district jurisdictions. Unlike the Bay Area Basin, there are no marine vessel baseline emissions within the Sacramento Basin that would be displaced by the locomotive emissions. Table 4.1-6 summarizes the estimated locomotive emissions that would occur within the Sacramento Basin by air district. It should be noted that the emissions presented in this table

represent the maximum amount of emissions increases that would occur. If less than 70,000 barrels per day of crude oil would be transported by rail, the resultant locomotive pollutant emissions would be proportionately less. As indicated in Table 4.1-6, long-term operations of the Project would result in increased locomotive-related NO_x emissions that would exceed significance thresholds established by YSAQMD and SMAQMD. Therefore, the impact relative to the potential for the Project to contribute to an existing or projected air quality violation in these air districts is considered to be significant.

**TABLE 4.1-6
ANNUAL OPERATIONAL EXHAUST EMISSIONS WITHIN THE SACRAMENTO VALLEY AIR BASIN**

Sources	Project Emissions					
	ROG	NO _x	CO	SO _x	PM ₁₀	PM _{2.5}
Yolo-Solano Air Quality Management District						
Locomotives (tons/yr)	1.48	31.16	6.14	0.02	0.83	0.81
Locomotives (lbs/day)	8.13	170.72	33.63	0.12	4.55	4.42
Significance Thresholds (tons/yr)	10	10	None	None	None	None
Significance Thresholds (lbs/yr)	None	None	None	None	80	None
Threshold Exceeded (Yes/No)	No	Yes	---	---	No	---
Sacramento Metropolitan Air Quality Management District						
Locomotives (lbs/day)	3.94	82.69	16.29	0.06	2.20	2.14
Significance Thresholds (lbs/day)	65	65	None	None	None	None
Threshold Exceeded (Yes/No)	No	Yes	---	---	No	---
Placer County Air Pollution Control District						
Locomotives (lbs/day)	3.38	57.91	8.34	0.03	1.34	1.33
Significance Thresholds (lbs/day)	82	82	None	None	82	None
Threshold Exceeded (Yes/No)	No	No	---	---	No	---

SOURCE: ESA, 2014, See Appendix E.5

Although a significant impact related to increased railroad emissions would occur in YSAQMD and SMAQMD, the locomotive activities associated with these emissions would be under the control of Union Pacific Railroad and locomotive emissions are regulated by the federal government. The City has no jurisdiction to impose any emission controls on the tanker car locomotives; therefore, there is no feasible mitigation available to reduce this significant impact to a less-than-significant level. The impact would be *significant and unavoidable*.

Mitigation Measure: None available.

Operations Outside the San Francisco Bay and Sacramento Basins

As explained above, if the Project were approved and constructed, Project-related trains would travel between oil field locations in North America and the Roseville Yard. These trains would cause an increase in locomotive emissions. These impacts can be described only in general terms,

however, because it is impossible to predict the routes that Project-related trains would take across North America with any degree of certainty. In both the short and the long term, Valero could obtain crude oil from oil fields in Louisiana, Texas, Oklahoma, North Dakota, and/or parts of western Canada. Any attempt to identify and quantify the impact of locomotive emissions associated with the Project on air quality in this vast region, without even knowing where the trains will come from, would be highly speculative.

The Project would also eliminate maritime emissions from ships traveling between the Refinery and oil field locations in Alaska, South America, the Middle East, and other parts of the world. Similarly, these emissions can be described only in general terms because it is impossible to identify and quantify emissions across the vast range of possible routes.

This analysis generally describes the net impact of the Project on air quality outside the boundaries of the Bay Area and Sacramento Basins by comparing locomotive emissions with emissions from marine vessels. First, the analysis identifies the relative rate of emissions for ships and trains, for each pollutant, based on a specified distance (1,000 miles) and a specified load (1 million barrels). The results are set forth in Table 4.1-7. For both locomotives and vessels, the emissions estimates are based on average emissions factors. Second, this analysis applies these emissions factors to a few scenarios that take into account the length of specified trips.

**TABLE 4.1-7
EMISSIONS FACTORS COMPARISON FOR 1,000,000 BARRELS DELIVERED PER 1,000 MILES
TRAVELLED OUTSIDE OF THE BAY AREA AND SACRAMENTO BASINS**

Sources	tons per thousand miles hauled per million barrels delivered					
	ROG	NO _x	CO	SO _x	PM ₁₀	PM _{2.5}
Locomotives – large line haul	0.91	19.1	3.75	0.01	0.51	0.49
Marine Vessel Main Engines	0.65	11.7	0.97	1.62	0.32	0.32

SOURCE: ESA 2014; See Appendix E.5

As Table 4.1-7 shows, locomotives generate more emissions than marine vessels per mile, per 1,000,000 barrels of crude oil delivered each year, of ROG, NO_x, CO, PM₁₀, and PM_{2.5}. The reverse is true, however, for SO_x. Even with these emissions factors, there is no way to estimate with any certainty the net effect of the Project on areas outside of the Bay Area and Sacramento Basins because there is no way to predict the length of locomotive trips that could occur if the Project were approved, or the length of marine vessel trips that would occur if the Project were not approved.

For purposes of a general analysis, it is useful to consider several examples. Currently, vessels carrying crude oil from Alaska to the Refinery travel approximately 2,000 miles (from the terminus of the TransAlaska pipeline), vessels carrying crude oil from South America to the Refinery travel roughly 4,000-miles, and vessels carrying crude oil from the Middle East to the Refinery travel roughly 8,500 miles. Using a weighted-average composite distance for crude oil

delivered to the Refinery from source countries of- origin during the baseline period, Valero has estimated that the average maritime distance travelled from source to the Refinery was 7,305 miles. By comparison, a train carrying North American crude oil to the Refinery could travel roughly 1,500 miles. Based on these distances, Table 4.1-8 generally compares baseline emissions from marine vessels traveling outside of the Bay Area and Sacramento Basins with locomotive emissions from trains traveling outside of the Bay Area and Sacramento Basins.

**TABLE 4.1-8
EXAMPLES OF EMISSIONS OUTSIDE OF THE BAY AREA AND SACRAMENTO BASINS**

Emission Sources for Example Crude Oil Origins	Example One-Way Distance (miles)	Tons per 25,550,000 Barrels Delivered per Year					
		ROG	NO _x	CO	SO _x	PM ₁₀	PM _{2.5}
Baseline Marine Vessel Main Engines - Alaskan Origin*	2,000	66.4	1,194.6	99.6	165.9	33.2	33.2
Baseline Marine Vessel Main Engines - South American Origin	4,000	132.7	2,389.2	199.1	331.8	66.4	66.4
Baseline Marine Vessel Main Engines - Middle East Origin	8,500	282.1	5,077.0	423.1	705.1	141.0	141.0
Baseline Marine Vessel Main Engines - Composite Origin	7,305	242.4	4,363.2	363.6	606.0	121.2	121.2
Project Locomotives - large line haul from North American Origin	1,500	69.6	1,460.5	287.7	1.0	38.9	37.8
Net Emissions with Alaskan Origin Baseline	---	3.2	265.9	188.2	-164.9	5.8	-4.6
Net Emissions with South American Origin Baseline	---	-63.19	-928.71	88.63	-330.81	-27.43	-28.59
Net Emissions with Middle East Origin Baseline	---	-212.51	-3,616.52	-135.35	-704.11	-102.10	-103.25
Net Emissions with Composite Baseline Origin Baseline	---	-172.86	-2,902.76	-75.87	-604.98	-82.27	-83.43

* This estimate excludes emissions from operation of the pipeline from the North Slope to the marine terminal.

SOURCE: ESA, 2014; See Appendix E.5

As indicated in Table 4.1-8, net emissions that would be generated outside of the Bay Area and Sacramento Basins are highly dependent on the origin of the crude oil source. However, due to the uncertainty of the origins of the crude oil that would be delivered by rail as well as the origins of the crude oil that would be displaced, the Project emissions data presented in Table 4.1-8 are disclosed for comparison purposes only and cannot be relied upon as the basis for any significance determinations.

- c) **Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is a non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors).**

Impact 4.1-2: The Project could result in a cumulatively considerable net increase in criteria pollutant and ozone precursor emissions. (*Significant and Unavoidable*)

Based on BAAQMD guidance, if a project would result in an increase in ROG, NO_x, PM₁₀, or PM_{2.5} of more than its respective average daily mass significance thresholds, then it would also be considered to contribute considerably to a significant cumulative impact. In developing thresholds of significance for air pollutants, BAAQMD considered the emission levels for which a project's individual emissions would be cumulatively considerable (BAAQMD, 2009b). If a project would exceed the identified significance thresholds, its emissions would be cumulatively considerable, and if a project would not exceed the significance thresholds, its emissions would not be cumulatively considerable. As presented under Impact 4.1-1a above, short-term construction and long-term operational locomotive emissions would not exceed BAAQMD significance thresholds, and implementation of Mitigation Measure 4.1-1 would ensure that impacts associated with construction-related fugitive dust emissions would be reduced to a less-than-significant level. Therefore, the Project would not be cumulatively considerable with respect to the generation of criteria pollutants and ozone precursors in the Bay Area Basin and the associated cumulative impact would be less than significant.

With regard to emissions of the Project generated within the Sacramento Basin, the YSAQMD and SMAQMD consider projects to have a significant cumulative impact if the project would result in individual emissions within their air districts that would exceed their thresholds of significance. If emissions in these districts would be below the thresholds, the Project would not be considered cumulatively considerable, and would result in a less than significant cumulative impact (YSAQMD, 2007; SMAQMD, 2014). For projects in Placer County, the PCAPCD recommends the use of a ROG and NO_x cumulative impact threshold of 10 pounds per day (PCAPCD, 2012). As discussed under Impact 4.1-1b above, Project-related emissions in the YSAQMD and SMAQMD would exceed the incremental project significance thresholds for NO_x and NO_x emissions generated in Placer County would exceed the cumulative 10 pounds per day significance threshold. Therefore, implementation of the Project would result in a cumulatively considerable increase of NO_x emissions in YSAQMD, SMAQMD, and PCAPCD, and the associated cumulative impact would be *significant and unavoidable*.

Mitigation: None available.

d) Expose sensitive receptors to substantial pollutant concentrations.

Impact 4.1-3: The Project could expose sensitive receptors to substantial pollutant concentrations. (*Less than Significant*)

The BAAQMD recommends that lead agencies assess the incremental toxic air contaminant (TAC) exposure risk to all sensitive receptors to determine the maximum exposure for the Project. Construction of the Project would generate diesel particulate matter (DPM), which is considered to be a TAC, from the use of diesel off-road equipment. For short-term construction emissions, the BAAQMD recommends that construction health risks be evaluated if there are sensitive receptors located within 1,000 feet of the construction site. All project-related construction sources would be temporary (i.e., 25 weeks) and would be over 2,000 feet from the nearest sensitive land uses, which are residences off Lansing Circle. Therefore, Project construction would not result in a significant health risk.

Long-term operations associated with the Project would generate TAC emissions including benzene, ethylbenzene, toluene, xylenes, hexane, and hydrogen sulfide from fugitive equipment leaks (rectangular area sources), DPM from locomotive idling (point sources), locomotive transit (line of volume sources), and locomotive switching (line of volume sources). The Applicant-provided detailed health risk assessment analysis for these TAC emissions and sources is summarized in Table 4.1-9. In addition to the assessment of health risks from toxics, PM_{2.5}, which comprises the majority of DPM, was modeled to evaluate the potential for elevated concentrations from the locomotives.

Locomotive emissions during transit were modeled over a track length of 4 miles out from the proposed unloading rack. The modeling domain around the Refinery was extended out to approximately 4 miles because this is the distance beyond where there would be minimal impacts from equipment fugitive emissions and train idling emissions. There are no residences in the immediate vicinity of the 4 miles of modeled train route, as residences in Benicia are located more than 1,000 feet away from the locomotive activity; however, in the City of Fairfield there are residences as close as approximately 50 feet from the train route. Additional modeling was conducted to evaluate the exposure from train travel to these residential receptors. In addition, Armijo High School is adjacent to the train tracks in Fairfield; a receptor was modeled there as well. The results of the modeling (Table 4.1-9 below) show that one of these residences, just south of Railroad Avenue, is the Maximum Exposed Individual Residential (MEIR).

Locomotive switching emissions were modeled over a distance equivalent to approximately two train lengths (i.e., 3,300 feet) from the unloading rack. Because the portion of the track within the Refinery would be used for both switching and transit, emissions from the two activities were added and assigned to the common volume sources. Five years of BAAQMD meteorological data from the “Valero Admin” meteorological site and digital elevation model files were reviewed to identify elevations for sources, receptors, and buildings/structures were used for the analysis in Benicia. The modeling analysis conducted to model the locomotives that would travel through Fairfield incorporated a string of volume sources the length of a 50-car train. Residences in Benicia near the Refinery are much farther away from the railroad compared to the residences in

**TABLE 4.1-9
MAXIMUM CANCER AND NONCANCER RISK IN THE BAY AREA BASIN**

Type of Estimated Health Impact	Cancer Risk	Chronic	Acute	PM _{2.5}
	per million (Receptor Location)	Hazard Index (Receptor Location)	Hazard Index (Receptor Location)	Concentration (ug/m ³) (Receptor Location)
Maximum Exposed Individual Residential (MEIR)	7.99 Worst case risk at 160 feet southeast of train tracks in Fairfield (585058E, 4234218N)	0.0003 Worst case risk at 160 feet southeast of train tracks in Fairfield (585058E, 4234218N)	0.0030 Near E. 6 th Street (575694E, 4212345N)	0.0157 Worst case Conc. at 160 feet southeast of train tracks in Fairfield (585058E, 4234218N)
Maximum Exposed Individual Worker (MEIW)	4.45 (576144E, 4214145N)	0.014 (576144E, 4214145N)	0.0113 (576094E, 4212895N)	N/A
Maximum Sensitive Receptor (MSR)	0.28 Day Care Center (574594E, 4212895N)	0.0005 Day Care Center (574594E, 4212895N)	0.0004 Elementary School (574900E, 4212500N)	0.00244 Day Care Center (574594E, 4212895N)
Significance Threshold	10	1	1	0.3 ug/m ³
Significant Impact?	No	No	No	No

SOURCE: ERM, 2014b and Appendix E.6

Fairfield; therefore, the MEIR was modeled in Fairfield using a five-year meteorological dataset from the Suisun Sewage Treatment Plant, adjacent to Fairfield. Risk was directly modeled using the ISCST3 dispersion model and Office of Environmental Health Hazard Assessment unit risk factors for cancer risk and reference exposure levels for non-cancer health effects, as the exposure pathway for all the toxic air contaminants emitted from the sources is inhalation only (ERM, 2014b). The above methodology is described in detail in Appendix E.6.

The dose to which receptors are exposed is the primary factor affecting health risk from exposure to TACs. Dose is a function of the concentration of a substance or substances in the environment and the duration of exposure to the substance. MEIR cancer risk is modeled for a 70-year period and multiplied by the BAAQMD-recommended age specific factor of 1.7. The maximum exposed individual worker (MEIW) was modeled using a 70-year residential cancer risk multiplied by an adjustment factor of 0.2199 to convert from residential risk to worker cancer risk. The maximum sensitive receptor (MSR) risk is the modeled 70-year residential risk multiplied by 9 years times the age specific factor of 3 and divided by 70 years. As shown in Table 4.1-9, the cancer risks at the MEIR, MEIW, and MSR are below 10 in a million. The chronic hazard index and the acute hazard index at the MEIR, MEIW, and MSR are also well below 1.0. In addition, the modeled PM_{2.5} concentrations at the MEIR and MSR are well below 0.3 ug/m³. Therefore, the impact related to exposing sensitive receptors in the Bay Area Basin to substantial pollutant concentrations would be less than significant.

A modeling assessment of risk and PM_{2.5} concentrations in the Sacramento Basin near tracks along the route to and from Roseville was also conducted for residential receptors in the YSAQMD, SMAQMD, and PCAPCD. The results of the analysis are shown in Table 4.1-10, below. The analysis methodology is identical to that described for the Fairfield receptors above, except meteorological data from the Sacramento Executive Airport were used for the modeling analysis. Data from this station are more representative of the Sacramento Basin than that used for Benicia or Fairfield. As indicated in Table 4.1-10, the impacts associated with Project-related incremental risk and PM_{2.5} concentrations relative to locomotive emissions at residences in these air districts would be less than significant.

**TABLE 4.1-10
MAXIMUM CANCER AND NONCANCER RISK IN THE SACRAMENTO BASIN**

Location of Estimated Health Impact	Cancer Risk* (per million)	Chronic Hazard Index	PM _{2.5} Concentration (ug/m ³)
Yolo-Solano Air Quality Management District (Dixon) 603050 E, 4256574 N	3.9	0.002	0.008
Sacramento Metropolitan Air Quality Management District (Sacramento) 643028 E, 4283130 N	4.4	0.002	0.009
Placer County Air Pollution Control District (Roseville) 648387 E, 4290123 N	4.6	0.002	0.008
Significance Threshold	10	1	0.3 ug/m ³
Significant Impact?	No	No	No

SOURCE: ERM, 2014b and Appendix E.6

Mitigation: No mitigation required.

e) Create objectionable odors affecting a substantial number of people.

Impact 4.1-4: The Project could generate objectionable odors affecting a substantial number of people. (*Less than Significant*)

Project construction and operations would include diesel exhaust sources, such as off-road construction equipment and generators and train locomotives that could result in the creation of objectionable odors. However, these emissions would be temporary and/or intermittent in nature and the closest sensitive receptors to the Project site are residences that would be at distances of over 2,000 feet, thus odor impacts associated with diesel combustion during Project construction activities and operations would be less than significant. This impact would be less than significant.

Mitigation: No mitigation required.

4.2 Biological Resources

4.2.1 Introduction

This section describes the biological resources occurring in the Project area, assesses the potential for the Project to affect sensitive biological resources, and proposes mitigation measures to avoid and minimize potentially significant impacts. The Project area includes the Project construction footprint as well as surrounding areas with biological resources that have the potential to experience secondary environmental impacts (e.g., noise and visual disturbance, light pollution, sediment loading, etc.). This generally limits the discussion to the Project construction footprint as the direct impact area and adjacent Sulphur Springs Creek as the indirect impact area. However, in response to public concerns over the potential biological consequences of an oil spill in the Suisun Marsh, the discussion includes an overview of biological resources in the Suisun Marsh. To differentiate among resources that occur or potentially occur in the Project construction footprint and its localized surroundings versus those that occur or potentially occur in the Suisun Marsh, the term Project Study Area is used to refer to the former and Suisun Marsh is used to refer to the latter. A brief overview of biological resources along the railroad alignment between the Suisun Marsh and the City of Roseville is also provided in Section 4.2.2.1, *Regional Setting*, but is not the focus of the section. The evaluation of biological resources is based on a site visit of the Project Study Area; interpretation of satellite imagery; a review of vegetation communities, wildlife habitats, and jurisdictional “waters of the United States” that occur or potentially occur in the Project area (CDFG, 2010; CDFG, 2011; CDFW, 2013a, 2013b, 2013c; CNPS, 2013);¹ and a review of published environmental documents for the vicinity (City of Benicia, 2002; Monk and Associates, 2013).

4.2.2 Setting

4.2.2.1 Regional Setting

The Refinery is located in southern Solano County, in a low range of coastal hills along the northern edge of the Suisun Bay, within the Bay Area-Delta Bioregion (Welsh, 1994). This bioregion extends from the Pacific Ocean east to the central valley then roughly south to San Joaquin County and north to Mendocino County, and includes the Suisun Marsh. Much of the railroad alignment from the city of Sacramento to the Refinery also occurs within the Bay-Delta Bioregion. The railroad alignment between the cities of Sacramento and Roseville is within the Sacramento Valley Bioregion, differing from the Bay Area-Delta Bioregion in having less rainfall, different soils, and wetlands as a secondary, rather than primary, vegetation community, among other differences. Additionally, while some plant and animal species occur across bioregions, each bioregion supports its own suite of special-status species.²

¹ The California Department of Fish and Game (CDFG) changed its name on January 1, 2013 to the California Department of Fish and Wildlife (CDFW). In this document, references to literature published by CDFW prior to Jan. 1, 2013 are cited as ‘CDFG, [year]’. The agency is otherwise referred to by its new name, CDFW.

² For the purposes of this analysis, the term “special-status” species includes those species that are listed or proposed for listing by the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and/or the

Dominant vegetation communities in the Bay-Delta Bioregion are tule marsh, California prairie, riparian forest, coastal prairie-scrub mosaic, and coastal salt marsh (Welsh, 1994) corresponding to the wildlife habitat types³ of fresh[water] emergent wetland, perennial grassland, saline emergent wetland, coastal scrub, valley oak woodland, coastal oak woodland, annual grassland, and estuarine. Examples of wildlife species in this bioregion are Pacific sturgeon (*Acipenser transmontanus*), striped bass (*Morone saxatilis*), Delta smelt (*Hypomesus transpacificus*), California red-legged frog (*Rana draytonii*), giant garter snake (*Thamnophis gigas*), silvery legless lizard (*Anniella pulchra pulchra*), California black rail (*Laterallus jamaicensis coturniculus*), California clapper rail (*Rallus longirostris obsoletus*), western meadowlark (*Sturnella neglecta*), loggerhead shrike (*Lanius ludovicianus*), salt marsh harvest mouse (*Reithrodontomys raviventris*), mink (*Neovision vison*), river otter (*Lontra canadensis*), and beaver (*Castor canadensis*).

Dominant vegetation communities in the Sacramento Valley Bioregion are California prairie, blue oak/gray pine forest, and riparian forest (Welsh, 1994) corresponding to the wildlife habitat types of annual grassland, blue oak/gray pine, valley oak woodland, and valley foothill riparian. Examples of wildlife species in this bioregion are California red-legged frog, foothill yellow-legged frog (*Rana boylei*), giant garter snake, yellow-billed magpie (*Pica nuttallii*), tricolored blackbird (*Agelaius tricolor*), yellow-billed cuckoo (*Coccyzus americanus*), California kangaroo rat (*Dipodomys californicus*), and beaver.

Suisun Marsh

Suisun Marsh is located in southern Solano County within an area bounded by the Sacramento-San Joaquin Delta on the east, Suisun Bay on the south, Interstate 680 on the west, and State Route 12 on the north. Suisun Marsh is the largest contiguous brackish water marsh remaining on the west coast of North America and is a critical part of the San Francisco Bay-Delta estuary ecosystem (DWR, 2013): it is 116,000 acres in size and comprises 52,000 acres of managed wetlands, 27,700 acres of upland grasses, 6,300 acres of tidal wetlands, and 30,000 acres of bays and sloughs. Suisun Marsh encompasses more than 10% of California's remaining natural wetlands and serves as the resting and feeding ground for thousands of waterfowl migrating on the Pacific Flyway. Additionally, the Marsh provides essential habitat for more than 221 bird species, 45 animal species, 16 different reptilian and amphibian species, and more than 40 fish species. Suisun Marsh supports 80% of the state's commercial salmon fishery by providing important tidal rearing areas for juvenile fish. The Marsh contains the Grizzly Island Wildlife Area.

California Department of Fish and Wildlife (CDFW) and receive specific protection defined in federal or state endangered species legislation, as well as species that are not formally listed as Threatened or Endangered but are designated as "Rare" or "Sensitive" on the basis of adopted policies and expertise of State resource agencies or organizations, or local agencies such as counties, cities, and special districts and protected under Section 15380(b) of the California Environmental Quality Act (CEQA) Guidelines. Principal sources for these designations are CDFW's Special Plant and Animal Lists (CDFG, 2010; CDFG, 2011; CDFW, 2013a; CDFW, 2013b; CDFW 2013c) and NMFS Southwest Regional Office's Protected Resources information (NMFS, 2013).

³ California Wildlife Habitat Relationships (CWHHR) is a comprehensive information system for terrestrial vertebrates and their habitats in California, which uses a standardized habitat classification scheme for California containing 59 habitat types developed by Mayer and Laudenslayer (1988).

Activities and resource uses in the Suisun Marsh are guided by a variety of land use plans described in Section 4.2.2.3, Regulatory Setting, and in Section 4.9, *Land Use*.

4.2.2.2 Project Setting

Refinery Property

The Refinery property is approximately 880 acres. The property is heavily developed on the eastern half with the Refinery's operational facilities. The western half is mostly undeveloped, totaling approximately 550 acres and supporting annual grasslands, a lesser amount of coyote brush scrub, and a small amount of freshwater emergent wetlands and riparian corridors. Sulphur Springs Creek flows adjacent to the eastern boundary but is not part of the Refinery property. A Refinery wastewater treatment plant outfall connects the Refinery to the Suisun Bay. The following vegetation communities occur on the Refinery property (annual grasslands, coyote brush scrub, freshwater emergent wetlands, or riparian corridors), though no elements of the Project are proposed within these vegetation communities, and no Project elements involve the treatment plant outfall that connects the Refinery to Suisun Bay.

Annual Grasslands

Annual grasslands within the Refinery property are dominated by wild oats (*Avena* sp.), brome (*Bromus* sp.), and fescues (*Festuca* sp.), while forbs such as Italian thistle (*Carduus pycnocephalus*), wild radish (*Raphanus sativus*), and anise (*Anethum graveolens*) are intermixed (City of Benicia, 2002). Other ruderal and aggressive invasive species present are fennel (*Foeniculum vulgare*) and French broom (*Genista monspessulana*), while native species observed in the grasslands include lupine (*Lupinus* sp.), blue dick (*Brodiaea pulchella*) and California poppy (*Eschscholzia californica*) (City of Benicia, 2002). Annual grasslands would not be affected by the Project.

Coyote Brush Scrub

Coyote brush scrub was not described in previous environmental documents but can be observed in satellite imagery on north-facing hillslopes within the Refinery property. Some coyote brush associations are of high priority for inventory by the California Department of Fish and Wildlife (CDFW) (CDFG, 2010). Species that may use coyote brush scrub within the Refinery property are northern alligator lizard (*Elgaria coerulea*), California quail (*Callipepla californica*), coyote (*Canis latrans*), bobcat (*Lynx rufus*), brush rabbit (*Sylvilagus bachmani*), and gray fox (*Urocyon cinereoargenteus*). Coyote brush scrub would not be impacted by the Project.

Freshwater Emergent Wetlands

Freshwater emergent wetlands can occur in or adjacent to the streambeds of several ephemeral or intermittent creeks traversing the Refinery property, and in conjunction with Sulphur Springs Creek, which supports the growth of sedges (*Carex* sp.) and rushes common to slow-moving waterways. Species that may use freshwater emergent wetlands within the Refinery property are California toad (*Anaxyrus boreas halophilus*), California red-legged frog, Sierran treefrog (*Pseudacris sierra*), western (=Pacific) pond turtle (*Actinemys marmorata*), and common garter

snake (*Thamnophis sirtalis*). Suisun song sparrow (*Melospiza melodia maxillaris*), San Pablo song sparrow (*M. m. samuelis*), and other marsh birds may forage or nest in freshwater emergent vegetation. Freshwater emergent wetlands would not be impacted by the Project.

Riparian

Riparian zones include Sulphur Springs Creek and other drainage swales within the Refinery with riparian overstory trees including coast live oak (*Quercus agrifolia*), willow (*Salix* spp.), and coyote brush (*Baccharis pilularis*), with an understory of poison oak (*Toxicodendron diversiloba*) and blackberry (*Rubus* sp.). Wildlife species that may use the Sulphur Springs Creek riparian corridor include California toad, California red-legged frog, Sierran treefrog, western (=Pacific) pond turtle, common garter snake, Suisun and San Pablo song sparrows and a variety of more common birds, opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), gray fox, and red fox (*Vulpes vulpes*). Nesting birds may use the riparian corridor during the breeding season. Riparian zones would not be impacted by the Project, though potential secondary impacts to wildlife species using the Sulphur Springs Creek riparian zone as a movement corridor or nesting area are assessed in the species impact discussion.

Project Construction Footprint

Developed

The Project construction footprint is entirely contained within developed areas of the existing Refinery. These areas lack vegetation and consist only of industrial structures, paved roadways, and compacted dirt and graveled surfaces. The area has little biological value and provides no food or cover for most species. Pallid bats (*Antrozous pallidus*), Townsend's big-eared bats (*Corynorhinus townsendii*), big brown bats (*Eptesicus fuscus*), California myotis (*Myotis californicus*), and a few other bat species will sometimes roost in industrial buildings; raptors such as barn owls (*Tytus alba*) and peregrine falcon (*Falco peregrinus*) will sometimes nest inside or on the exterior ledges of industrial buildings; and ground-nesting birds such as killdeer (*Charadrius vociferous*) will sometimes nest on the margins of industrial roads, especially where the roads are graveled and infrequently traveled. Operational traffic volume on Refinery roads is likely to deter any potential use by ground-nesting birds. No raptors or bats are known to use Refinery structures, and the Project would not impact Refinery structures.

Special-Status Species

A variety of special-status natural communities, plants, and wildlife species have recently or historically occurred in the Project Study Area and Suisun Marsh. Table 4.2-1 lists all the plants and animals documented by the California Natural Diversity Database (CNDDB) (CDFW, 2013) and California Native Plant Society (CNPS) (CNPS, 2013) in the Benicia U.S. Geological Survey 7.5-minute quadrangle where the Refinery is located or in the surrounding eight quadrangles

**TABLE 4.2-1
SPECIAL-STATUS SPECIES CONSIDERED FOR THE PROPOSED PROJECT**

Common Name Scientific Name	Listing Status USFWS/ CDFW/CRPR	General Habitat Requirements	Potential for Species Occurrence ⁴
FEDERAL AND STATE LISTED OR PROPOSED FOR LISTING			
ANIMALS			
Invertebrates			
Conservancy fairy shrimp <i>Branchinecta conservatio</i>	FE/ --	Vernal pools and swales.	Project Study Area: Absent. Suisun Marsh: Present. Occurs at two locations in northeast Suisun Marsh, at least 13 miles from the Project Study Area and 3 miles from the railroad.
Vernal pool fairy shrimp <i>Branchinecta lynchi</i>	FT/ --	Vernal pools and swales, seasonal depressions.	Project Study Area: Absent. Suisun Marsh: Present. Occurs at two locations in northeast Suisun Marsh, at least 13 miles from the Project Study Area and 3 miles from the railroad.
Valley elderberry longhorn beetle <i>Desmocerus californicus dimorphus</i>	FT/ --	Host plant is the elderberry (<i>Sambucus</i> species), which usually grows in riparian areas but sometimes in grasslands.	Project Study Area: Absent. Suisun Marsh: Absent. There is only 1 record in the surrounding 10 quads, 11 miles northeast of the Project Study Area near Rockville.
Delta green ground beetle <i>Elaphrus viridis</i>	FT/ --	Vernal pools, seasonal wetlands.	Project Study Area: Absent. Suisun Marsh: Absent. Occurs only in Solano County. Only 2 records in surrounding 10 quads, in grasslands northeast of Suisun Marsh, at least 18 miles from the Project Study Area and 5 miles from the railroad.
Vernal pool tadpole shrimp <i>Lepidurus packardii</i>	FE/ --	Vernal pools and swales.	Project Study Area: Absent. Suisun Marsh: Present. Occurs at four locations in northeast Suisun Marsh and beyond, at least 13 miles from the Project Study Area and 3 miles from the railroad.
Callippe silverspot butterfly <i>Speyeria callippe callippe</i>	FE/ --	Host plant is the yellow pansy (<i>Viola pedunculata</i>), which grows in grasslands.	Project Study Area: Absent. Suisun Marsh: Unlikely. Only 1 record in surrounding 10 quads, from the Cordelia Hills.
California freshwater shrimp <i>Syncaris pacifica</i>	FE/ SE	Low-elevation, low-gradient perennial freshwater streams in Sonoma, Marin, and Napa Counties.	Project Study Area: Absent. Suisun Marsh: Absent. Does not occur in Solano County. Its range is limited to Marin, Sonoma, and Napa counties.

⁴ Statements regarding the potential for species to occur in Sulphur Springs Creek (a component of the Project Study Area) do not extend to plants because they would not experience secondary disturbance-related impacts (e.g., noise, visual) from the project.

TABLE 4.2-1 (Continued)
SPECIAL-STATUS SPECIES CONSIDERED FOR THE PROPOSED PROJECT

Common Name Scientific Name	Listing Status USFWS/ CDFW/CRPR	General Habitat Requirements	Potential for Species Occurrence ⁴
FEDERAL AND STATE LISTED OR PROPOSED FOR LISTING (cont.)			
Fish			
Delta smelt <i>Hypomesus transpacificus</i>	FT/ SE	Freshwater-saltwater mixing zone. Tolerant of a wide range of salinity but sensitive to other environmental changes.	Project Study Area: Absent. Suisun Marsh: Present. Distributed from San Francisco Estuary in the west, to the confluence of the Sacramento and Feather Rivers in the north, and to the disjunction of Old and San Joaquin rivers in the south. Found seasonally throughout Suisun marsh in small numbers.
Steelhead, Central Valley DPS <i>Oncorhynchus mykiss irideus</i>	FT/ --	Larger rivers serve as migration pathways for adults; juveniles rear in smaller tributaries.	Project Study Area: Absent. Suisun Marsh: Present. Adults migrate through Suisun Bay. Juveniles enter Suisun Marsh at a smolt stage and likely utilize the marsh for foraging, rearing, and migration.
Steelhead, Central California Coast DPS <i>Oncorhynchus mykiss irideus</i>	FT/ --	Larger rivers serve as migration pathways for adults; juveniles rear in smaller tributaries.	Project Study Area: Absent. Suisun Marsh: Present. The Suisun Marsh is the easternmost extent of this DPS's range. Spawns in tributary streams including Suisun Creek, Green Valley Creek, and Red Top Creek.
Longfin smelt <i>Spirinchus thaleichthys</i>	FT/ --	Estuaries and near-coastal waters from Monterey Bay to the Smith River.	Project Study Area: Absent. Suisun Marsh: Present. Can occur in Suisun Marsh year-round, but use it mostly during the larval stage when brackish waters serve as nurseries.
Amphibians			
California tiger salamander <i>Ambystoma californiense</i>	FT/ ST	Aestivation sites occur in grasslands; breed in fresh emergent and seasonal wetlands, and slow-moving or receding streams. Needs 3-6 month hydroperiod to complete metamorphosis.	Project Study Area: Absent. Suisun Marsh: Present. Present in northeast Suisun Marsh (Portrero Hills), at least 15 miles from the Project Study Area and 3 miles from the railroad.
California red-legged frog <i>Rana draytonii</i>	FT/SSC	Breeds in fresh emergent and seasonal wetlands, and slow-moving streams. Aestivation habitat includes oak woodlands and grasslands.	Project Study Area: Unlikely. Suisun Marsh: Absent. This species occurs in grasslands in Solano County, but no suitable habitat is present in the project construction footprint. Sulphur Springs Creek and small tributaries through other areas of the Refinery could potentially provide movement corridors for the species.

TABLE 4.2-1 (Continued)
SPECIAL-STATUS SPECIES CONSIDERED FOR THE PROPOSED PROJECT

Common Name Scientific Name	Listing Status USFWS/ CDFW/CRPR	General Habitat Requirements	Potential for Species Occurrence ⁴
FEDERAL AND STATE LISTED OR PROPOSED FOR LISTING (cont.)			
Reptiles			
Alameda whipsnake <i>Masticophis lateralis euryxanthus</i>	FT/ ST	Primarily associated with scrub and chaparral habitat. Require open areas to maintain optimal body temperature.	Project Study Area: Absent. Suisun Marsh: Absent. The species does not occur in Solano County. Its range is limited to Contra Costa and Alameda Counties.
Birds			
Swainson's hawk <i>Buteo swainsoni</i>	--/CT	Breeds in grasslands with scattered trees, in riparian areas, and savannahs.	Project Study Area: Absent. Suisun Marsh: Low to moderate. Only 1 nest location is documented in Solano County, at least 9 miles from the Project Study Area and 3 miles from the railroad. Nest locations could occur in suitable habitat along the railroad.
Western snowy plover <i>Charadrius alexandrinus nivosus</i>	FT/--	Inland nests occur on salt pond levees and other open areas with sandy substrate and sparse vegetation.	Project Study Area: Absent. Suisun Marsh: Absent. No documented occurrences in Solano County, the Suisun Marsh, or along the railroad. Only records in the surrounding 10 quads are in the Napa Salt Marsh Restoration Area, at least 13 miles west of the Project Study Area.
Bald eagle <i>Haliaeetus leucocephalus</i>	--/ SE	Breeds near aquatic features such as coastlines, rivers, and lake. Typically requires mature trees for nesting.	Project Study Area: Absent. Suisun Marsh: Unlikely. No nests are documented in the surrounding 10 quads, except at San Pablo Reservoir in Contra Costa County.
California black rail <i>Laterallus jamaicensis coturniculus</i>	--/ ST	Nests and forages in tidal emergent wetland with pickleweed.	Project Study Area: Absent. Suisun Marsh: Present. Multiple records from salt marshes in North San Pablo and Suisun Bays, where the breeding population occurs. Documented from marshes along the Suisun Bay approximately 1.5 miles from the Project Study Area. Also occurs in Suisun Marsh.
California clapper rail <i>Rallus longirostris obsoletus</i>	FE/ SE	Nests and forages in emergent wetlands with pickleweed, cordgrass, and bulrush.	Project Study Area: Absent. Suisun Marsh: Present. Multiple records from salt marshes in North San Pablo and Suisun Bays. Documented from marshes along the Suisun Bay approximately 1.5 miles from the Project Study Area. Also occurs in Suisun Marsh.
Bank swallow <i>Riparia riparia</i>	--/ ST	Low areas along lakes, rivers, streams, coastlines. Bluffs or eroding banks, sand and gravel quarries, road cuts.	Project Study Area: Absent. Suisun Marsh: Unlikely. There is only 1 documented occurrence in the surrounding 10 quads, along Sonoma Creek in the town of Napa at least 17 miles from the Project Study Area.

TABLE 4.2-1 (Continued)
SPECIAL-STATUS SPECIES CONSIDERED FOR THE PROPOSED PROJECT

Common Name Scientific Name	Listing Status USFWS/ CDFW/CRPR	General Habitat Requirements	Potential for Species Occurrence ⁴
FEDERAL AND STATE LISTED OR PROPOSED FOR LISTING (cont.)			
Mammals			
Salt marsh harvest mouse <i>Reithrodontomys raviventris</i>	FE/ SE	Saline emergent marshlands with dense pickleweed. Will forage in adjacent grasslands.	Project Study Area: Absent. Suisun Marsh: Present. Multiple records from salt marshes in North San Pablo and Suisun Bays. Documented from marshes along the Suisun Bay approximately 1.5 miles from the Project Study Area. Also occurs in Suisun Marsh.
Plants			
Pallid manzanita <i>Arctostaphylos pallida</i>	FT/ SE/ 1B.1	Shale, sandy, or gravelly substrate; forests, chaparral, cismontane woodland, and coastal scrub.	Project Study Area: Absent. Suisun Marsh: Absent. Range is limited to hills just east of San Francisco Bay.
Tiburon paintbrush <i>Catilleja affinis</i> var. <i>neglecta</i>	FE/ ST/ 1B.2	Valley and foothill grassland in serpentine soils. Rocky serpentine endemic.	Project Study Area: Absent. Suisun Marsh: Absent. Known from only 9 occurrences in Marin, Napa, and Santa Clara Counties. Documented in American Canyon at least 7.5 miles northwest from Project Study Area.
Soft bird's beak <i>Chloropyron molle</i> spp. <i>molle</i>	FE/ Rare/ 1B.2	Heavy clay soils of coastal salt or brackish marshes of northern San Francisco Bay.	Project Study Area: Absent. Suisun Marsh: Present. Documented in north Suisun Marsh at least 10 miles from the Project Study Area and 2 miles from the railroad.
Suisun thistle <i>Cirsium hydrophilum</i> var. <i>hydrophilum</i>	FE/--/ 1B.1	Salt marshes and swamps.	Project Study Area: Absent. Suisun Marsh: Present. Documented from central and northern Suisun Marsh at least 10 miles from the Project Study Area. Nearest record in Suisun Marsh is 0.2 mile east of railroad near Ledgewood Creek and Paytonia Slough.
Santa Cruz tarplant <i>Holocarpha macradenia</i>	FT/ SE/ 1B.1	Heavy soils on grassy coastal flats in Marin, Alameda, and Santa Cruz counties.	Project Study Area: Absent. Suisun Marsh: Absent. Not documented in Solano County, the Suisun Marsh, or along the railroad. North of San Francisco Bay, the known distribution is limited to Marin County.
Contra Costa goldfields <i>Lasthenia conjugens</i>	FE/--	Low-elevation sunny flats and perimeters of drying vernal pool in dry, inner Coast Range valleys.	Project Study Area: Absent. Suisun Marsh: Present. Documented by CNDDB in northwestern Suisun Marsh at least 10 miles from the Project Study Area. Nearest record in Suisun Marsh is 0.5 miles west of railroad near Ledgewood Creek and Cordelia Road. CNPS documents the species in the Benicia quad, which encompasses land areas north and south of Suisun Bay.

TABLE 4.2-1 (Continued)
SPECIAL-STATUS SPECIES CONSIDERED FOR THE PROPOSED PROJECT

Common Name Scientific Name	Listing Status USFWS/ CDFW/CRPR	General Habitat Requirements	Potential for Species Occurrence ⁴
FEDERAL AND STATE LISTED OR PROPOSED FOR LISTING (cont.)			
Plants (cont.)			
Antioch Dunes evening primrose <i>Oenothera deltoides</i> ssp. <i>howellii</i>	FE/ SE/ 1B.1	Inland dunes.	Project Study Area: Absent. Suisun Marsh: Absent. In the surrounding 10 quads, known only from the Lime Ridge Open Space in Contra Costa County.
Keck's checkerbloom <i>Sidalcea keckii</i>	FE/--/ 1B.1	Serpentine and clay soils in cismontane woodland and valley and foothill grassland.	Project Study Area: Absent. Suisun Marsh: Low. In the surrounding 10 quads, known from only one location at the southeastern edge of Suisun Marsh in the Montezuma Hills.
California seablite <i>Suaeda californica</i>	FE/-- /1B.1	Coastal salt marshes and swamps.	Project Study Area: Absent. Suisun Marsh: Absent. Does not occur in Solano County, in Suisun marsh, or along the railroad. Reintroductions have occurred in San Francisco at Pier 94 and Eastshore State Park.
Showy rancheria clover <i>Trifolium amoenum</i>	FE/--/ 1B.1	Coastal bluff scrub, valley and foothill grassland.	Project Study Area: Absent. Suisun Marsh: Absent. In the surrounding 10 quads, only documented from 2 locations in Napa County greater than 9 miles west from the Project Study Area.
STATE SPECIES OF SPECIAL CONCERN OR LOCALLY RARE SPECIES			
Fish			
Sacramento perch <i>Archoplites interruptus</i>	--/SSC	Slow, vegetated waters of lakes and sloughs. Native to the Sacramento River.	Project Study Area: Absent. Suisun Marsh: Reintroduction efforts. Once abundant but now extirpated from most former habitats throughout the Delta.
Sacramento splittail <i>Pogonichthys macrolepidotus</i>	--/SSC	Open-water floodplains and vegetated tidal channels, sloughs and backwaters of larger watersheds, and smaller tidal tributaries to the Bay.	Project Study Area: Absent. Suisun Marsh: Present. Juveniles and adults inhabit tidal fresh and brackish water in the Suisun Marsh. The core of adult splittail summer distribution is between Suisun Bay and the west Delta.
Reptiles			
Western pond turtle <i>Actinemys marmorata</i>	--/SSC	Lakes, ponds, reservoirs, and slow-moving streams and rivers, primarily in foothills and lowlands.	Project Study Area: Absent. Suisun Marsh: Present. Documented to occur in Suisun Marsh. Western pond turtle may be infrequently encountered in ponds, drainages, riparian areas, brackish wetlands, and uplands.

**TABLE 4.2-1 (Continued)
SPECIAL-STATUS SPECIES CONSIDERED FOR THE PROPOSED PROJECT**

Common Name Scientific Name	Listing Status USFWS/ CDFW/CRPR	General Habitat Requirements	Potential for Species Occurrence ⁴
STATE SPECIES OF SPECIAL CONCERN OR LOCALLY RARE SPECIES (cont.)			
Birds			
Tricolored blackbird <i>Agelaius tricolor</i>	--/SSC	Nests in freshwater marshes with dense stands of cattails or bulrushes, occasionally in willows, thistles, mustard, blackberry brambles, and dense shrubs and grains.	Project Study Area: Absent. Suisun Marsh: Present. Documented to occur in marshes associated with Lake Herman approx. 1 mile north of the Project Study Area and in the Suisun Marsh.
Golden eagle <i>Aquila chrysaetos</i>	--/ fully protected	Large trees in open areas and cliff-walled canyons provide nesting habitat. Forage in rolling foothills, mountain areas, flats, and deserts.	Project Study Area: Absent. Suisun Marsh: Present. Documented to occur in grasslands north of Lake Herman approx. 1 mile north of the Project Study Area and in the Suisun Marsh. May occur in suitable habitat along the railroad.
Short-eared owl <i>Asio flammeus</i>	--/SSC	Nests and forages in grasslands and marshes. Nests in on dry ground in depression concealed by vegetation.	Project Study Area: Absent. Suisun Marsh: Present. Documented to occur in the Suisun Marsh. May occur in suitable habitat along the railroad alignment.
Burrowing owl <i>Athene cunicularia</i>	--/SSC	Nests and forages in low-growing grasslands that support burrowing mammals.	Project Study Area: Absent. Suisun Marsh: Present. Documented to occur in the Suisun Marsh. The nearest record is located adjacent to the railroad alignment near Highway 12 and Cordelia Road. May occur in suitable habitat along the railroad.
Northern harrier <i>Circus cyaneus</i>	--/SSC	Nests in coastal freshwater and saltwater marshes, nest and forages in grasslands.	Project Study Area: Absent. Suisun Marsh: Present. Documented from coastal marsh in Benicia State Park and from Suisun Marsh. Nearest record is 2 miles west of the railroad near Cutoff Slough. May occur in suitable habitat along the railroad.
White-tailed kite <i>Elanus leucurus</i>	--/ fully protected	Nests near wet meadows and open grasslands in dense oak, willow or other large tree stands.	Project Study Area: Absent. Suisun Marsh: Low to moderate. Documented from grasslands in Solano County greater than 5 miles from the Project Study Area and 2 miles from the railroad.
American peregrine falcon <i>Falco peregrinus anatum</i>	--/ fully protected	Breeds near water with nearby vertical structure such as niches in steep banks and ledges to serve as nesting sites.	Project Study Area: Absent. Suisun Marsh: Low to moderate. From surrounding 10 quads, there is 1 documented occurrence in Solano County. Record details are suppressed. May occur in suitable habitat along the railroad.

TABLE 4.2-1 (Continued)
SPECIAL-STATUS SPECIES CONSIDERED FOR THE PROPOSED PROJECT

Common Name Scientific Name	Listing Status USFWS/ CDFW/CRPR	General Habitat Requirements	Potential for Species Occurrence ⁴
STATE SPECIES OF SPECIAL CONCERN OR LOCALLY RARE SPECIES (cont.)			
Birds (cont.)			
Saltmarsh common yellowthroat <i>Geothlypis trichas sinuosa</i>	--/SSC	Breeds in moist saltmarsh habitats with dense, low cover.	Project Study Area: Absent. Suisun Marsh: Present. Documented from coastal marshes along Suisun Bay approx. 2 miles east of the Project Study Area and from Suisun Marsh. Nearest record mapped along the railroad is in the vicinity of Sheldrake Slough.
Suisun song sparrow <i>Melospiza melodia maxillaris</i>	--/SSC	Endemic to Suisun Bay. Inhabits brackish marshes, perching and nesting in stands of bulrush along tidal channels, distribution ditches and permanent ponds where brackish conditions exist and foraging in bulrush and on exposed tidal mudflats.	Project Study Area: Absent. Suisun Marsh: Present. Documented to occur in brackish coastal marsh associated with lower Sulphur Springs Creek, including on the Refinery property. Documented throughout the Suisun Bay shoreline and the Suisun Marsh. May occur in adjacent Sulphur Springs Creek and in suitable habitat along the railroad.
Alameda song sparrow <i>Melospiza melodia pusillula</i>	--/SSC	Inhabits brackish marshes of east San Francisco Bay, perching and nesting in dense vegetation along tidal channels.	Project Study Area: Absent. Suisun Marsh: Absent. This subspecies does not occur in Solano County, but rather in marshes south of the Project Study Area, Suisun Marsh, and the railroad.
San Pablo song sparrow <i>Melospiza melodia samuelis</i>	--/SSC	Inhabits brackish marshes of San Pablo Bay, perching and nesting in dense vegetation along tidal channels. Particularly in areas of pickleweed, and gumplant.	Project Study Area: Absent. Suisun Marsh: Absent. This subspecies does not occur in Solano County, but rather marshes west of the Project Study Area, Suisun Marsh, and the railroad.
Yellow-headed blackbird <i>Xanthocephalus xanthocephalus</i>	--/SSC	Occasionally nests in wet meadows with tall emergent vegetation such as tules or cattails, and with adequate water to discourage predators.	Project Study Area: Absent. Suisun Marsh: Unlikely. In the surrounding 10 quads, there is only 1 historic record near Hercules in Contra Costa County. May occur in suitable habitat along the railroad.
Mammals			
Pallid bat <i>Antrozous pallidus</i>	--/SSC	Day roosts are in bridges, caves, crevices and mines; also found in buildings and under bark. Forages in open lowland areas.	Project Study Area: Absent. Suisun Marsh: Low. In the surrounding 10 quads, all occurrences are documented in west Contra Costa County. May occur in suitable habitat along the railroad.
Western red bat <i>Lasiurus blossevillii</i>	--/SSC	Forages in open lowland areas. Roosts in tall bridges.	Project Study Area: Absent. Suisun Marsh: Present. Usually roosts in tall bridges (e.g. 100 feet). Documented from a narrow riparian strip near Grizzly Island in the Suisun Marsh, approx. 6 miles east of the railroad.

TABLE 4.2-1 (Continued)
SPECIAL-STATUS SPECIES CONSIDERED FOR THE PROPOSED PROJECT

Common Name Scientific Name	Listing Status USFWS/ CDFW/CRPR	General Habitat Requirements	Potential for Species Occurrence ⁴
STATE SPECIES OF SPECIAL CONCERN OR LOCALLY RARE SPECIES (cont.)			
Mammals (cont.)			
San Pablo vole <i>Microtus californicus sanpabloensis</i>	--/SSC	Grassy habitats associated with salt marshes.	Project Study Area: Absent. Suisun Marsh: Absent. Known only from the salt marshes of San Pablo Creek in Contra Costa County, on the south shore of San Pablo Bay.
Big free-tailed bat <i>Nyctinomops macrotis</i>	--/SSC	Rugged, rocky habitats in arid landscapes; lowlands; occurs in desert shrub, woodlands, and forests. Roosts in buildings, caves, outcrops, trees.	Project Study Area: Absent. Suisun Marsh: Low. Rare in California, and not believed to breed in the state. Two records from 1916 and 1971, located near Berkeley and Martinez respectively.
Suisun shrew <i>Sorex ornatus sinuosus</i>	--/SSC	Upper edges of tidal marshes within northern shores of San Pablo and Suisun Bays.	Project Study Area: Absent. Suisun Marsh: Present. Documented from coastal marshes along San Pablo Bay, Benicia State Park, and Suisun Marsh. The nearest record is from 1952, mapped on both sides of the railroad at downtown Suisun City marsh.
Salt marsh wandering shrew <i>Sorex vagrans halicoetes</i>	--/SSC	Salt marsh habitat 6-8 feet above sea level, with abundant pickleweed and driftwood.	Project Study Area: Absent. Suisun Marsh: Absent. Present distribution is confined to San Mateo, Santa Clara, Alameda, and Contra Costa Counties.
American badger <i>Taxidea taxus</i>	--/SSC	Grasslands, savannas, deserts, timberline mountain meadows.	Project Study Area: Absent. Suisun Marsh: Low. In the surrounding 10 quads, documented from 2 records located in Napa and Contra Costa Counties. May occur in suitable habitat along the railroad alignment.
Plants			
Bent-flowered fiddleneck <i>Amsinckia lunaris</i>	--/-/ 1B.2	Cismontane woodland, valley and foothill grassland.	Project Study Area: Absent. Suisun Marsh: Low. There are no records from Solano County or Suisun Marsh. North of San Francisco Bay, specimens have been collected from Sonoma, Marin, Napa, Colusa, Yolo, and Lake Counties.
Slender silver moss <i>Anomobryum julaceum</i>	--/-/ 2B.2	Damp rock and soil on outcrops, usually on roadcuts through forests.	Project Study Area: Absent. Suisun Marsh: Absent. No suitable habitat occurs in the project area. Nearest occurrence is east Contra Costa County. The species has not been collected from Solano County. There are no records in Solano County, Suisun Marsh, or along the railroad.

TABLE 4.2-1 (Continued)
SPECIAL-STATUS SPECIES CONSIDERED FOR THE PROPOSED PROJECT

Common Name Scientific Name	Listing Status USFWS/ CDFW/CRPR	General Habitat Requirements	Potential for Species Occurrence ⁴
STATE SPECIES OF SPECIAL CONCERN OR LOCALLY RARE SPECIES (cont.)			
Plants (cont.)			
Alkali milkvetch <i>Astragalus tener</i> var. <i>tener</i>	--/--/ 1B.2	Grows in playas, valley and foothill grasslands in adobe clay, and vernal pools in alkaline soils.	Project Study Area: Absent. Suisun Marsh: Present. Documented to occur in the northern Suisun Marsh. The nearest record is located 0.5 mile west from the railroad, along Cordelia Rd. between Ledgewood Creek and Pennsylvania Ave.
Heartscale <i>Atriplex cordulata</i> var. <i>cordulata</i>	--/--/ 1B.2	Saline or alkaline soils in chenopod scrub, meadows, and seeps; sandy soils in valley and foothill grasslands.	Project Study Area: Absent. Suisun Marsh: Present. In the surrounding 10 quads, documented from only 1 location in the northern Suisun Marsh, approx. 3.5 miles east of the railroad.
Brittlescale <i>Atriplex depressa</i>	--/--/ 1B.2	Alkaline or clay soils in chenopod scrub, meadows and seeps, playas, vernal pools, and valley and foothill grasslands.	Project Study Area: Absent. Suisun Marsh: Present. Documented at the northern boundary of Suisun Marsh and beyond. The nearest record is located approx. 3.5 miles east of the railroad.
San Joaquin spearscale <i>Atriplex joaquiniana</i>	--/--/ 1B.2	Grows in alkaline soils in chenopod scrub, meadows and seeps, playas, and valley and foothill grassland.	Project Study Area: Absent. Suisun Marsh: Present. Documented from grasslands in Solano County and in the northeastern Suisun Marsh. The nearest record is located approx. 1.7 miles west of the railroad near Chadbourne Slough.
Vernal pool smallscale <i>Atriplex persistens</i>	--/--/ 1B.2	Alkaline soils in vernal pools.	Project Study Area: Absent. Suisun Marsh: Present. Documented from northwestern Suisun Marsh. This single record is located approx. 0.6 mile west of the railroad near Ledgewood Creek and Cordelia Road.
Big-scale balsamroot <i>Balsamorhiza macrolepis</i>	--/--/ 1B.2	Valley and foothill grassland, cismontane woodland.	Project Study Area: Absent. Suisun Marsh: Low. Documented from the American Canyon 7.5 miles northwest of the Project Study Area. Limited suitable habitat along the railroad.
Big tarplant <i>Blepharizonia plumosa</i>	--/--/ 1B.1	Clay soils in valley and foothill grassland.	Project Study Area: Absent. Suisun Marsh: Low. An historic record is mapped very generally to include lands west of the Refinery; this population is believed to be possible extirpated. There are no other records in Solano County or the Suisun Marsh.

TABLE 4.2-1 (Continued)
SPECIAL-STATUS SPECIES CONSIDERED FOR THE PROPOSED PROJECT

Common Name Scientific Name	Listing Status USFWS/ CDFW/CRPR	General Habitat Requirements	Potential for Species Occurrence ⁴
STATE SPECIES OF SPECIAL CONCERN OR LOCALLY RARE SPECIES (cont.)			
Plants (cont.)			
Round-leaved filaree <i>California macrophylla</i>	--/--/ 1B.1	Grows in clay soils in cismontane woodland and valley and foothill grassland.	Project Study Area: Absent. Suisun Marsh: Low. In the surrounding 10 quads, there is only 1 record in Contra Costa County. May occur in suitable habitat along the railroad.
Mt. Diablo fairy lantern <i>Calochortus pulchellus</i>	--/--/ 1B.2	Chaparral, cismontane and riparian woodland, valley and foothill grassland.	Project Study Area: Absent. Suisun Marsh: Low. Specimens have been collected from Solano, Napa, Sonoma, Alameda, Contra Costa, and Humboldt Counties. May occur in suitable habitat along the railroad.
Coastal bluff morning glory <i>Calystegia purpurata</i> ssp. <i>saxicola</i>	--/--/ 1B.2	Coastal bluff scrub, dunes, and coniferous forest.	Project Study Area: Absent. Suisun Marsh: Absent. The species has not been collected from Solano County. Known occurrences are in Contra Costa, Marin, Sonoma, Lake, and Mendocino Counties.
Congdon's tarplant <i>Centromadia parryi</i> ssp. <i>congdonii</i>	--/--/ 1B.1	Valley and foothill grassland (alkaline soils).	Project Study Area: Absent. Suisun Marsh: Present. An historic record for an extirpated population occurs in Benicia west of the Project Study Area. The species is also documented from the northeastern Suisun Marsh, with a single record approx. 6 miles east of the railroad. May occur in suitable habitat along the railroad.
Pappose tarplant <i>Centromadia parryi</i> ssp. <i>parryi</i>	--/--/ 1B.2	Coastal prairie, meadows and seeps, coastal salt marsh, valley and foothill grassland.	Project Study Area: Absent. Suisun Marsh: Present. Documented from grasslands in Solano County and from Suisun Marsh. The nearest record is located approx. 0.75 mile west of the railroad, near Ledgewood Creek and Cordelia Road.
Point Reyes bird's beak <i>Chloropyron maritimum</i> ssp. <i>palustre</i>	--/--/ 1B.2	Coastal salt marsh.	Project Study Area: Absent. Suisun Marsh: Absent. The species is not documented to occur in Solano County, the Suisun Marsh, or along the railroad. Specimens have been collected from Marin, Sonoma, Contra Costa, Santa Clara, San Mateo, San Francisco, Alameda, and Humboldt Counties.

TABLE 4.2-1 (Continued)
SPECIAL-STATUS SPECIES CONSIDERED FOR THE PROPOSED PROJECT

Common Name Scientific Name	Listing Status USFWS/ CDFW/CRPR	General Habitat Requirements	Potential for Species Occurrence ⁴
STATE SPECIES OF SPECIAL CONCERN OR LOCALLY RARE SPECIES (cont.)			
Plants (cont.)			
Hispid bird's beak <i>Chloropyron molle</i> ssp. <i>hispidum</i>	--/--/ 1B.1	Alkaline soils in meadows and seeps, playas, and valley and foothill grassland.	Project Study Area: Absent. Suisun Marsh: Present. CNPS documents occurrence in the Denverton quad (eastern Suisun Marsh). In the CNDDDB, from the surrounding 10 quads, the species is documented from 1 location near Travis Air Force Base more than 5 miles from the railroad.
Bolander's water hemlock <i>Cicuta maculata</i> var. <i>bolanderi</i>	--/--/ 2B.1	Fresh, brackish, and coastal marshes and swamps.	Project Study Area: Absent. Suisun Marsh: Present. There is an historic record in Benicia west of the Refinery, two older (1970s) records in the Suisun Marsh along the railroad, and one extant occurrence in the Suisun Slough near Deadman's Island approx. 1.3 miles west of the railroad.
Franciscan thistle <i>Cirsium andrewsii</i>	--/--/ 1B.2	Mesic, sometimes serpentinite soils in broadleaved forest and coastal bluff scrub and prairie.	Project Study Area: Absent. Suisun Marsh: Absent. The species is not documented from Solano County, the Suisun Marsh, or along the railroad. Specimens have been collected from Marin, Sonoma, Contra Costa, San Francisco, and San Mateo Counties.
Western leatherwood <i>Dirca occidentalis</i>	--/--/ 1B.2	Mesic soils in upland and coniferous forest, chaparral, cismontane woodland, and riparian forest and woodland.	Project Study Area: Absent. Suisun Marsh: Absent. The species is not documented from Solano County, the Suisun Marsh, or along the railroad. Specimens have been collected from Marin, Sonoma, Alameda, Contra Costa, Santa Clara, and San Mateo Counties.
Dwarf downingia <i>Downingia pusilla</i>	--/--/ 2B.2	Mesic grasslands, vernal pools.	Project Study Area: Absent. Suisun Marsh: Present. There is a single 1961 record, presumed extant, in the northeastern Suisun Marsh located approx. 6.5 miles east of the railroad. The species has been collected from Solano and Sacramento Counties, among others.
Mt. Diablo buckwheat <i>Eriogonum truncatum</i>	--/--/ 1B.1	Sandy soils in chaparral, costal scrub, and valley and foothill grassland.	Project Study Area: Absent. Suisun Marsh: Absent. The Solano County population is presumed extirpated; it is an 1888 record along the railroad alignment near downtown Fairfield. The species has also been collected in Contra Costa and Alameda Counties.

**TABLE 4.2-1 (Continued)
SPECIAL-STATUS SPECIES CONSIDERED FOR THE PROPOSED PROJECT**

Common Name Scientific Name	Listing Status USFWS/ CDFW/CRPR	General Habitat Requirements	Potential for Species Occurrence ⁴
STATE SPECIES OF SPECIAL CONCERN OR LOCALLY RARE SPECIES (cont.)			
Plants (cont.)			
Fragrant fritillary <i>Fritillaria liliacea</i>	--/--/ 1B.2	Loamy clay soils of open grassland, rocky soils, coastal scrub.	Project Study Area: Absent. Suisun Marsh: Low. The species is documented to occur in the Jepson Prairie Preserve northeast of the Suisun Marsh. It has broad distribution across California, and has been collected in Solano, Yolo, and Sacramento Counties, among others.
Diablo helianthella <i>Helianthella castanea</i>	--/--/ 1B.2	Broadleaf forest, chaparral, coastak scrub, cismontane and riparian woodland, and valley and foothill grassland.	Project Study Area: Absent. Suisun Marsh: Unlikely. All CNDDB records occur south of Suisun Bay; CNPS documents the species north of Suisun Bay only in Marin County, but maps the species as extant in the Benicia and Cordelia quads. However, the species is not otherwise documented to occur east of Fairfield. May occur in suitable habitat along the railroad but not likely at low elevations near the Bay.
Loma Prieta hoita <i>Hoita strobilina</i>	--/--/ 1B.1	Mesic, usually serpentinite soils in chaparral and cismontane and riparian woodland.	Project Study Area: Absent. Suisun Marsh: Absent. The species does not occur in Solano County or in any location north of Contra Costa County.
Carquinez goldenbush <i>Isocoma arguta</i>	--/--/ 1B.1	Found along the Carquinez Straits in Solano and Contra Costa counties in alkaline soils, flats, and on lower hills.	Project Study Area: Absent. Suisun Marsh: Present. The species historically occurred on both sides of the Carquinez Strait and is currently documented to occur at the eastern edge of the Suisun Marsh. The nearest record is located approx. 5.6 miles west of the railroad near Highway 12 and Nurse Slough Road.
Delta tule pea <i>Lathyrus jepsonii</i> var. <i>jepsonii</i>	--/--/ 1B.2	Natural edges of estuarine marshes, sloughs, and rivers in the Sacramento – San Joaquin Delta.	Project Study Area: Absent. Suisun Marsh: Present. Documented throughout the Suisun Marsh and along shorelines of Suisun Bay. The nearest record to the Project Study Area is located approx. 1.8 miles east of the Refinery near Lake Herman Road along the Suisun Bay shoreline. Multiple records are mapped adjacent to the railroad.
Legenere <i>Legenere limosa</i>	--/--/ 1B.1	Vernal pools.	Project Study Area: Absent. Suisun Marsh: Present. CNPS documents the species in the Denverton quad encompassing eastern Suisun Marsh. The species is documented in CNDDB to occur at the Jepson Prairie Preserve approximately 7 miles east of the railroad. Other Fairfield and Vacaville occurrences are extirpated. There are no records in Benicia or along the railroad.

TABLE 4.2-1 (Continued)
SPECIAL-STATUS SPECIES CONSIDERED FOR THE PROPOSED PROJECT

Common Name Scientific Name	Listing Status USFWS/ CDFW/CRPR	General Habitat Requirements	Potential for Species Occurrence ⁴
STATE SPECIES OF SPECIAL CONCERN OR LOCALLY RARE SPECIES (cont.)			
Plants (cont.)			
Mason's lilaeopsis <i>Lilaeopsis masonii</i>	--/--/ 1B.1	Brackish and freshwater marshes.	Project Study Area: Absent. Suisun Marsh: Present. Documented throughout Suisun Marsh and some shoreline marshes around Suisun Bay. One occurrence in Benicia at west end of "E" Street, approximately 1.4 mile west of the Refinery. The nearest record to the railroad shares a boundary with the eastern berm where Ledgewood Creek joins Suisun Slough.
Delta mudwort <i>Limosella australis</i>	--/--/ 2B.1	Mud banks of freshwater or brackish marshes and swamps, riparian scrub.	Project Study Area: Absent. Suisun Marsh: Present. Documented in the CNDDDB from Ryer Island in Suisun Bay approximately 7 miles east of the Refinery, and from Jepson Prairie Preserve northeast of Suisun Marsh. Documented by CNPS in the Vine Hill quad, which encompasses land north and south of Suisun Bay and could include areas of southwestern Suisun Marsh, such as the Grizzly Island Wildlife Area.
Hall's bush-mallow <i>Malacothamnus hallii</i>	--/--/ 1B.2	Chaparral and costal scrub.	Project Study Area: Absent. Suisun Marsh: Absent. With the exception of Lake and Mendocino Counties, the species has not been collected north of Contra Costa County.
Oregon meconella <i>Meconella oregana</i>	--/--/ 1B.1	Coastal prairie and scrub.	Project Study Area: Absent. Suisun Marsh: Absent. Known from only five locations in Contra Costa and Santa Clara Counties. Suitable habitat is absent.
Baker's navarretia <i>Navarretia leucocephala</i> ssp. <i>bakeri</i>	--/--/ 1B.1	Mesic soils in cismontane woodland, coniferous forest, meadows and seeps, vernal pools, and valley and foothill grassland.	Project Study Area: Absent. Suisun Marsh: Low. Documented in the CNDDDB to occur at Jepson Prairie Preserve and reported from other locations in Solano County north and east of Fairfield. Documented by CNPS to occur in the Denverton quad, which encompasses eastern Suisun Marsh.
Bearded popcornflower <i>Plagiobothrys hystriculus</i>	--/--/ 1B.1	Vernal swales, vernal pool margins, and valley and foothill grassland.	Project Study Area: Absent. Suisun Marsh: Absent. Known only from the Montezuma Hills east of Suisun Marsh.

TABLE 4.2-1 (Continued)
SPECIAL-STATUS SPECIES CONSIDERED FOR THE PROPOSED PROJECT

Common Name <i>Scientific Name</i>	Listing Status USFWS/ CDFW/CRPR	General Habitat Requirements	Potential for Species Occurrence ⁴
STATE SPECIES OF SPECIAL CONCERN OR LOCALLY RARE SPECIES (cont.)			
Plants (cont.)			
Chaparral ragwort <i>Senecio aphanactis</i>	--/--/ 2B.2	Alkaline soils in chaparral, cismontane woodland, and coastal scrub.	Project Study Area: Absent. Suisun Marsh: Low. Distributed from Contra Costa south to Tijuana. There is an historic record from Mare Island in Solano County, but no other records north of Contra Costa County.
Slender-leaved pondweed <i>Stuckenia filiformis</i> ssp. <i>alpine</i>	--/--/ 2B.2	Shallow, freshwater marshes and swamps.	Project Study Area: Absent. Suisun Marsh: Moderate. Fairly broad distribution across northern California. Not documented from the Suisun Marsh or along railroad. Recorded from the Fairfield North quad located north of Fairfield.
Suisun Marsh aster <i>Symphyotrichum lentum</i>	--/--/ 1B.2	Occurs along levees of rivers and sloughs in Suisun and Napa marshes and around Delta islands.	Project Study Area: Absent. Suisun Marsh: Present. Documented throughout Suisun Marsh and the Suisun Bay shoreline. The nearest record to the Project Study Area is located 1.5 mile east, along both sides of the Southern Pacific Railroad Tracks, and it also occurs in Suisun Marsh near Ledgewood Creek and Cordelia Road.
Saline clover <i>Trifolium hydrophilum</i>	--/--/ 1B.2	Grows in marshes and swamps, valley and foothill grassland in mesic and alkaline soils, and in vernal pools.	Project Study Area: Absent. Suisun Marsh: Present. There is an historic record along Interstate 680 between Benicia and Cordelia. Extant populations are reported from northwest Suisun Marsh near Ledgewood Creek and Cordelia Road.
Oval-leaved viburnum <i>Viburnum ellipticum</i>	--/--/ 2B.3	Openings in chaparral, cismontane woodland, lower montane coniferous forest.	Project Study Area: Absent. Suisun Marsh: Absent. Distributed fairly broadly across lower mountains of northern California; absent from the Central Valley. Reported from Solano County north of Fairfield. Suitable habitat is absent along the railroad.

STATUS CODES:

FEDERAL: (U.S. Fish and Wildlife Service)

FE = Listed as Endangered (in danger of extinction) by the Federal Government.

FT = Listed as Threatened (likely to become Endangered within the foreseeable future) by the Federal Government.

FC = Candidate to become a *proposed* species.

FSC = Federal Species of Concern. May be Endangered or Threatened, but not enough biological information has been gathered to support listing at this time.

STATE: (California Department of Fish and Wildlife)

SE = Listed as Endangered by the State of California

ST = Listed as Threatened by the State of California

SSC = California Species of Special Concern

SOURCE: CDFW, 2013; CNPS, 2013; USFWS, 2013; CNPS, 2014; CDFG, 2011

(quads, collectively: Cuttings Wharf, Cordelia, Fairfield South, Mare Island, Vine Hill, Richmond, Briones Valley, Walnut Creek). A tenth quad (Denver-ton) was added because its geographic area encompasses the eastern half of Suisun Marsh and could include additional species along the railroad. The construction footprint lacks suitable habitat for the species identified in Table 4.2-1. The localized area surrounding the construction footprint that is subject to secondary impacts (e.g., noise, visual, and lighting disturbance) contains limited habitat that could support some special-status species. This limited habitat is a 3,839 linear feet (approximately 0.7 miles) segment of the Sulphur Springs Creek riparian corridor, which occurs outside of the Refinery property but adjacent to the northeastern Project boundary. Special-status species potentially occurring in the Sulphur Springs Creek riparian corridor are California red-legged frog (*Rana draytonii*), western pond turtle (*Actinemys marmorata*), and nesting birds. The remainder of special-status species occur in the Suisun Marsh and would only be potentially impacted by the Project through disturbance from an increased frequency of railcars or from an accidental oil spill.

Special Status Natural Communities

Special Status Natural Communities are communities that are of limited distribution statewide or within a county or region and are often vulnerable to environmental effects of projects. These communities may or may not contain special status species or their habitat. CDFW's List of California Terrestrial Natural Communities (2010) indicates which natural communities are of special status.⁵ The Project Study Area does not support Special Status Natural Communities, but they are present in the Refinery vicinity or along the railroad alignment through Suisun Marsh. Northern Coastal Salt Marsh and Valley Needlegrass Grassland are not documented to occur along the railroad and would not be impacted by the Project. Coastal Brackish Marsh and Northern Claypan Vernal Pool have the potential to be impacted by the Project only if there were an oil spill in the Suisun Marsh.

Coastal Brackish Marsh

Coastal Brackish Marsh is dominated by perennial, emergent monocots forming dense cover. Water is brackish from freshwater input, and salinity may vary widely based on tides or seasons. This vegetation community usually intergrades with coastal salt marshes toward the ocean and with freshwater marshes in the Sacramento-San Joaquin Delta, and is distributed among the interior margins of coastal bays, lagoons, and estuaries. In California, it is most extensively developed around Suisun Bay at the mouth of the Delta. Coastal Brackish Marsh periodic tidal-influenced wetland can be found at the southeastern edge of the Refinery property where Sulphur Springs Creek nears Suisun Bay, and is mapped by the CNDDDB along the railroad near downtown Suisun City.

Northern Claypan Vernal Pool

Northern Claypan Vernal Pool is an amphibious, herbaceous community of annual herbs and grasses that germinates with the onset of winter rains. Rising air temperatures in the spring raise water temperatures and evaporate the pools, leaving concentric bands of vegetation around the drying pool. Pools may be as small as a few square meters or as large as several hectares.

⁵ Detailed plant information was not necessarily available to determine whether the natural communities could be assigned to the newer (2010) classification system or would be considered special-status under the 2010 classification system.

Microrelief is minimal, and plant cover is often reduced compared to other types of vernal pools. Northern claypan vernal pools are mapped by the CNDDDB on both sides of the railroad west of Suisun City.

Northern Coastal Salt Marsh

Northern Coastal Salt Marsh is formed by salt-tolerant plants forming dense cover. Plants grow vigorously in the summer and typically go dormant in the winter. Hydric soils are subject to regular tidal inundation for at least part of the year. This vegetation community is found along sheltered inland margins of bays, lagoons, and estuaries, and is distributed extensively in the San Francisco Bay Area. It is mapped in the CNDDDB west of the City of Benicia at Benicia State Park, across Suisun Bay along the City of Martinez shoreline, and at other shoreline areas in San Pablo Bay.

Valley Needlegrass Grassland

Valley Needlegrass Grassland is a mid-height grassland community dominated by the perennial growth of the bunchgrass *Nassella pulchra*. Native and introduced annuals may also grow between needlegrass tussocks. This vegetation community usually occurs on fine-textured (e.g., clay) soils that are moist, even waterlogged, during winter but extremely dry during summer. It often intergrades with oak woodlands. Valley Needlegrass Grassland is mapped in the CNDDDB just northeast of Suisun Marsh at Jepson Prairie.

4.2.2.3 Regulatory Setting

This section describes federal, state and local regulations, permits, and policies pertaining to biological resources and wetlands as they apply to the Project.

Federal Regulations

Endangered Species Act

The United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) have jurisdiction over species listed as threatened or endangered under Section 9 of the federal Endangered Species Act (ESA). In the Project area, NMFS would be responsible for protection of anadromous fish and USFWS would be responsible for the protection of other listed species. The federal ESA protects listed species from “take,” which is defined broadly as “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct.”

If a listed species or its habitat would be affected by the project, and the project involves a federal agency, that agency must consult with USFWS in accordance with ESA Section 7. More specifically, if another federal approval is required, ESA Section 7 consultation and issuance of a Biological Opinion (BO), and potentially also an Incidental Take Statement, would be necessary. The Endangered Species Act (16 USC § 1531 et seq.) requires federal agencies to consult with USFWS or NMFS, as appropriate, to ensure that any undertaking or action they take, including permit issuance, is not likely to jeopardize the continued existence of a listed species (plant or animal) or result in the destruction or modification of critical habitat (50 CFR § 402.01(a)).

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) prohibits the killing, possessing, or trading of migratory birds, bird parts, eggs and nests. If a project could have a negative impact on migratory birds, then Executive Order 13186 instructs federal agencies to coordinate with the USFWS in developing a Memorandum of Understanding to conserve migratory bird populations. Migratory Bird Permit Memorandum (MBPM-2) dated April 15, 2003, clarifies that destruction of most unoccupied bird nests is permissible under the MBTA, except for the nests of federally threatened or endangered migratory birds, bald eagles, and golden eagles. Most Project-area bird species and their occupied nests are protected under the MBTA.

Oil Pollution Act

Enacted in 1990, this Act (Public Law No. 101-380) amends the Clean Water Act to create a comprehensive oil spill and prevention response scheme. Spill Prevention Control and Countermeasure Plans must be prepared by owners or operators of facilities that have or could reasonably be expected to discharge a certain amount of oil. These plans should contain preventative (failsafe) and contingency (cleanup) plans for controlling accidental discharges, and for minimizing the effect of such events.

State Regulations

California Environmental Quality Act

The California Environmental Quality Act (CEQA) is the regulatory framework by which California public agencies identify and mitigate significant environmental impacts. In addition to threatened and endangered species, a species not listed under the federal or state endangered species act may be considered rare or endangered if the species meets the criteria identified in CEQA Guidelines Section 15380(b)(2).

California Endangered Species Act

The California Endangered Species Act regulates the listing and “take” of state-listed threatened and endangered species. In California, “take” is defined as “hunt, pursue, catch, capture, or kill” or to attempt to do these things. The California Department of Fish and Wildlife (CDFW) may allow take of a listed species through special permit issuance, except for fully protected species.

California Fish and Game Code

Fully Protected Species. CDFG code sections 3511, 4700, 5050, and 5515 designate fully protected species and protection measures. Fully protected species may not be taken or possessed at any time, and no licenses or permits may be issued for their take except when collecting these species is necessary for scientific research or relocation of birds is necessary for livestock protection.

Protection of Nesting Birds. Nesting birds are protected under CDFG code sections 3503 and 3503.5, which make it (1) unlawful to take, possess, or destroy the nests or eggs or any such bird of prey except as otherwise provided by the code; and (2) protect the active nests of all other birds (except house sparrow (*Passer domesticus*) and European starling (*Sturnus vulgaris*)).

Disturbance that causes nest abandonment and/or reproductive failure is considered a take. No take permits are issued under these statutes.

Wetlands

There are no wetlands in the Project area that would be impacted by the Project. However, scoping comments identified that a potential oil spill resulting from tank car derailment in the Suisun Marsh is a public concern. Therefore, a discussion is provided of agencies with regulatory jurisdiction over wetlands as they relate to the potential for oil spills in the Suisun Marsh.

U.S. Environmental Protection Agency

Under the legal authority of the Clean Water Act (Act), including subsequent amendment to the Act by the Oil Pollution Act of 1990, the Discharge of Oil regulation (the “sheen rule”) provides the framework for determining whether an oil spill to inland or coastal waters and/or their adjoining shorelines should be reported to the federal government. Discharges that cause a sheen or discoloration on the water surface, violate applicable water quality standards, or cause a sludge or emulsion to be deposited beneath the surface of the water or on adjoining shorelines must be reported. A person in charge of a vessel, with knowledge of any discharge of oil from such vessel in violation of the Act, must immediately report the spill to the National Response Center in Washington, D.C.

U.S. Army Corps of Engineers

Within the U.S. Environmental Protection Agency’s National Response System, the U.S. Army Corps of Engineers (Corps) has been designated as a supporting agency for oil and hazardous pollution incidents occurring within the U.S. The Corps can provide specialized equipment and personnel, design services, construction activities, and contract services for other federal agencies. The Corps conducts its emergency response activities under the Flood Control and Coastal Emergency Act, and the Stafford Disaster and Emergency Assistance Act. Under the Flood Control and Coastal Emergency Act, the Corps provides disaster preparedness services and advanced planning measures designed to reduce the amount of damage caused by an impending disaster. Under the Stafford Act, the Corps supports the Department of Homeland Security and Federal Emergency Management Agency (FEMA) in carrying out the National Response Plan.

State and Regional Water Quality Control Boards

State and Regional Water Quality Control Boards are not directly responsible for hazardous waste spills. Spills are handled by the State Office of Emergency Services. However, California Government Code Section 8589.7 requires the California Emergency Management Agency to, upon receipt of a report concerning an oil spill in the Suisun Marsh, immediately inform the Regional Water Quality Control Board. The San Francisco Regional Water Quality Control Board states in their Water Quality Control Plan (Basin Plan) for the San Francisco Bay Region (1995, 2013), Section 4.24 Oil Spills, that oil transfer operations are the step in petroleum handling where spills are most likely to occur. It further states that the petroleum industry has been improving its safety record in oil transfer operations. This improvement has been attributed to:

- U.S. Coast Guard regulations for oil transfer operations;

- State Lands Commission guidelines for petroleum facility operations manuals;
- High clean-up costs and public concern associated with oil spills
- Water Board, California Department of Fish and Game, and U.S. Coast Guard enforcement actions against parties responsible for spills

As of the July 2013 publication, the Water Board recognizes that additional regulation is unnecessary if the petroleum industry maintains its improved record.

Bay Conservation and Development Commission

The Bay Conservation and Development Commission (BCDC) has planning and regulatory authority over Suisun Marsh. The Suisun Marsh Protection Plan (BCDC, 1976) identifies Findings and Policies concerning hazardous spills in Suisun Marsh. This Plan is discussed in more detail in *Local Regulations*, below. Other BCDC land use plans are described in Section 4.9, *Land Use*.

Local Regulations

City of Benicia General Plan (1999)

The General Plan, adopted in 1999, includes specific policies to preserve and enhance existing development and to provide for orderly and appropriate new development of the City of Benicia until approximately the year 2020.

Specifically, the Open Space and Conservation of Resources provisions of the General Plan include the following goals and policies:

Goal 3.19: Preserve and enhance habitat for special-status plants and animals.

Policy 3.19.1: Protect essential habitat of special-status plants and animal species.

Goal 3.20: Protect and enhance native vegetation and habitats.

Policy 3.20.1: Protect native grasslands, oak woodlands and riparian habitats.

Policy 3.20.2: Restore native vegetation, such as birch grasses and oaks, whenever possible for open spaces of existing developed areas.

Policy 3.20.4: Require protection of movement corridors.

Goal 3.21: Permanently protect and enhance wetlands so that there is no net loss of wetlands within the Benicia Planning Area.

Policy 3.21.1: Encourage avoidance and enhancement of sensitive wetlands as part of future development.

Solano County General Plan (2008).

The General Plan was adopted in 2008 and provides actions Solano County can take to maintain, protect, and preserve a wide range of species and natural communities found in the county, and the habitats that support them. Specifically, the Biological Resources chapter of the General Plan includes the following policies:

RS.P-1: Protect and enhance the county's natural habitats and diverse plant and animal communities, particularly occurrences of special-status species, wetlands, sensitive natural communities, and habitat connections.

RS.P-2: Manage the habitat found in natural areas and ensure its ecological health and ability to sustain diverse flora and fauna.

RS.P-3: Focus conservation and protection efforts on high-priority habitat areas (depicted on General Plan Figure RS-1).

RS.P-4: Together with property owners and federal and state agencies, identify feasible and economically viable methods of protecting and enhancing natural habitats and biological resources.

RS.P-5: Protect and enhance wildlife movement corridors to ensure the health and long-term survival of local animal and plant populations. Preserve contiguous habitat areas to increase habitat value and to lower land management costs.

More detailed policies directly affecting the Suisun Marsh are described in the 2008 General Plan Appendix C, Suisun Marsh Policy Addendum. These policies have been incorporated into the Solano County component of the Suisun Marsh Local Protection Program certified by the Bay Conservation and Development Commission (BCDC) and include the following policy regarding hazardous materials:

P-14: The development of industrial facilities in, adjacent to or upstream from the Marsh should be planned to eliminate significant adverse environmental impacts on the water quality of the Suisun Marsh. Activities that could significantly alter the temperature, salinity, or turbidity of the water should be prohibited. Industrial facilities that will increase the potential for spills of toxic and hazardous materials should not be permitted unless it is established that spills of such materials will not represent a significant threat to the Marsh.

Bay Conservation and Development Commission Plans

The BCDC is a state agency with permit authority over the Bay and its shoreline. Their regulatory authority and relevant provisions are presented in several land use plans, including the *San Francisco Bay Plan*, *Benicia Waterfront Special Area Plan*, *Bay Area Seaport Plan*, and the *Suisun Marsh Protection Plan*. These plans and their applicability to the Project are described in Section 4.9, *Land Use*. Their consideration of the transport of hazardous cargo through the Suisun Marsh is described above as part of the *Solano County General Plan*, Appendix C.

Suisun Marsh Habitat Management, Preservation, and Restoration Plan

The *Suisun Marsh Habitat Management, Preservation, and Restoration Plan* (DOI, 2011) is a 30-year plan developed by the U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Wildlife (CDFW), National Marine Fisheries Service (NMFS), California Department of Water Resources, and the Suisun Resource Conservation District to balance the benefits of tidal wetland restoration with other habitat uses. The Marsh relies on levees to protect diked managed wetlands, roads, and other infrastructure from flooding, and levees also serve as important local transportation corridors including Union Pacific Railroad, Amtrak Capitol Corridor, petroleum pipelines to Travis Air Force Base and other locations, State Route 12, natural gas production wells and transmission lines, electrical

transmission lines, and water conveyance facilities. According to the plan, Suisun Marsh Region 1 consists of the western and northwestern portions of the marsh that are primarily west of or adjacent to the Union Pacific Railroad line that carries freight cars from the J.R. Davis Yard in Roseville to Bay Area ports, including the Refinery. The plan considers the potential for hazardous materials spills in the Suisun Marsh and describes the agencies and some of the procedures in place under approved emergency response and evacuation plans.

Solano County Habitat Conservation Plan

The Solano County Habitat Conservation Plan has not been formally adopted by its participants, but upon adoption it will streamline biological permitting associated with the development of future flood control, irrigation facilities, and public infrastructure projects in the Suisun Marsh. Section 4.9, *Land Use*, provides additional background information on the Solano County Habitat Conservation Plan. The City of Benicia and the unincorporated areas of Solano County outside the plan's service area have elected not to participate in the plan. While the railroad crosses portions of the plan area, and the plan discusses levee maintenance as a covered activity, railcar transport through the Suisun Marsh is not the focus of the plan's covered activities and the plan would have limited, if any, applicability to the Project.

Yolo County Natural Community Conservation Plan/Habitat Conservation Plan

The Yolo County Habitat Conservation Plan has not been formally adopted by its participants, but upon adoption it will streamline biological permitting associated with development in Yolo County. Section 4.9, *Land Use*, provides additional background information on the Yolo County Habitat Conservation Plan. The railroad crosses Yolo County near Sacramento, and railroad maintenance and the cleanup of hazardous materials are covered activities under the plan. The plan may have limited applicability to the Project along the railroad segment through Yolo County.

Delta Plan

The Delta Plan, authorized under the Sacramento-San Joaquin Delta Reform Act of 2009, is a comprehensive management plan for the Sacramento-San Joaquin River Delta and Suisun Marsh. The Suisun Marsh is considered a secondary management area of the Delta Plan (Delta Stewardship Council, 2013). Section 4.9, *Land Use*, provides additional background information on the Delta Plan. While levee maintenance and emergency preparedness and response policies and recommendations are included in the Delta Plan, they are focused on flood control activities and do not specifically address hazardous materials.

Draft Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California

Administered by the U.S. Fish and Wildlife Service, this voluntary plan identifies threats to seven endangered species associated with San Francisco Bay tidal marshes and elaborates implementation measures, including habitat restoration, to facilitate species recovery. Specifically, this Plan addresses the Suisun Bay Area Recovery Unit, Segments A and B, Zones 1 and 2. Railroad transport of hazardous materials is not considered in the plan.

Baylands Ecosystem Habitat Goals Project

The Goals Project was undertaken in June 1995 to establish a long-term vision for a healthy and sustainable baylands ecosystem. The final report, published in 1999 (Goals Project 1999) enumerated a series of non-binding recommendations for habitat protection and restoration in the Suisun Marsh. Railroad transport of hazardous materials is not considered in the plan.

CALFED Ecosystem Recovery Program

The CALFED program of state and federal cooperation in water use was formalized in June 1994 with the signing of a Framework Agreement by the state and federal agencies with management and regulatory responsibility in the Bay-Delta Estuary. The Framework Agreement pledged that the state and federal agencies would work together in water quality standards formulation, coordination of State Water Project and Central Valley Project operations, and long-term solutions to problems in the Bay-Delta Estuary. Railroad transport of hazardous materials is not considered in the plan.

San Francisco Bay Subtidal Habitat 50-Year Conservation Plan

The San Francisco Bay Subtidal Habitat 50-Year Conservation Plan is a guide for restoring and improving subtidal habitat, including all submerged areas of Suisun Bay upstream to Sherman Island. The voluntary plan was developed by California State Coastal Conservancy and Ocean Protection Council, National Marine Fisheries Service and Restoration Center, San Francisco Bay Conservation and Development Commission, and the San Francisco Estuary Partnership to provide basic information in support of conservation, restoration, research, and protection activities in the Bay. Railroad transport of hazardous materials is not considered in the plan.

Strategic Plan for the Restoration of Wetlands and Wildlife in the San Francisco Bay Area

This voluntary plan outlines habitat restoration and enhancement goals identified by the San Francisco Bay Joint Venture partnership, including habitat goals for the Suisun Bay subregion. The plan outlines a framework for collaborative action in preserving wetlands. While oil refining and clean water programs are briefly discussed in the plan, railroad transport of hazardous materials is not considered.

4.2.2.4 Project Baseline

Baseline conditions reflect the current setting of the Project Area, as described above in Section 4.2.2, *Project Setting*. This includes the existing developed habitats of the Refinery and the special-status plant and animal species listed in Table 4.4-1 with the potential to occur in or near these habitats and that may be affected by Project activities.

4.2.3 Significance Criteria

Based on CEQA Guidelines Appendix G, a project would cause significant adverse impacts to biological resources if it would:

- a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional

plans, policies, or regulations, or by the California Department of Fish and Wildlife, the National Marine Fisheries Service, or U.S. Fish and Wildlife Service;

- b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service;
- c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;
- d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
- e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or
- f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional or state habitat conservation plan.

4.2.4 Discussion of Impacts and Mitigation Measures

4.2.4.1 Project Study Area

- a) **Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife, the National Marine Fisheries Service, or U.S. Fish and Wildlife Service.**

The Project construction footprint lacks habitat for special-status species. However, a localized area surrounding the construction footprint has the potential for secondary Project-related disturbance (e.g., noise and vibrations) that could affect species present in the adjacent Sulphur Springs Creek riparian corridor. Sulphur Springs Creek is outside of the Refinery property but is adjacent to the northeastern Project boundary, and the riparian canopy extends to the property line. The creek is separated from the Refinery by a tall chain link fence. The vegetated bank extends approximately 65 feet before reaching the channel. Sulphur Springs Creek and its associated riparian corridor and in-stream marshes provide potentially suitable habitat for the following special-status species: California red-legged frog, western pond turtle, tri-colored blackbird, yellow-headed blackbird, Suisun song sparrow, Samuel's song sparrow, grasshopper sparrow, loggerhead shrike, yellow-breasted chat, San Francisco common yellowthroat, and short-eared owl.

California red-legged frog could use the Sulphur Springs riparian zone as a movement corridor. Breeding is unlikely due to urban runoff and high storm flows, and any individuals are likely to be transients that would not be disturbed by construction and operation of the Project. Western pond turtle may occur as a resident or transient in Sulphur Springs Creek, but breeding areas are more likely to occur upstream of the Project area where adjacent terraces and/or grasslands provide sandy egg-laying substrate. Like California red-legged frog, western pond turtle is

unlikely to be disturbed by construction and operation of the Project. Although the chain link fence is permeable to these species, there is no habitat in the Project area and no protective cover.

Suisun song sparrow is documented within coastal brackish marsh associated with downstream reaches of Sulphur Springs Creek and could occur (nest) in upstream Sulphur Springs Creek near the Project, as could Samuel's song sparrow, grasshopper sparrow, loggerhead shrike, yellow-breasted chat, and San Francisco common yellowthroat. Short-eared owls typically nest in grasslands and may forage in the riparian corridor but are not likely to nest there. Though brackish and salt marshes at the mouth of Sulphur Springs Creek provide habitat occupied by California black rail, California clapper rail, and salt marsh harvest mouse (CDFW, 2013a), only California black rail has the potential to occur in freshwater marshes of upstream Sulphur Springs Creek; this would be unlikely due to the small patch sizes of creek marshes and the industrial surroundings. Aside from the riparian corridor, nesting bird habitat would be limited to industrial areas. Peregrine falcons often nest on tall buildings, and their nests could occur on industrial buildings or rock outcrops associated with surrounding grasslands. American peregrine falcon is documented from undisclosed areas of Benicia (CDFW, 2013), but nests are not known to occur on Refinery structures. Thus, of the special-status species potentially present in the adjacent Sulphur Springs Creek riparian corridor, Project construction and operation is only likely to affect nesting birds, indirectly, as described below.

Impact 4.2-1: The Project could have a substantial adverse effect on nesting birds in the Sulphur Springs Creek riparian corridor. (*Less than Significant with Mitigation*)

The Project could have a substantial adverse indirect effect on nesting birds. The noise, vibrations, visual disturbance, and increased human activity associated with Project construction could result in nest failure (disturbance, avoidance, or abandonment that leads to unsuccessful reproduction), or cause flight behavior that exposes an adult or its young to predators such as Cooper's hawks (*Accipiter cooperii*). Nest failure is a possible but unlikely outcome of construction activities, since the baseline noise and activity levels at the Refinery would not be significantly increased by construction activities. However, if it were to occur, nest failure would be a significant effect under CEQA and a violation of California Fish and Game Code Sections 3503-3513 and the federal Migratory Bird Treaty Act. During operation, the noise, vibrations, visual disturbance, and increased human activity associated with the Project become part of the ambient environment, so any birds that subsequently nest nearby are presumed to be tolerant of the disturbance. Implementation of the following mitigation measure would reduce potentially significant construction-related effects on nesting birds to a less-than-significant level.

Mitigation Measure 4.2-1: Project construction activities should avoid the nesting season of February 15 through August 31, if feasible. If seasonal avoidance is not possible then no sooner than 30 days prior to the start of any Project activity a biologist experienced in conducting nesting bird surveys shall survey the Project area and all accessible areas within 500 feet. If nesting birds are identified, the biologist shall implement a suitable protective buffer around the nest and no activities shall occur within this buffered area. Typical buffers are 250 feet for songbirds and 500 feet for raptors, but may be increased or decreased according to site-specific, Project-specific, activity-specific considerations such as visual barriers between the nest and the activity, decibel levels associated with the activity, and the

species of nesting bird and its tolerance of the activity. Construction activities that are conducted within a reduced buffer shall be conducted in the presence of a qualified full-time biological monitor.

Significance after Mitigation: Less than significant.

- b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.**

Impact 4.2-2: The Project could have a substantial adverse effect on the Sulphur Springs Creek riparian corridor. (*Less than Significant with Mitigation*)

The Sulphur Springs Creek riparian corridor and downstream coastal brackish marshes could potentially experience adverse effects from Project construction, resulting from excessive sediment loads generated by grading and other soil-disturbing activities adjacent to Sulphur Springs Creek that are carried into the stream. However, Project construction would be restricted to active work areas within the Refinery property and indirect impacts to Sulphur Springs Creek would be prevented through implementation of appropriate mitigation. Proposed Project construction would occur primarily during the low-flow period of April 15 through October 15 when rainfall is not anticipated and the transport of sediments by surface flow would be unlikely. Additionally, the Project would implement construction Best Management Practices and Storm Water Pollution Prevention measures identified in Section 4.8, *Hydrology and Water Quality*. Implementation of Mitigation Measure 4.8-1 would reduce potential construction-related impacts on riparian habitat and downstream coastal brackish marshes to a less-than-significant level. No additional mitigation is required.

Significance after Mitigation: Less than significant.

- c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.**

Impact 4.2-3: The Project could have a substantial adverse effect on federally protected wetlands. (*Less than Significant with Mitigation*)

No wetlands or waters occur in the Project construction footprint. Sulphur Springs Creek is outside the Refinery property but adjacent to the northeast Project boundary. Sulphur Springs Creek is a federally protected waters, and downstream coastal brackish marshes are federally protected wetlands. Without mitigation, these waters could potentially experience indirect adverse effects resulting from Project construction such as sediment loading during grading activities or soil stockpiling. However, the implementation of Mitigation Measure 4.8-1 would reduce potential indirect impacts on federally protected wetlands to a less-than-significant level. Project operation would not significantly increase surface runoff, but operational water quality impacts

would be addressed through the preparation and implementation of drainage improvements and stormwater capture and treatment systems described in Section 4.8, *Hydrology and Water Quality*. No additional mitigation is required.

-
- d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.**

Impact 4.2-4: The Project could interfere with wildlife movement in the Sulphur Spring Creek riparian corridor. (*Less than Significant*)

The Project would not interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites. No nursery sites such as monarch butterfly roosting groves, heron rookeries, or bat roosts are known to occur in the Project Study Area and migratory fish such as steelhead are not documented to occur in Sulphur Springs Creek. The Sulphur Springs Creek riparian zone is a likely movement corridor for wildlife, and could be adversely affected during Project construction and operation by the use of nighttime lighting, which could deter use of the corridor. However, the downward orientation of Project lighting, away from the riparian corridor, should result in a less-than-significant impact on wildlife movement, not substantially affecting movement relative to the current Project baseline.

Mitigation: None required.

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- f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional or state habitat conservation plan.**

Impact 4.2-5: The Project may not be in conformance with applicable habitat conservation plans. (*No Impact*)

The Project would be constructed within an active industrial area inside the existing Refinery boundary and would not conflict with the programs and policies of the *City of Benicia General Plan* (City of Benicia, 1999) or the *Solano County General Plan* (Solano County, 2008). Other area plans described in Section 4.2.2.3, Regulatory Setting, including the *Solano County Habitat Conservation Plan*, are not applicable to the Refinery. Therefore, the Project is in conformance with applicable habitat conservation plans, and there is no impact.

Mitigation: None required.

4.2.4.2 Suisun Marsh

In addition to impacts to the Project Study Area above, the Suisun Marsh located south and east of the Refinery is crossed by UPRR mainline railroad tracks which would be used to transport crude feedstocks to the Project. The following considers the potential indirect impacts of accidental releases related to this proposed new transport on the Marsh. Note that these impacts also may apply to other sensitive areas anywhere along the railroad tracks used to transport crude feedstocks.

Under existing conditions, the marine vessels that transport crude oil to local Refineries utilize open waterways that are adjacent to Suisun Marsh. Thus, there is a finite risk that crude oil would be released into the waters of the Carquinez Strait and a subsequent risk that tidal or wind action could drive the release and cause an adverse effect on the Marsh. The risk of such a release is discussed in Section 4.7, *Hazards and Hazardous Materials*. Whatever the current total risk from all such ship traffic, operation of the Project along with the reduction in of up to 82% of marine vessel trips, would decrease the risk of release and also decrease the risk of adverse effect to the Marsh. (See Section 3.1.1.2 for a discussion of the decrease in crude oil delivered by marine vessel and the discussion of Impact 4.7-2 in Section 4.7, *Hazardous and Hazardous Materials*).

- a) **Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife, the National Marine Fisheries Service, or U.S. Fish and Wildlife Service.**

The Suisun Marsh supports the special-status natural communities Coastal Brackish Marsh, Northern Claypan Vernal Pool, and Valley Needlegrass Grassland, and a wide variety of special-status animals and plants including fairy shrimp, smelt, steelhead, California tiger salamander, California red-legged frog, California black rail, California clapper rail, salt marsh harvest mouse, soft bird's beak, Suisun thistle, Contra Costa goldfields, and many others. Construction of the Project would not impact these species, as existing railroad tracks would be used to transport crude oil between Roseville and the Refinery. However, the following impacts could occur.

Impact 4.2-6: The Project could have a substantial adverse effect on special-status wildlife species in the Suisun Marsh disturbed by an increased frequency (high traffic volumes) of railcars through the marsh. (*Less than Significant*)

Project operation could impact species by increasing the volume (number or duration) of railcars travelling through the marsh, causing increased noise and vibration. Noise pollution is a concern to wildlife conservation. In humans, long-term exposure to noise can induce psychological stress and lead to physiological disorder (Job, 1996; Stansfeld et al., 1993; Lines et al., 1994; Job, 1996; and Babisch et al., 1999 in Seiler, 2001). Whether wildlife is similarly stressed by noise is questionable but some species may perceive railroad noise as a token for human presence and consequently avoid these areas (Klein, 1971; Rost and Bailey, 1979; Curatolo and Murphy, 1986; McLellan and Schackleton, 1988; and Mace et al., 1996 in Seiler, 2001). The effects of train noise on wildlife have not been studied, and have not been studied across a range of taxa (e.g., insect

pollinators, amphibians, birds, mammals). Birds may be especially sensitive to noise, as it directly interferes with their vocal communication and affects territorial behavior and mating success.

Rail traffic causes intermittent noise, present when the train is passing and ceasing between trains. A researcher at the University of Edinburgh, Scotland determined the pattern of amplitude decay of train noise in the natural environment (Altringham, 2012), finding that it peaked at 25 meters (82 feet) with no significant difference between woodland and open ground. Sound in the higher frequency range experienced by birds deteriorated faster than full frequency spectrum sound. From its peak at 25 meters, railroad noise amplitude deteriorated to 50% at 200 meters (656 feet) for full spectrum noise, and deteriorated to 30% in the bird call frequency band. In other words, of all the noise generated by the train, only 30% would be experienced by birds 200 meters away. In comparison, she notes that vehicle road noise generates almost continuous noise pollution over a much greater distance, resulting in a wider lateral disturbance zone with amplitude deteriorating to just 50% at 900 meters (2,950 feet).

The species currently inhabiting areas within 200 meters of the railroad are presumably habituated to the current level of railcar traffic, else they would not be present. It is possible these areas provide essential breeding habitats that are rare or missing in the surrounding landscape, and that species are present even though disturbance effects may reduce the quality of these habitats (Seiler, 2001). Special-status species documented to occur within a more conservative 400 meters (1,312 feet) of the railroad alignment through Suisun Marsh are the monarch butterfly, calippe silverspot butterfly, Suisun song sparrow, salt marsh common yellowthroat, California black rail, California clapper rail, burrowing owl, Suisun shrew, and salt marsh harvest mouse (CDFW, 2013). The Project would add up to four trains to the daily average of 42 trains traveling through the marsh. The majority of these, approximately 35 trains, run during daytime hours and approximately 7 trains run during nighttime hours; the Project would add trains during the nighttime hours. The average number of cars in each train (i.e., the duration of disturbance generated by a single train as experienced by a stationary receptor) is unknown for baseline and Project conditions.

The Project would not increase the lateral area of disturbance that extends approximately 200 meters from the railroad alignment, relative to baseline conditions, since this is determined by physical laws of sound attenuation. The addition of four trains would increase the number of intermittent disturbances by 9.5%. Perhaps more importantly, if all four trains were added during nighttime hours when presently only about 7 trains run, the percentage increase of train cars running during nighttime hours would be closer to 60%. However, it is reasonable to assume that there would continue to be long periods of silence punctuated by intermittent, and relatively short, periods of train disturbance. Thus, while the increase in train traffic may initially have a slight negative effect on nearby wildlife species, they are expected to soon habituate to the increased noise. The impact is less than significant, and no mitigation is required.

Mitigation: None required.

Impact 4.2-7: In the event of a train accident that involves a relatively large amount of oil spilled from one or more tank cars, the Project could have a substantial adverse effect on special-status natural communities and special-status species, including those present in the Suisun Marsh. (*Less than Significant*)

The approximately 730 trains that would transport crude oil through the Marsh each year would introduce a risk of an oil spill if a train were to derail *and* breach the integrity of the tank car, spilling some of its contents. Though a spill could occur anywhere along the line, the aquatic character of Suisun Marsh and the number of special-status organisms it supports make it an especially vulnerable location for a large spill. Depending on the location and severity of an oil spill and its resulting effects on special-status species, this could be a significant impact. However, the risk of a release greater than 100 gallons is along the portion of the route traversing the Suisun wetland area is very low at 0.00381, which corresponds to an estimated frequency of once per 262 years (see Section 4.7.5). Because the risk is very low, the impact would be considered to be less than significant.

Mitigation: None required.

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- c) **Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.**

Impact 4.2-8: The Project could have a substantial adverse effect on federally protected wetlands. (*Less than Significant*)

Suisun Marsh is a federally protected wetland. As described in Section 4.2.2.1, Setting, Suisun Marsh is the largest contiguous brackish water marsh remaining on the west coast of North America and is a critical part of the San Francisco Bay-Delta estuary ecosystem. An oil spill in the Suisun Marsh, depending on the location and severity of the spill and its resulting effects, could be a significant impact. However, given that the likelihood of an oil spill of any size related to the trains that transport crude oil each year is considered to be “unlikely,” as explained in 4.2-7 above, the impact would be considered to be less than significant.

Mitigation: None required.

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- f) **Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional or state habitat conservation plan.**

Impact 4.2-9: The Project may not be in conformance with applicable habitat conservation plans. (*Less than Significant*)

The *Solano County General Plan*, the *Suisun Marsh Habitat Management, Preservation, and Restoration Plan*, the *Solano County Habitat Conservation Plan*, and the *Yolo County Habitat*

Conservation Plan acknowledge the presence of railroad tracks through the Suisun Marsh and briefly address the need for levee maintenance, track maintenance, and/or transport of hazardous materials. Other plans do not address these issues. The biological focus of these plans is on the preservation, restoration, and enhancement of the Suisun Marsh. The tank car transport of crude oil through the Suisun Marsh does not expressly conflict with any of these plans.

Mitigation: None required.

4.3 Cultural Resources

4.3.1 Introduction

Cultural resources include historical resources, unique archaeological resources, paleontological resources, and human remains. This section evaluates the potential for the Project to result in substantial adverse effects on these resources.

4.3.2 Setting

The Valero Benicia Refinery is in the City of Benicia, situated on the northern bank of the Carquinez Strait. The strait represents the entry point for the Sacramento and San Joaquin Rivers into the San Francisco Bay. Benicia lies within both the San Francisco Bay and the west end of the Central Valley archaeological regions, and both contain a rich array of prehistoric and historic-period cultural resources. More specifically, the areas surrounding the Carquinez Strait and Suisun Bay have been occupied for millennia given its abundant combination of littoral and oak woodland resources.

4.3.2.1 Paleontological Setting

The Society of Vertebrate Paleontology (SVP) has established guidelines for the identification, assessment, and mitigation of adverse impacts on nonrenewable paleontological resources (SVP, 1995, 1996). Many federal, state, county, and city agencies have either formally or informally adopted the SVP's standard guidelines for the mitigation of adverse construction-related impacts on paleontological resources.

Paleontological Potential

The surface soils of the Project site consist of approximately 10 to 15 feet of artificial fills. Based on the guidelines discussed above, artificial fill does not have paleontological potential.

4.3.2.2 Geoarchaeological Context

Historically on the Refinery site, excavated native unconsolidated deposits and crushed bedrock were placed as compacted fill, ranging from approximately 10 to 50 feet in topographically low areas in the vicinity (Woodward-Clyde, 1993). A recent geotechnical study indicates the Project site specifically is underlain by between 10 to 15 feet of artificial fill (Kleinfelder, 2013). These disturbed deposits would not yield buried archaeological resources.

4.3.2.3 Cultural Setting

Prehistoric Context

Archaeologists have developed individual cultural chronological sequences tailored to the archaeology and material culture of each subregion of California. Each of these sequences is based principally on the presence of distinctive cultural traits and stratigraphic separation of

deposits. Milliken et al. (2007) suggest a framework for the interpretation of the San Francisco Bay Area. That research divides human history in California into three broad periods: the Early Period, the Middle Period, and the Late Period. Economic patterns, stylistic aspects, and regional phases further subdivide cultural patterns into shorter phases. This scheme uses economic and technological types, socio-politics, trade networks, population density, and variations of artifact types to differentiate between cultural periods.

Ethnographic Background

Based on a compilation of ethnographic, historic, and archaeological data, Milliken (1995) describes a group known as the Ohlone, who once occupied the general vicinity of the Project site. Levy (1978) describes the language group spoken by the Ohlone, known as “Costanoan.” This term is originally derived from a Spanish word designating the coastal peoples of Central California. Today Costanoan is used as a linguistic term that references to a larger language family spoken by distinct sociopolitical groups that spoke at least eight languages (as different as Spanish is from French) of the same Penutian language group. The Ohlone once occupied a large territory from San Francisco Bay in the north to the Big Sur and Salinas Rivers in the south. The Project site is in the greater *Karkin*-speaking tribal area, centered on both sides of the Carquinez Strait (Milliken et al., 2009).

Historical Background

The first Europeans to visit the San Francisco Bay area were Spanish explorers who passed through in 1772. After Mexico won independence from Spain in 1821, large tracts of land in California were granted to military heroes and loyalists. The area surrounding Benicia became a portion of Mariano Vallejo’s military territory with the purchase of Rancho Suscol from the government in 1844, which included control of Mission Sonoma and the Benicia area. In 1847 the United States government acquired 252-acres adjacent to the City of Benicia for a military reserve. The Benicia Barracks were constructed in 1849 and in 1851 the first Ordnance Supply Depot in the West was established. In 1852 it was designated the Benicia Arsenal. Benicia became a vital metropolis for Northern California that rivaled San Francisco in terms of religious, military, and educational diversity and centrality. The Benicia Arsenal was deactivated in 1963, and the facility was closed in 1964. The Arsenal Historic Conservation Plan, adopted by the City of Benicia in 1993, includes objectives and policies for the preservation of buildings and structures associated with the historic arsenal.

Cultural Resources Research and Assessment

ESA conducted a records search of all pertinent survey and site data at the Northwest Information Center (NWIC) of the California Historical Resources Information System on July 31, 2002 with an update on January 28, 2013 (File No. 12-0760). The records were accessed by referring to the Benicia USGS 7.5-minute quadrangle map, Sections 25 and 30, Township 2 North, Range 3 West and 2 West. The review included the Project site, as shown in Figures 3-2 through 3-3, and a half-mile buffer. Previous surveys, studies, and site records were accessed as they pertained to the Project site. Records were also accessed and reviewed in the *Historic Property Data File for*

Solano County, which includes listings from the *National Register of Historic Places*, the *California Register of Historical Resources*, the *California Inventory of Historic Resources*, the *California Historical Landmarks*, and the *California Points of Historical Interest*.

The records search indicated that no previously recorded archaeological resources have been identified within the Project site or within the half-mile records search radius. Qualified archaeologists conducted a pedestrian survey of the Refinery in 2001 (URS, 2001). The surveyors noted the extent of soil disturbance due to grading and identified no archaeological resources within the boundaries of the Refinery. Based on previous development/disturbance in the Refinery property generally and the Project site specifically, as well as expected ground disturbance from the Project, there is a very low potential to uncover archaeological resources.

The records search indicated that the nearest known recorded architectural resource is the Benicia Arsenal Igloo Bunker #C-425 (designated as P-48-000516; Dexter, 2001). This structure is a World War II-era concrete ammunition bunker within the Refinery property that was previously recommended not eligible for listing in the California Register of Historical Resources (CRHR) or the National Register of Historic Places (NRHP). The bunker is located over 1,000 feet west of the Project site and would be unaffected by the Project.

4.3.2.4 Regulatory Setting

Federal Regulations

Archaeological resources are protected through the National Historic Preservation Act (NHPA) of 1966, as amended (16 USC 470f), and its implementing regulations. Prior to implementing an “undertaking” (e.g., federal funding or issuing a federal permit), Section 106 of the NHPA requires federal agencies to consider the effects of the undertaking on historic properties (i.e., properties listed in or eligible for listing in the NRHP) and to afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on any undertaking that would adversely affect properties eligible for listing in the NRHP. Under the NHPA, a property is considered significant if it meets the NRHP listing criteria at 36 CFR 60.4, as stated below:

The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and that:

- a) Are associated with events that have made a significant contribution to the broad patterns of our history, or
- b) Are associated with the lives of persons significant in our past, or
- c) Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction, or
- d) Have yielded, or may be likely to yield, information important in prehistory or history.

Federal review of projects is normally referred to as the Section 106 process. This process is the responsibility of the federal lead agency. The Section 106 review normally involves a four-step procedure, which is described in detail in the implementing regulations (36 CFR Part 800):

- Identify historic properties in consultation with the State Historic Preservation Officer (SHPO) and interested parties;
- Assess the effects of the undertaking on historic properties;
- Consult with the SHPO, other agencies, and interested parties to develop an agreement that addresses the treatment of historic properties and notify the Advisory Council on Historic Preservation; and finally,
- Proceed with the project according to the conditions of the agreement.

State Regulations

The State of California implements the NHPA of 1966, as amended, through its statewide comprehensive cultural resource surveys and preservation programs. The California Office of Historic Preservation, as an office of the California Department of Parks and Recreation (DPR), implements the policies of the NHPA on a statewide level. The Office of Historic Preservation also maintains the California Historical Resources Inventory. The SHPO is an appointed official who implements historic preservation programs within the State's jurisdictions.

California Environmental Quality Act

CEQA, as codified in Public Resources Code (PRC) Section 21000 et seq., is the principal statute governing the environmental review of projects in the State. CEQA requires lead agencies to determine if a proposed project would have a significant effect on historical resources, including archaeological resources. The CEQA Guidelines define a historical resource as: (1) a resource in the CRHR; (2) a resource included in a local register of historical resources, as defined in PRC Section 5020.1(k) or identified as significant in a historical resource survey meeting the requirements of PRC Section 5024.1(g); or (3) any object, building, structure, site, area, place, record, or manuscript that a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California, provided the lead agency's determination is supported by substantial evidence in light of the whole record.

If a lead agency determines that an archaeological site is a historical resource, the provisions of PRC Section 21084.1 and CEQA Guidelines Section 15064.5 would apply. If an archaeological site does not meet the CEQA Guidelines criteria for a historical resource, then the site may meet the threshold of PRC Section 21083 regarding unique archaeological resources. A unique archaeological resource is "an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

- 1) Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.

- 2) Has a special and particular quality such as being the oldest of its type or the best available example of its type.
- 3) Is directly associated with a scientifically recognized important prehistoric or historic event or person (PRC Section 21083.2 [g]).

The CEQA Guidelines note that if a resource is neither a unique archaeological resource nor a historical resource, the effects of the project on that resource shall not be considered a significant effect on the environment (CEQA Guidelines Section 15064[c][4]).

California Register of Historical Resources

The CRHR is “an authoritative listing and guide to be used by state and local agencies, private groups, and citizens in identifying the existing historical resources of the state and to indicate which resources deserve to be protected, to the extent prudent and feasible, from substantial adverse change” (PRC Section 5024.1[a]). The criteria for eligibility to the CRHR are based on NRHP criteria (PRC Section 5024.1[b]). Certain resources are determined by the statute to be automatically included in the CRHR, including California properties formally determined eligible for or listed in the NRHP.

To be eligible for the CRHR a historical resource must be significant at the local, state, and/or federal level under one or more of the following criteria:

- 1) Is associated with events that have made a significant contribution to the broad patterns of California’s history and cultural heritage.
- 2) Is associated with the lives of persons important in our past.
- 3) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.
- 4) Has yielded, or may be likely to yield, information important in prehistory or history (PRC Section 5024.1[c]).

For a resource to be eligible for the CRHR, it must also retain enough integrity to be recognizable as a historical resource and to convey its significance. A resource that does not retain sufficient integrity to meet the NRHP criteria may still be eligible for listing in the CRHR.

Provisions for Paleontological Resource Protection

PRC Section 5097.5 prohibits “knowing and willful” excavation, removal, destruction, injury, and defacement of any paleontological feature on public lands (lands under state, county, city, district, or public authority jurisdiction, or the jurisdiction of a public corporation), except where the agency with jurisdiction has granted permission.

Effects on Human Remains

Under State law, human remains and associated burial items may be significant resources in two ways: they may be significant to descendent communities for patrimonial, cultural, lineage, and religious reasons; and human remains may also be important to the scientific community, such as

prehistoric archaeologists, epidemiologists, and physical anthropologists. The specific stake of some descendent groups in ancestral burials is a matter of law for some groups, such as Native Americans (CEQA Guidelines Section 15064.5 (d), PRC Section 5097.98). In other cases, the concerns of the associated descendent group regarding appropriate treatment and disposition of discovered human burials may become known only through outreach. Beliefs concerning appropriate treatment, study, and disposition of human remains and associated burial items may be inconsistent and even conflict between descendent and scientific communities. CEQA and other State regulations concerning Native American human remains provide the following procedural requirements to assist in avoiding potential adverse effects to human remains within the contexts of their value to both descendent communities and the scientific community:

- When an initial study identifies the existence or probable likelihood that a project would impact Native American human remains, the lead agency is to contact and work with the appropriate Native American representatives identified through the Native American Heritage Commission (NAHC) to develop an agreement for the treatment and disposal of the human remains and any associated burial items (CEQA Guidelines Section 15064.5 [d], PRC Section 5097.98).
- If human remains are accidentally discovered, the county coroner must be contacted. If the county coroner determines that the human remains are Native American, the coroner must contact the NAHC within 24 hours. The NAHC must identify the most likely descendant (MLD) to provide for the opportunity to make recommendations for the treatment and disposal of the human remains and associated burial items. If the MLD fails to make recommendations within 48 hours of notification or the project applicant rejects the recommendations of the MLD, the Native American human remains and associated burial items must be reburied in a location not subject to future disturbance within the project site (PRC Section 5097.98).
- If potentially affected human remains/burial may have scientific significance, whether or not having significance to Native Americans or other descendent communities, then under CEQA, the appropriate mitigation of effect may require the recovery of the scientific information of the remains/burial through identification, evaluation, data recovery, analysis, and interpretation (CEQA Guidelines Section 15064.5[c][2]).

4.3.3 Significance Criteria

Based on CEQA Guidelines Section 15064.5 and CEQA Guidelines Appendix G, a project would cause adverse impacts to cultural resources if it would:

- a) Cause a substantial adverse change in the significance of a historical resource as defined in CEQA Guidelines Section 15064.5;
- b) Cause a substantial adverse change in the significance of a unique archaeological resource pursuant to CEQA Guidelines Section 15064.5;
- c) Directly or indirectly destroy a unique paleontological resource or site or unique geological feature; or
- d) Disturb any human remains, including those interred outside of formal cemeteries.

4.3.4 Discussion of No Cultural Resources Impacts

Review and comparison of the setting circumstances and Project characteristics with the significance criteria stated above, clearly show that no impacts would result for any of these criteria. The following discusses the reasoning supporting this conclusion:

a) Cause a substantial adverse change in the significance of a historical resource as defined in CEQA Guidelines Section 15064.5.

CEQA Guidelines Section 15064.5 requires the lead agency to consider the effects of a project on historical resources. A historical resource is defined as any building, structure, site, or object listed in or determined to be eligible for listing in the California Register of Historical Resources, or determined by a lead agency to be significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, or cultural annals of California. The following discussion focuses on architectural and structural resources. Archaeological resources, including archaeological resources that are historical resources according to Section 15064.5, are addressed below under criteria b).

The Project would not impact any previously recorded historic-period buildings or structures within the Project site. As discussed in Section 4.3.2.3 Cultural Setting above, the nearest known recorded resource is the Benicia Arsenal Igloo Bunker #C-425. This structure is located over 1,000 feet west of the Project site and would be unaffected by the Project.

The Project would have no impact on historical resources and no mitigation is required.

b) Cause a substantial adverse change in the significance of a unique archaeological resource pursuant to CEQA Guidelines Section 15064.5.

This section discusses archaeological resources, both as historical resources according to CEQA Guidelines Section 15064.5 as well as unique archaeological resources as defined in Public Resources Code Section 21083.2 (g).

The records search at the NWIC discussed above indicates that no previously recorded archaeological resources are located within the Project site or within the half-mile records search radius. Qualified archaeologists conducted a pedestrian survey of the Refinery in 2001 (URS, 2001). The surveyors noted that the extent of soil disturbance due to grading and identified no prehistoric archaeological resources within the boundaries of the Refinery.

No unique prehistoric or historic-period archaeological resources were identified within the Project site during the background research or the 2001 surface survey. Based on previous development/disturbance in the Refinery property generally and the Project site specifically, as well as expected ground disturbance from the Project, there is a very low potential to uncover archaeological resources.

Based on the geologic context and proposed depth of ground disturbance there would be no impact on archaeological resources and no mitigation is required.

c) Directly or indirectly destroy a unique paleontological resource or site or unique geological feature.

Rock formations that are considered of paleontological sensitivity are those rock units that have yielded significant vertebrate or invertebrate fossil remains. The soils of the Project site consist of approximately 10 to 15 feet of artificial fills below the ground surface. The Project would not extend below the artificial fills.

Artificial fill does not have paleontological potential and no mitigation is required.

d) Disturb any human remains, including those interred outside of formal cemeteries.

There is no indication that the Project site has been used for burial purposes in the recent or distant past. The soils of the Project site consist of approximately 10 to 15 feet of artificial fills below the ground surface.

Based on the geologic context of the Project site and proposed depth of ground disturbance, there would be no potential to uncover human remains and no mitigation is required.

4.3.5 Discussion of Impacts and Mitigation Measures

There would be no impacts to cultural resources.

4.4 Energy Conservation

4.4.1 Introduction

This section presents analysis of the Project's relationship to energy conservation goals as described in Appendix F of the CEQA Guidelines. This section discusses the physical and regulatory setting, the baseline for determining environmental impacts, the significance criteria used for determining environmental impacts, and potential impacts associated with construction and operation of the Project.

4.4.2 Setting

The Refinery is a component of the energy infrastructure in the State of California. The Refinery currently processes a range of raw materials to produce gasoline, diesel, and other fuels for the California market. Approximately 70% of the Refinery's product is clean-burning gasoline; other products include diesel, jet fuel, fuel oil, propane and asphalt.

4.4.2.1 Regional Setting

California's energy system includes electric, natural gas, hydroelectric, nuclear, and petroleum resources. California's energy production system provides 71% of the electricity, 12% of the natural gas, and 38% of the petroleum consumed or used for the State. The rest of the State's energy needs are imported and include: natural gas purchases from Canada (22%), the Rocky Mountain states (23%), and the Southwest (42%); electricity from the Pacific Northwest (8%, primarily hydroelectric-generated) and the Southwest (21%, primarily coal and nuclear generated); and crude oil imported from Alaska (12%) and foreign sources (50%) (CEC, 2011).

The production of electricity requires the consumption or conversion of energy resources, including water, wind, oil, gas, coal, solar, geothermal, and nuclear sources. Of the electricity generated in-State in 2012, 61.1% was generated by natural gas-fired power plants, 0.8% was generated by coal-fired power plants, 11.7% came from large hydroelectric dams, and 9.3% came from nuclear power plants. The remaining 17.1% of the in-State total electricity production was supplied by renewable sources (CEC, 2011). The electricity generated is distributed via a network of transmission and distribution lines commonly referred to as the power grid (CEC, 2013).

4.4.2.2 Project Setting

In 2001, Valero installed a one-unit 51 megawatt (MW) cogeneration plant. This unit met power demand of existing Refinery operations and effectively removed that demand from the grid at the time. In that timeframe, Valero considered installation of a second 51 MW cogeneration unit but decided not to implement it. In 2002, the Refinery power use was approximately 50 MW of electricity. As part of its 2003 Valero Improvement Project (VIP) Valero also proposed to increase its electrical power use by about 23 MW. This increase in energy use was approved as part of the approval of the VIP in 2003 by the City of Benicia.

The Refinery uses natural gas as the marginal fuel when it is not economical or possible to use refinery gas or propane. Natural gas is typically used as a feedstock for the processes that produce clean fuels. In addition, the Refinery currently generates most of the electricity and refinery gas necessary to operate the Refinery and with the Project, would continue this practice.

4.4.2.3 Regulatory Setting

Federal and state agencies regulate energy use and consumption through various programs. On the federal level, the U.S. Department of Transportation, U.S. Department of Energy, and U.S. Environmental Protection Agency are three agencies with substantial influence over energy policies and programs. Generally, federal agencies influence transportation energy consumption through establishment and enforcement of fuel economy standards for automobiles and light trucks, through funding of energy related research and development projects, and through funding for transportation infrastructure projects. On the state level, the California Public Utilities Commission and California Energy Commission (CEC) are the two agencies with authority over different aspects of energy.

In addition, the Federal Railroad Administration (FRA) was created by the Department of Transportation Act of 1966. It is one of ten agencies within the U.S. Department of Transportation concerned with intermodal transportation, and implements federal environmental laws and policies related to the nation's railroads. Any discretionary decisions are made by the FRA for projects under their jurisdiction; however, the Project does not require FRA approval.

Federal Regulations

Energy Policy and Conservation Act

The Energy Policy Act of 1975 was established in response to the oil crisis of 1973, which increased oil prices due to a shortage of reserves. The Act required that all vehicles sold in the U.S. meet certain fuel economy goals. Since 1990, the fuel economy standard for new passenger cars has been 27.5 miles per gallon. Since 1996, the fuel economy standard for new light trucks (gross vehicle weight of 8,500 pounds or less) has been 20.7 miles per gallon. Heavy-duty vehicles (i.e., vehicles and trucks over 8,500 pounds gross vehicle weight) are not subject to fuel economy standards. This Act indirectly applies to the Project due to its requirements for increased fuel economy standards particularly for the construction equipment to be used.

Energy Policy Act of 2005

The Energy Policy Act of 2005 seeks to reduce reliance on non-renewable energy resources and provide incentives to reduce current demand on these resources. For example, under the Act, consumers and businesses can attain federal tax credits for purchasing fuel-efficient appliances and products, buying hybrid vehicles, building energy efficient buildings, and improving the energy efficiency of residential and commercial buildings. Additionally, tax credits are available for the installation of qualified fuel cells, stationary microturbine power plants, and solar power equipment.

State and Local Regulations

State of California Integrated Energy Policy

In 2002, the Legislature passed Senate Bill 1389, which required the CEC to develop an integrated energy plan biannually for electricity, natural gas, and transportation fuels, for the California Energy Report. The plan calls for the State to assist in the transformation of the transportation system to improve air quality, reduce congestion, and increase the efficient use of fuel supplies with the least environmental and energy costs. To further this policy, the plan identifies a number of strategies, including assistance to public agencies and fleet operators in implementing incentive programs for Zero Emission Vehicles and their infrastructure needs, and encouragement of urban designs that reduce vehicle miles traveled and accommodate pedestrian and bicycle access.

The latest update – the *2013 Integrated Energy Policy Report Update* – was proposed for adoption by the CEC on December 20, 2013 (CEC, 2013) and provides the results of the CEC’s assessments of a wide variety of energy issues currently facing California. These issues include future demand for electricity, natural gas, and transportation fuels; energy efficiency in California’s existing buildings; publicly owned utilities’ progress toward achieving 10-year energy efficiency targets; the definition of zero-net-energy and its inclusion in state building standards; challenges to increased use of geothermal heat pump/ground loop technologies and procurement of biomethane; using demand response to meet California’s energy needs and integrate renewable technologies; bioenergy development; California’s electricity infrastructure needs given potential retirement of power plants and the closure of the San Onofre Nuclear Generating Station; new generation costs for utility-scale renewable and fossil-fueled generation; the need for investments in new or upgraded transmission infrastructure; utility progress in implementing past recommendations related to nuclear power plants; natural gas market trends; the Alternative and Renewable Fuel and Vehicle Technology Program; potential vulnerability of California’s energy supply and demand infrastructure to the effects of climate change, and potential electricity system needs in 2030.

City of Benicia Municipal Code

Chapter 17.32 of the City of Benicia Municipal Code contains several regulations and performance standards regarding Industrial District land uses, but does not contain specific policies related to energy conservation within industrial land uses that apply to the Project.

City of Benicia General Plan

The City of Benicia General Plan identifies goals and policies pertaining to energy conservation, however they are related to urban development and do not specifically apply to the Project.

Solano County General Plan

The Solano County General Plan’s Energy Resources and Conservation section identifies Gasoline as an important source of energy in the county, including operations of the Refinery, and recognizes that it is an important contributor to energy production and the local economy. Specific goals identified within this section primarily focus on increasing efficiency of energy resources, and reducing energy consumption in all new and existing development, as well as the need to produce renewable energy, which will help the county reduce its reliance on fossil fuels.

City of Benicia Climate Action Plan

On September 15, 2009, the Benicia City Council adopted the Benicia Climate Action Plan (CAP), which identifies specific measures on how the City can achieve GHG reduction targets. The Climate Action Plan has established targets for City government operations and for the community at large. The City government goal is to reduce GHG emission 25 percent below 2000 levels by 2010 and 33 percent below 2000 by 2020. The community-wide emission reduction goal is to maintain 2005 emission levels by 2010 and reduce emissions to 10 percent below 2000 levels by 2020.

In 2014, the City Council accepted the 2010 GHG Inventory Update Report, which quantified 2010 emissions and assessed the City's progress toward meeting its reduction targets. The City narrowly missed its reduction targets (reduced emissions by 21%), while community-wide emissions excluding large emitters increased (41%) (emissions increased by only 24% including large emitters). As part of the 2010 update, the City decided to report emissions from large emitters, but ultimately exclude them utilizing a method developed in nearby Contra Costa County. Permitted entities, 64% of natural gas use (process related), and Valero's emissions were ultimately excluded from totals and will allow the City to focus on those entities over which it has regulatory control. The Update Report also included reference to emission reducing projects completed by Valero including:

- Participated in the Solano Napa Commute Challenge; 24 people registered and 15 people completed the challenge. Valero earned a "Top 10" in the county for its participation.
- Nominated by the Solano Transportation Authority (STA) Board for Business of the Year (16th Annual STA Awards).
- Installed new heat exchanger that recovers heat from various processes and uses it to heat new crude oil. Nexant, the third-party company hired by PG&E to verify energy savings, reported that the exchanger will save 3,530 metric tons of CO₂e annually.
- Changed shift cycles from 8 hours to 12 hours; 2 shifts per day instead of 3, reducing one round-trip commute for 275 people. In addition, employees travel during non-heavy commute times, reducing trip time and congestion during peak travel times.
- Installed Flue Gas Scrubber (FGS) unit at refinery. The FGS is designed to reduce SO₂ (sulfur dioxide) and NO_x (nitrogen oxide, a precursor to smog), and particulate matter (PM). Since startup in February 2011, the FGS has reduced emissions of SO₂ by over 6,000 tons (95% reduction), 750 tons of NO_x (55% reduction), and 60 tons of particulate matter per year. This project also allowed the refinery to retire older heaters in favor of new energy-efficient furnaces. Finally, this project also eliminates air emissions of ammonia that were previously used to control NO_x.

4.4.2.4 Project Baseline

For the energy conservation analysis, the baseline reflects the existing energy used and/or produced at the Refinery as it existed at the time of preparation of the Initial Study / Mitigated Negative Declaration i.e., Spring 2013.

4.4.3 Significance Criteria

Appendix F of the CEQA Guidelines provides guidance for assessing energy impacts of projects. The appendix provides three goals:

- Decreasing overall per capita energy consumption;
- Decreasing reliance on natural gas and oil; and
- Increasing reliance on renewable energy sources.

Consistent with Appendix F, environmental impacts evaluated in this analysis include:

- a) The Project's energy requirements by amount and fuel type for each stage of the Project including construction, operation, maintenance and/or removal;
- b) The effects of the Project on local and regional energy supplies and on requirements for additional capacity;
- c) The effects of the Project on peak and base period demands for electricity and other forms of energy;
- d) The degree to which the Project complies with existing energy standards;
- e) The effects of the Project on energy resources; and
- f) The Project's projected transportation energy use requirements and its overall use of efficient transportation alternatives.

4.4.4 Discussion of No Energy Conservation Impacts

Review and comparison of the setting circumstances and Project characteristics with each of the six significance criteria stated above, clearly show that no impacts would result with respect to the following four issues.

- b) The Project would cause no adverse effect on local and regional energy supplies or requirements for additional capacity.**
- c) Generally, the effects of the Project on peak and base period demands for electricity and other forms of energy would be neutral or beneficial.**
- d) The Project complies with existing energy standards by directly supporting and furthering efforts toward achieving those standards.**
- e) The Project would have no adverse effect on energy resources**

The following discusses the reasoning supporting this no impact conclusion for the four above criteria:

The Refinery currently generates most of the electricity and refinery gas necessary to operate the Refinery and with the Project, would continue this practice. The Project would change the transportation method used to deliver a portion of the crude oil to the Refinery. Operation of the Project is not expected to increase the total Refinery electrical and fuel usage. Furthermore, the

Project would directly support energy conservation efforts through the implementation of energy conservation measures. As described above, the Project is not expected to increase the total Refinery electrical and fuel usage; therefore, it would not be expected to result in any adverse effects on existing energy resources available to the local area or region.

The construction and implementation of the Project would be required to comply with current energy standards and policies including local building codes and energy related standards for industrial structures. The City of Benicia and the County of Solano do not currently have any energy efficiency policies or standards specifically related to industrial development. However, in order to support efforts toward achieving current energy standards, Valero proposes to incorporate energy conservation measures into the Project that include installing: 1) Energy efficient lighting; 2) High efficiency electric motors; and 3) High efficiency pumps. Thus, the Project would not conflict with energy efficiencies or standards. The Project would not increase the volume of crude oil delivered to the Refinery because crude oil quantities delivered by train would be offset by a corresponding decrease in crude oil deliveries by marine vessels. The Project would replace marine vessel delivery with rail delivery, resulting in an approximate 81% reduction in marine vessel deliveries. In addition, the amount of energy that would be utilized under the Project is projected to be approximately equal to the amount of energy currently utilized in order to pump and transport the crude oil to the storage facility from the proposed unloading rack in comparison to existing pumping from the marine terminal. Furthermore, Valero proposes to implement energy conservation measures, such as the use of high efficiency lighting, high efficiency electric motors, and high efficiency pumps at the proposed tank car unloading rack. Thus, the operational energy usage from the Project is not expected to represent a substantive increase in energy consumption, or a wasteful or unnecessary consumption of energy, and would not have a significant impact to energy resources.

The Benicia Climate Action Plan (CAP) described above in Section 4.4.2.3 lists several energy-related non-binding strategies specific to the Valero Refinery in general to reduce emissions of greenhouse gasses. These strategies are:

E-3.1: Encourage Parking Lot Solar Photovoltaic Arrays

“Photovoltaic arrays can be placed on shade structures above parking lots, providing a large area for photovoltaic panels. Such projects could be developed at large parking lot sites belonging to Amports, Benicia High School, Valero, and the City.”

IC-4.2. Investigate On-site Energy Production

“Generating on-site energy reduces fluctuation in energy cost and increases the efficiency of the power generated because of reduced transmission loss. The refinery should aggressively pursue increased on-site energy production. As future demand and processes change, Valero should consider becoming operationally independent for energy supply. On-site energy production measures include photovoltaic, wind power, and an increased number of cogeneration systems, as well as the exploration of fuel cell technologies for energy storage.”

Valero already self generates most of its onsite electrical energy through its cogeneration unit (see Section 4.4.2.2 above) installed in 2001. So, in some respects, Valero has already complied with

IC-4.2. With regard to E-3.1, there are no new proposed parking lots associated with the Project and while this may be a strategy the Refinery may implement in the future, because the energy operational demand for the Project would be similar to existing conditions, there does not appear to be a Project-specific need for a parking lot solar installation to support the Project.

In summary, under operation of the Project, the Refinery would not increase the importation or exportation of product, and would continue to be a net exporter of energy. The Project would utilize a more efficient mode of transportation of product, implement energy conservation measures, and would not have a significant effect on local and regional energy supplies, and construction related impacts would be short term and temporary in nature; therefore, the Project would have no impact on issues outlined in the four significance criteria items above.

4.4.5 Discussion of Impacts and Mitigation Measures

This energy analysis addresses the changes in energy conservation that would result from the construction and operation of the Project.

Although two of the objectives of Appendix F focus on decreasing reliance on natural gas and oil and increasing reliance on renewable energy sources, these hydrocarbon energy sources remain critical to the functioning of society today. As a part of the State's energy infrastructure, the Refinery produces gasoline, diesel, and other hydrocarbon fuels for the California market, which enable the State economy to continue in support of the State's long-term energy goals.

- a) **Would the Project's energy requirements by amount and fuel type for each stage of the Project, including construction, operation, maintenance and/or removal, be considered significant?**

Impact 4.4-1: Construction and operation of the Project would result in consumption of energy and could cause adverse effect on local and regional energy supplies or requirements. (*Less than Significant with Mitigation*)

Construction

Although construction-related energy consumption would be short-term in duration, it would represent irreversible consumption of fossil fuel energy resources. Construction-related energy expenditures would include both direct and indirect uses of energy in the form of fuel (typically diesel and gasoline) and electricity. Indirect energy use typically represents about three-quarters of total construction-related energy consumption, while direct energy represents about one-quarter of consumption (Hannon et al., 1978). Direct energy use would include the consumption of petroleum fuels for operation of construction vehicles and the use of electricity for construction equipment, such as welding machines and power tools. Energy consumed by power equipment used during construction would be relatively minimal, as would be the energy required for any required lighting and operation of ancillary electrical equipment. Indirect energy use includes the energy required to make the materials and components used in construction of the Project. This includes energy used for extraction of raw materials, manufacturing, and transportation associated with manufacturing. Implementation of Mitigation Measure 4.1-1, which is described and analyzed in Section 4.1, *Air Quality*, would ensure that fuel energy consumed in the construction phase

would not be wasted through unnecessary idling or through the operation of poorly maintained equipment. With implementation of Mitigation Measure 4.1-1 and the short construction period, construction of the Project would be less than significant.

Operations

The exact amount of energy usage by Project operations is not known. However, as the Project would off load and pump the same amount of crude feedstocks uphill to the same tanks used by the current marine vessels, it is assumed that the average energy use from the Project would be similar to the equivalent operations for the same crude feedstocks at the marine terminal, i.e., because the Project would simply replace the same amount of crude being delivered by marine vessel with it being delivered by tanker car, there should be no real significant change in energy use. Therefore, impacts from operations and maintenance of the Project related to energy conservation would be less than significant.

f) Would the Project's projected transportation energy use requirements be significant, and would the Project's overall use of transportation alternatives be efficient?

Impact 4.4-2: Transportation energy usage for the Project could result in wasteful or unnecessary consumption of energy. (*Less than Significant*)

As discussed Section 4.4.4 and in the discussion of Impact 4.4-1 above, Project construction and operation would result in the consumption of energy (primarily though fuel usage) during transportation of labor and materials to and from the Project site. This transportation-related energy usage would be greatest during construction activities. For the reasons discussed above, construction-related transportation energy use would be less than significant.

During Project operations, transportation-related energy usage in the form of diesel fuel used by trains bringing crude oil feedstocks to the Refinery and returning empty tank cars to North American source locations for refilling. However, with the Project marine vessels that currently deliver crude oil feedstocks would be reduced by approximately 81% on an annual basis. This reduction in energy use from marine vessel trips would be offset to some degree by the increase in energy use with the Project-related rail trips. Given that distances to potential crude feedstock sources over the life of the Project for both marine vessel and rail transport are likely to vary and depend on future market forces, it would be speculative to estimate or compare exact energy usage differences between the two modes of transport. However, published data are available to generally compare these two transport modes. One study suggests that marine vessels in domestic waters can typically travel 514 miles / gallon of fuel while transporting one ton of cargo, while rail transport can typically travel 202 miles / gallon of fuel while transporting one ton of cargo (Tennessee-Tombigbee Waterway, 2014). Another study estimated the differences as 340 person miles per gallon (pmpg) for marine vessels and 190.5 pmpg for rail transport (True Cost, 2014). These general data suggests that rail transport varies between less than half to three quarters in efficiency when compared to marine vessel transport on a per mile basis. Although as already stated, exact distances to potential crude feedstocks are not known for either marine vessel or rail

transport, it is likely that rail transport of North American sourced crude would tend to be much shorter than crude brought from Alaska or more distant foreign sources by marine vessels.

In summary, with operation of the Project although transportation of crude feedstocks would tend to be less efficient than marine vessels, the Refinery would continue to be a net exporter of energy to the marketplace. Thus, the change in efficiency in transportation energy usage from the Project would not represent a wasteful or unnecessary consumption of energy and would be a less-than-significant impact.

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4.5 Geology and Soils

4.5.1 Introduction

This section describes the existing geology, soil conditions, and seismicity in the Project area in terms of local topography, geology, soil resources, and regional seismicity. This section also identifies local geologic and seismic hazards that could affect structures associated with the Project. The study area relevant to geology, soils, and geologic hazards is the physical footprint of the Project. The study area relevant to faulting and seismic hazards for the physical footprint of the Project is the broader Bay Area region, because distant faults can produce ground shaking and secondary seismic hazards at the Project site. Regulations, plans, and policies including federal and state laws related to geologic and seismic considerations that may be relevant to the Project also are discussed. Environmental impacts are subsequently determined, based on changes in the existing conditions resulting from the Project. The impact analysis is based, in part, on site specific geotechnical studies prepared in support of the Project; Kleinfelder West, Inc. prepared a Geotechnical Seismic Deformation Modeling Report, dated February 5, 2013 (“Kleinfelder, 2013a”) and updated November 15, 2013 which incorporates Kleinfelder 2013a (“Kleinfelder, 2013b”).

4.5.2 Setting

4.5.2.1 Regional Geology

The Project is located in southern Solano County along the northern edge of Suisun Bay in the region of California known as the Coast Ranges geomorphic province. This province is characterized by a series of northwest trending ridges and valleys controlled by tectonic folding and faulting, examples of which include the Suisun Bay to the south, the East Bay Hills and Briones Hills to the southwest, the Vaca Mountains and Napa Valley to the north, and the Diablo Ranges to the southeast.

Regional basement rocks consist of the highly deformed Great Valley Sequence, which include massive beds of sandstone interfingered with siltstone and shale. Unconsolidated alluvial deposits, artificial fill, and estuarine deposits underlie the low-lying region along the margins of the Carquinez Straight and Suisun Bay. The estuarine sediments found along the shorelines of Solano County are soft, water-saturated mud, peat, and loose sands. The organic, soft, clay-rich sediments along the San Francisco and San Pablo Bays are referred to locally as Bay Mud and can present a variety of engineering challenges due to inherent low strength, compressibility, and saturated conditions. Landslides in the region occur in weak, easily weathered bedrock on relatively steep slopes.

4.5.2.2 Local Geology

The Project is located within the existing Valero Benicia Refinery property, an area that has been extensively modified by cutting and filling. The Refinery was constructed in the late 1960's. The Refinery consists of three areas in the Benicia Industrial Park, including the main refinery area,

the crude oil storage area (site of the Project), and the wastewater treatment area. Neither the natural unconsolidated deposits nor the underlying Great Valley Sequence bedrock is noted for unique or scientifically valuable features, and no such features have been reported from the surrounding region (URS, 2002).

Topography

The Refinery is located on an east-facing, 200-foot bedrock hill at the northwestern edge of the property. Weak bedrock composed of younger continental and marine sedimentary rocks and volcanic rocks underlie this hill slope. Along the southwestern side of the Refinery, a south-to-southeast trending alluvial valley and several east-to-west trending tributary valleys dissect the hillside. At the eastern side of the Refinery, and along the proposed rail spur alignment, the hill slopes downward to a broader, relatively flat south-to-southwest trending alluvial valley at an elevation of 10 to 20 feet above mean sea level.

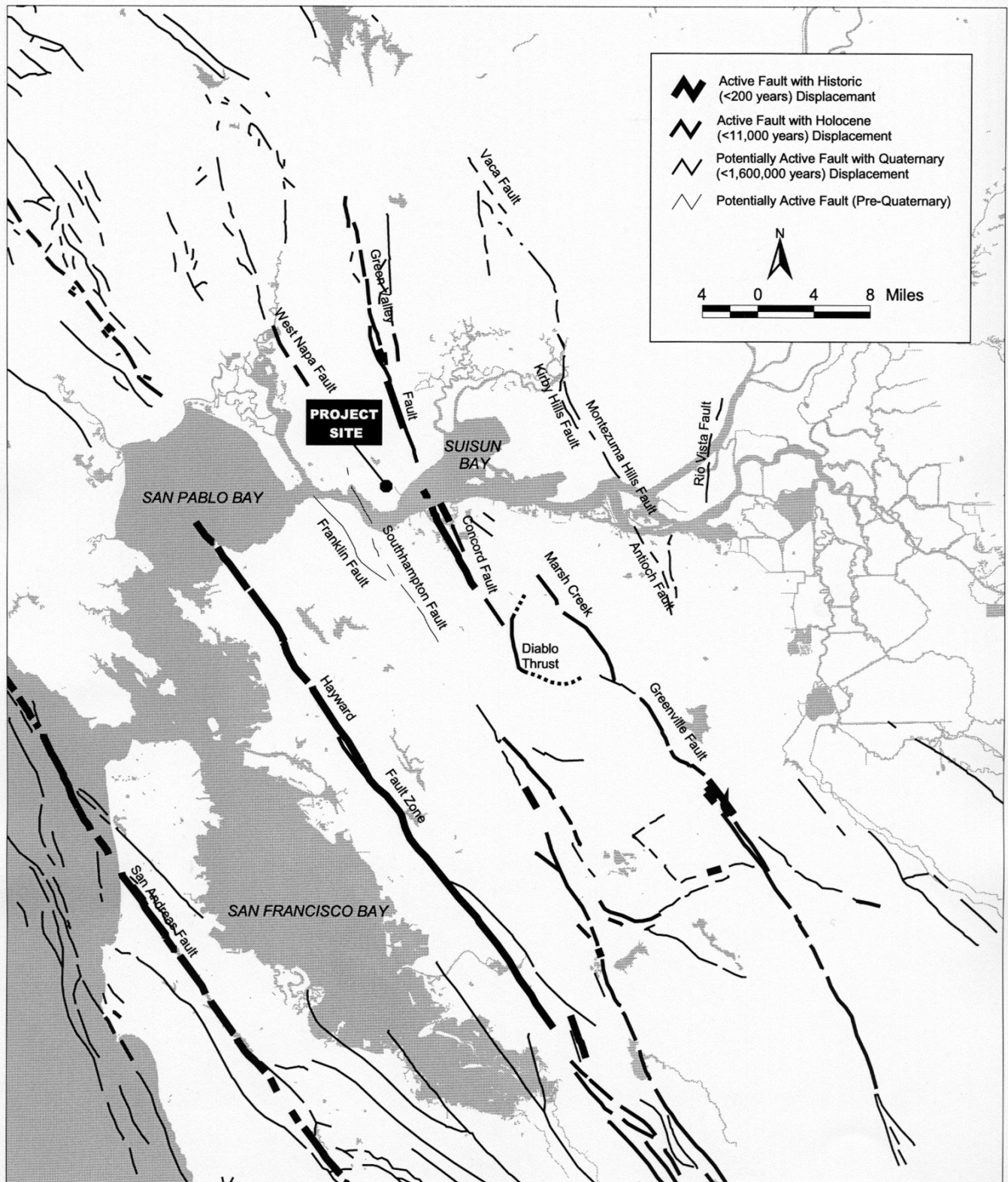
Soils

The hillsides within the Refinery property are covered with a varying thickness of stiff clay-rich colluvium. The colluvium accumulates as a result of in-situ weathering of underlying bedrock that is then subject to down-slope movement by soil creep and slope wash. The colluvium at the Refinery site is predominantly a highly plastic, expansive clay and sandy clay containing some carbonaceous materials. These hillsides have been subjected to extensive cut-and-fill excavation during past construction activities (Woodward-Clyde, 1993). The Project area is generally underlain by about 10 to 15 feet of manmade fill. This manmade fill is in turn underlain by alluvial and residual soils and bedrock. Of the manmade fill, the upper 10 feet is engineered fill. The lower layer of manmade fill is older fill that was placed for the former Benicia Army Arsenal. The native soils below the fill are primarily clays, but sandy layers are present (Kleinfelder, 2013b).

4.5.2.3 Faults and Seismicity

The Project site is located in the seismically active San Francisco Bay region, which is situated on a plate boundary marked by the San Andreas Fault System and several northwest trending active and potentially active faults (see Figure 4.5-1). According to the U.S. Geologic Survey Working Group on California Earthquake Probabilities, there is a 63% likelihood that an earthquake of moment magnitude¹ (Mw) 6.7 or higher will occur in the Bay Area between 2007 and 2037 (USGS, 2008). Although the Project site could be subjected to ground shaking and seismic hazards from movement on any one of the Bay Area Faults, the closest active fault to the Refinery is part of the Concord-Green Valley fault zone. The main trace of the Concord-Green Valley fault extends northwesterly approximately 1.75 miles east of the Project site (Kleinfelder, 2013a). The Working Group on California Earthquake Probabilities (USGS, 2008) assigns a 3% probability to the occurrence of a Mw 6.7 or larger earthquake on the Concord-Green Valley fault

¹ While Richter Magnitude was historically the primary measure of earthquake magnitude, seismologists now use Moment Magnitude as the preferred way to measure earthquakes. The Moment Magnitude scale (Mw) is related to the physical characteristics of a fault, including the rigidity of the rock, the size of fault rupture, and the style of movement or displacement across the fault. Although the formulae of the scales are different, they both contain a similar continuum of magnitude values, except that Mw can reliably measure larger earthquakes and do so from greater distances.



SOURCE: California Department of Conservation, Division of Mines and Geology (After Jennings, 1994)

Benicia Valero CBR . 202115.01

Figure 4.5-1
Active and Potentially Active
Bay Area Earthquake Faults

over the next 30 years. The Concord-Green Valley fault is capable of generating a Maximum Credible Earthquake (MCE) of Mw 7.1.

Other smaller faults in the region classified as potentially active include the Southampton and Franklin faults (see Figure 4.5-1). The Southampton Fault, located approximately 3 miles west of the Project site, extends northwest from Nevada Dock, near the town of Port Costa along the south shore of the Carquinez Strait (USGS, 1968), to an inferred terminal point in the low-lying hills east of the City of Vallejo. The California Geological Survey (CGS) does not consider the Southampton Fault to be active, nor is it zoned as an Earthquake Fault Zone. The maximum credible earthquake for the Southampton fault has been estimated to be Mw 6.25. The Franklin Fault, located approximately 6 miles west of the Project site, is a reverse fault that extends from southwest of the Walnut Creek area to an inferred terminal point located near the town of Selby along the south shore of the Carquinez Strait. The CGS does not consider the Franklin Fault to be active, nor is it zoned as an Earthquake Fault Zone. The maximum credible earthquake for the Franklin Fault has been estimated to be Mw 6.5.

4.5.2.4 Seismic Hazards

Surface Fault Rupture

Seismically induced ground rupture is defined as the physical displacement of surface deposits in response to an earthquake's seismic waves. The magnitude and nature of fault rupture can vary for different faults, or even along different strands of the same fault. Ground rupture is considered more likely along active faults and is regulated under the Alquist-Priolo Earthquake Fault Zoning Act.² Under the Alquist-Priolo Earthquake Fault Zoning Act (formerly the Alquist-Priolo Special Studies Act) of 1972 (revised 1994), Earthquake Fault Zones were established by the California Division of Mines and Geology along "active" faults, or faults along which surface rupture occurred in Holocene time (the last 11,000 years). In the Bay Area, these include the San Andreas, Hayward, Rodgers Creek-Healdsburg, Concord-Green Valley, Greenville-Marsh Creek, Seal Cove/San Gregorio, and West Napa faults. The Project site is not located on a known active fault and is not within an Earthquake Fault Hazard Rupture Zone as defined by the Act (Hart, 1997). The closest active fault to the Project area mapped under the Alquist-Priolo Act is the Concord-Green Valley fault which is oriented north-south and is located approximately two miles east of the Project area (USGS, 2013; CDMG, 1993). Fault rupture is not necessarily bound to occur within the rupture zone, but the likelihood of rupture outside of this demarcation made by the CGS is considered low.

Ground Shaking

Strong ground motion is described as motion of sufficient strength to affect people and their environment or ground movement recorded on a strong-motion instrument or seismograph. Strong ground shaking from earthquakes generated by active faults in Solano County and the Bay Area is a significant hazard to the Project site. Ground movement intensity during an earthquake can vary depending on the overall magnitude, distance to the fault, focus of earthquake energy, and type of

² The Alquist-Priolo Earthquake Fault Zoning Act, signed into law in December of 1972, requires the delineation of zones along active faults. The purpose of the Alquist-Priolo Act is to regulate development on or near active fault traces to reduce the hazard of fault rupture.

geologic material. Areas that are underlain by bedrock tend to experience less ground shaking than those underlain by unconsolidated sediments such as artificial fill. In general, bedrock areas will experience ground shaking of higher frequency, shorter period, and lower amplitude. Structural damage resulting from shaking tends to be worse for structures located on unconsolidated deposits, such as areas underlain by Bay Mud. Earthquake ground shaking may have secondary effects on certain foundation materials, including liquefaction, seismically induced settlement, and lateral spreading (discussed below). The Project site is likely to be subjected to at least one moderate to severe earthquake during the Project lifetime that will cause strong ground shaking.

Terminology and Concepts

Generally, the greater the earthquake magnitude and the closer the fault rupture to a site, the greater the intensity of ground shaking. The amplitude and frequency of ground shaking are related to the size of an earthquake, the distance from the causative fault, the type of fault (e.g., strike-slip), and the response of the geologic materials at the site. Ground shaking can be described in terms of acceleration, velocity, and displacement of the ground. A common measure of ground motion during an earthquake is the peak ground acceleration (PGA).³ Unlike measures of magnitude, which provide a single measure of earthquake energy, PGA varies from place to place, and is dependent on the distance from the epicenter and the character of the underlying geology (e.g., hard bedrock, soft sediments, or artificial fills).

The primary tool that seismologists use to describe ground shaking hazard is a probabilistic seismic hazard assessment (PSHA). The PSHA for the State of California takes into consideration the range of possible earthquake sources and estimates their characteristic magnitudes to generate a probability map for ground shaking. The PSHA maps depict values of PGA that have a 10 percent probability of being exceeded in 50 years (probability of 1 in 475 of occurring in a given year). Use of this probability level allows engineers to design structures to withstand ground motions that have a 90 percent chance of not occurring in the next 50 years, making buildings safer than if they were merely designed for the most probable events.

The Modified Mercalli (MM) Intensity Scale (Table 4.5-1) assigns an intensity value based on the observed effects of ground shaking produced by an earthquake. Unlike measures of earthquake magnitude, the MM intensity scale is qualitative in nature (i.e., it is based on actual observed effects rather than measured values). MM intensity values for an earthquake at any one place can vary depending on its magnitude, the distance from its epicenter, and the type of geologic material. The MM values for intensity range from I (earthquake not felt) to XII (damage nearly total), and intensities ranging from IV to X could cause moderate to significant structural damage⁴. Because the MM Intensity Scale is a measure of ground shaking effects, intensity values can be related to a range of PGA values, also shown in Table 4.5-1.

³ The PGA for a given component of motion is the largest value of horizontal acceleration obtained from a seismograph. PGA is expressed as the percentage of the acceleration due to gravity (g), which is approximately 9.8 meters per second squared.

⁴ The damage level represents the estimated overall level of damage that will occur for various MM intensity levels. Some buildings will experience substantially more damage than this overall level, and others will experience substantially less damage. Not all buildings perform identically in an earthquake. The age, material, type, method of construction, size, and shape of a building all affect its performance.

**TABLE 4.5-1
MODIFIED MERCALLI INTENSITY SCALE**

Intensity Value	Intensity Description	Average Peak Ground Acceleration^a
I	Not felt except by a very few persons under especially favorable circumstances.	< 0.0017 g
II	Felt only by a few persons at rest, especially on upper floors on buildings. Delicately suspended objects may swing.	0.0017 – 0.014 g
III	Felt noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly, vibration similar to a passing truck. Duration estimated.	0.0017 – 0.014 g
IV	During the day felt indoors by many, outdoors by few. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.	0.014 – 0.039 g
V	Felt by nearly everyone, many awakened. Some dishes and windows broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles may be noticed. Pendulum clocks may stop.	0.035 – 0.092 g
VI	Felt by all, many frightened and run outdoors. Some heavy furniture moved; and fallen plaster or damaged chimneys. Damage slight.	0.092 – 0.18 g
VII	Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.	0.18 – 0.34 g
VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motor cars disturbed.	0.34 – 0.65 g
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.	0.65 – 1.24 g
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from riverbanks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks.	> 1.24 g
XI	Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.	> 1.24 g
XII	Damage total. Practically all works of construction are damaged greatly or destroyed. Waves seen on ground surface. Lines of sight and level are distorted. Objects are thrown upward into the air.	> 1.24 g

NOTES:

^a Value is expressed as a fraction of the acceleration due to gravity (g), which is 9.8 meters per second squared. 1.0 g of acceleration is a rate of increase in speed equivalent to a car traveling 328 feet from rest in 4.5 seconds.

SOURCE: ABAG, 2010

Ground Shaking Potential on the Project Site

The Bay Area has experienced many large, damaging earthquakes during historic time. The 1989 moment magnitude (Mw) 6.9 Loma Prieta earthquake caused widespread damage throughout the Bay Area and produced shaking of Modified Mercalli Intensity (MMI) VI in the area of Benicia. The March 31, 1898, Mw 6.3 Mare Island earthquake resulted in significant damage along the northern shore of San Pablo Bay. This earthquake, which may have occurred on the Rodgers Creek fault, resulted in shaking intensities of MMI VII to VIII in the area of the Refinery property. The strongest shaking experienced in the Benicia area during historic time was generated from the April 18, 1906, Great San Francisco earthquake on the San Andreas Fault, which was a Mw 7.9 event. This earthquake produced shaking intensities of MMI VIII and IX (URS, 2002).

The Project site may be subject to strong seismic ground motions. The Concord-Green Valley fault is capable of generating a Maximum Credible Earthquake (MCE) of Mw 7.1. The Working Group on California Earthquake Probabilities (USGS, 2008) assigns a 3% probability to the occurrence of a Mw 6.7 or larger earthquake on the Concord-Green Valley fault over the next 30 years. A Mw 6.7 earthquake on the Concord-Green Valley fault is predicted to result in shaking intensities of MM-VIII (very strong) at the Project site (ABAG, 2013; ABAG, 2010). According to the PSHA, with a 10% probability of exceedance in 50 years (equivalent to an earthquake with a 475-year recurrence interval), the expected ground motions at the site would be 0.5g (CGS, 2013).⁵

Liquefaction and Lateral Spreading

Liquefaction is the sudden temporary loss of shear strength in saturated, loose to medium dense, granular sediments subjected to ground shaking. It generally occurs when seismically-induced ground shaking causes pore water pressure to increase to a point equal to the overburden pressure. Liquefaction can cause foundation failure of buildings and other facilities due to the reduction of foundation bearing strength. The potential for liquefaction depends on the duration and intensity of earthquake shaking, particle size distribution of the soil, density of the soil, and elevation of the groundwater. Portions of the project area that may be at risk due to the effects of liquefaction include areas that have a high groundwater table and are underlain by loose to medium-dense, granular sediments, particularly younger alluvium and non-engineered (uncompacted) artificial fill. Lateral spreading is a ground failure associated with liquefaction and generally results from predominantly horizontal displacement of materials toward relatively unsupported free faces. Unsupported fill slopes can be subject to lateral spreading. Shear and tensile cracking of the ground surface can accompany lateral spreading.

Seismic hazard mapping prepared by the Association of Bay Area Governments (ABAG, 2013), indicates that the Project site is located in a very low risk area for liquefaction. However, geotechnical investigations conducted in the vicinity of the Project (Kleinfelder, 2013a) have identified subsurface conditions that have the potential for seismically induced liquefaction and lateral spreading, including settlement and lateral migration towards Sulphur Springs Creek.

⁵ g is an acceleration equivalent to the earth's gravity = 980 centimeters per second squared. Ground accelerations are scaled by comparison to the earth's gravity. An acceleration of 1.0 g is equivalent to a car traveling 100 meters (328 feet) from rest in 4.5 seconds.

Earthquake-Induced Landslides

Earthquake motions can induce significant horizontal and vertical dynamic stresses in slopes that produce dynamic normal and shear stresses along potential failure surfaces within a slope. The susceptibility for native and engineered slopes to fail depends on the gradient and localized geology as well as the amount of rainfall, excavation, or seismic activities. During a slope failure, a mass of rock, soil, and debris is displaced down slope by sliding, flowing, or falling. Steep slopes and down-slope creep of surface materials characterize areas most susceptible to failure. Engineered slopes have a tendency to fail during an earthquake if not properly designed, constructed, or compacted. The Project site is not characterized by any major slopes and consequently is not considered susceptible to landslides.

Earthquake-Induced Settlement

Settlement of the ground surface can be accelerated and accentuated by earthquakes. During an earthquake, settlement can occur as a result of the relatively rapid compaction and settling of subsurface materials (particularly loose, non-compacted, and variable sandy sediments) due to the rearrangement of soil particles during prolonged ground shaking. Settlement can occur both uniformly and differentially (i.e., where adjoining areas settle at different rates). Typically, areas underlain by artificial fills, unconsolidated alluvial sediments, slope wash, and areas with improperly engineered construction fills are susceptible to this type of settlement. Geotechnical investigations conducted in the project area (Kleinfelder, 2013b) have identified subsurface conditions having the potential for seismically induced settlement.

4.5.2.5 Other Geologic Hazards

Soil Erosion

Soil erosion is the process whereby soil materials are worn away and transported to another area either by wind or water. Rates of erosion can vary depending on the soil material and structure, placement, and human activity. Erosion is most likely on sloped areas with exposed soil, especially where unnatural slopes are created by cut and fill activities. Soil erosion rates can therefore be higher during the construction phase. Typically, the soil erosion potential is reduced once the soil is graded and covered with concrete, structures, or asphalt. Soils in the project area have not been identified that are susceptible to significant, long-term erosion. However, due to soil disturbing activities conducted as part of proposed construction, soil erosion is assessed in Section 4.6, below.

Subsidence and Settlement

Subsidence is the gradual lowering of the land surface due to loss or compaction of underlying materials. Subsidence can occur as the result of hydro-compaction; groundwater, gas, and oil extraction; or the decomposition of highly organic soils. Hydro-compaction is the process of volume decrease and density increase upon saturation of moisture deficient deposits. Settlement is the depression of the bearing soil when a load, such as that of a building or new fill material, is placed upon it. Soils tend to settle at different rates and by varying amounts depending on the load weight, which is referred to as differential settlement. Differential settlement can be a greater

hazard than total settlement if there are variations in the thickness of previous and new fills or natural variations in the thickness and compressibility of soils across an area. Settlement commonly occurs as a result of building construction or other large projects that require soil stockpiles. As noted in Section 4.5.2.2, above, the Project site has been previously graded and filled with approximately 10 feet of engineered fill; consequently, the risk of soil settlement is minimal.

Slope Instability and Landslides

Slope failures, commonly referred to as landslides, include many phenomena that involve the downslope displacement and movement of material, either triggered by static (i.e., gravity) or dynamic (i.e., earthquake) forces. Rock slopes exposed to either air or water can undergo rockfalls, rockslides, or rock avalanches, while soil slopes experience shallow soil slides, rapid debris flows, and deep-seated rotational slides. The Project site is a relatively flat developed area with no hill or slope features susceptible to slope instability.

Expansive Soils

Expansive soils possess a “shrink-swell” behavior. Shrink-swell is the cyclic change in volume (expansion and contraction) that occurs in fine-grained clay sediments from the process of wetting and drying. Structural damage may result over an extended period of time, usually the result of inadequate soil and foundation engineering or the placement of structures directly on expansive soils. The effects of expansive soils could damage foundations of above-ground structures, paved roads and streets, and concrete slabs. Expansion and contraction of soils, depending on the season and the amount of surface water infiltration, could exert enough pressure on structures to result in cracking, settlement, and uplift. Typically, soils that exhibit expansive characteristics comprise the upper five feet of the surface. Geotechnical investigations conducted at the Project site have concluded that the area is underlain by 10 to 15 feet of manmade fill which is in turn underlain by alluvial and residual soils and bedrock (Kleinfelder, 2013a). The upper 10 feet of fill is mainly engineered fill, placed during Refinery development, and is comprised of stiff, moderately expansive clay (Kleinfelder, 2013a).

4.5.2.6 Regulatory Setting

Federal

Federal Railroad Administration

The FRA’s regulations are contained in the Title 49 Code of Federal Regulations (CFR), Chapter 2, Parts 200 - 269. Under FRA regulations, each railroad has primary responsibility to ensure its track meets or exceeds the federal safety standards. This includes railroad inspectors performing track inspections at specified minimum frequencies based on the class of track, the type of track, the annual gross tonnage operated over the track, and whether it carries passenger trains (FRA, 2013). The primary duty of FRA’s federal track safety inspectors, along with certified State inspectors, is to strategically monitor, inspect, and assess track conditions to determine whether a railroad is complying with federal safety standards. The FRA’s federal track safety standards generally focus on track structure, track geometry, road bed (ballast, drainage and vegetation), and track inspection

(FRA, 2013). Track Safety Standards are contained in 49 CFR Parts 213.1 – 213.369. These standards developed a system of classification for track quality. The class of a section of track determines the maximum possible running speed limits for freight and passenger trains as well as various tolerance limits for changes to the track surface. Track surface is the evenness or uniformity of track in short distances measured along the tread of the rails. Under load, the track structure gradually deteriorates due to dynamic and mechanical wear effects of passing trains. Improper drainage, unstable roadbed, inadequate tamping, and deferred maintenance can create surface irregularities. Allowable deviations in track surface are specified in the Track Safety Standards. For example, the track sections proposed as part of the Project can undergo seismic related settlement of 2 inches across the track gage width and maintain compliance with 49 CFR § 213.63 for Class 1 track (IRC, 2013). Settlement of track, such as that proposed as part of the Project, is expected during routine operations and Federal Track Safety Standards (49 CFR § 213) allow for such settlement while maintaining safe operations (IRC, 2013).

The FRA's interest is in ensuring the railroad maintains the track to the appropriate federal safety standards for that class of track. According to FRA Regulations, railroads are required to maintain accurate records of regular and special or ad hoc track inspections. FRA inspectors monitor a railroad's safety performance hundreds of times per year to determine compliance and assess the potential risks or hazards. A railroad is subject to FRA enforcement actions, or possibly liable for civil penalties, if it fails to comply with the track safety standards, or if it operates trains in excess of the designated track speed (FRA, 2013).

State

Alquist-Priolo Earthquake Fault Zoning Act

Alquist-Priolo Earthquake Fault Zoning Act (formerly the Alquist-Priolo Special Studies Zone Act) of 1972 (revised in 1994) is the State law that addresses hazards from earthquake fault zones. The purpose of this law is to mitigate the hazard of surface fault rupture by regulating development near active faults. As required by the Act, the State has delineated Earthquake Fault Zones (formerly Special Studies Zones) along known active faults in California. The Project does not lie within an Alquist-Priolo Zone.

California Building Code

The California Building Standards Commission (CBSC), established in 1953 by the California Building Standards Law, is an independent commission within the State and Consumer Services Agency. Commission members are appointed by the Governor, confirmed by the State Senate, and include building and construction design professionals. The CBSC is charged with many tasks associated with the CBC including review and approval of building standards proposed and adopted by state agencies, codifying and publishing approved building standards in one state building standards code (California Code of Regulations, Title 24), administering California's building code adoption processes, and resolving conflict, duplication, and overlap in building standards.

The California Building Code (CBC), which is codified in Title 24 CCR Part 2, was promulgated to safeguard the public health, safety, and general welfare by establishing minimum standards

related to structural strength, egress facilities, and general building stability. The purpose of the CBC is to regulate and control the design, construction, quality of materials, use/occupancy, location, and maintenance of all buildings and structures within its jurisdiction.

The 2013 CBC is based on the 2009 International Building Code. In addition, the CBC contains necessary California amendments that are based on the American Society of Civil Engineers (ASCE) Minimum Design Standards 7-05. ASCE 7-05 provides requirements for general structural design and includes means for determining earthquake loads as well as other loads (flood, snow, wind, etc.) for inclusion in building codes. The provisions of the CBC apply to the construction, alteration, movement, replacement, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California.

The earthquake design requirements take into account the occupancy category of the structure, site class, soil classifications, and various seismic coefficients, all of which are used to determine a Seismic Design Category (SDC) for a project. The SDC is a classification system that combines the occupancy categories with the level of expected ground motions at the site, and ranges from SDC A (very small seismic vulnerability) to SDC E/F (very high seismic vulnerability and near a major fault). Design specifications are then determined according to the SDC.

Roles and Responsibilities. Implementing the regulatory requirements in the CBC and ensuring that a building is constructed in compliance with the law is the responsibility of the project engineers and Building Officials. The geotechnical engineer, as a registered professional with the State of California, is required to comply with the CBC and local codes while applying standard engineering practice and the appropriate standard of care for the particular region in California, which, in the case of the proposed project, is the San Francisco Bay Area. The California Professional Engineers Act (Building and Professions Code Sections 6700-6799), and the Codes of Professional Conduct, as administered by the California Board of Professional Engineers and Land Surveyors, provides the basis for regulating and enforcing engineering practice in California. The local Building Officials are typically with the local jurisdiction and are responsible for inspections and ensuring CBC compliance.

The geotechnical engineer is responsible for investigating the underlying soils and bedrock on a site and, if necessary, developing remedies to improve soil conditions based on standard, accepted, and proven engineering practices. The geotechnical investigation must characterize, log, and test soils and bedrock conditions and determine the response of those underlying materials to ground shaking generated during an earthquake. Seismic response to varying material types is especially critical in the San Francisco Bay Area where a considerable percentage of construction occurs over soft clay and fills at the San Francisco Bay margin.

The geotechnical investigation and the recommendations developed during the investigation are presented in a report, which is reviewed, signed, and stamped by the professional engineer in charge. Based on the site's geotechnical conditions, the geotechnical report includes recommendations for methods and materials for all aspects of the site development, including the site preparation, building foundations, structural design, utilities, sidewalks and roadways, to remedy any geotechnical conditions related to seismic impacts. Once finalized, the geotechnical

report is submitted to the local permitting agency for review and comment. The Building Officials work with the applicant and the geotechnical engineer to resolve inconsistencies and ensure that the investigation complies with the CBC and local ordinances. In connection with grading, foundation, building, and other site development permits, the building department engineers review the geotechnical investigation and recommendations and impose permit requirements based on the geotechnical recommendations and CBC provisions. While in many cases the geotechnical report is a required element for the project review and issuance of a building permit, it also provides the necessary soil and foundation information required by the structural engineer designing the building; a structure can not be designed without adequate information on the underlying soils and response of those soils to earthquake ground motion. Grading plans, foundation designs, and structural designs are also prepared based on the geotechnical recommendations and other pertinent requirements of the CBC.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act was developed to protect the public from the effects of strong ground shaking, liquefaction, landslides, or other ground failure, and from other hazards caused by earthquakes. This act requires the State Geologist to delineate “zones of required investigation” (i.e., seismic hazard zones) where site investigations are required to determine the need for mitigation of potential liquefaction and/or earthquake-induced landslide ground displacements. The act requires cities, counties, and other local permitting agencies to regulate certain development projects by implementing the provisions of the act through various local building codes, permits, and ordinances. Before a development permit is granted for a site within a seismic hazard zone, a geotechnical investigation of the site must be conducted and appropriate mitigation measures incorporated into the project design, consistent with California Geological Survey Special Publication 117, *Guidelines for Evaluating and Mitigating Seismic Hazards in California* (2008b). The Project site has not yet been evaluated by the CGS. This act is included in the regulatory framework because it requires the State of California to identify and disseminate information about seismic hazards, which is considered relevant to the environmental setting.

Local

City of Benicia General Plan

The City of Benicia has established goals, policies, and programs in regard to geologic hazards. These are outlined in the Responses to Hazards section of the *City of Benicia General Plan* (City of Benicia, 1999). The following geologic hazard programs are directly related to the Project:

Community Hazards

Goal 4.11: Minimize harm from geologic hazards.

Program 4.11.A: Require geotechnical engineering reports to address site stability and building foundation integrity for projects involving substantial grading.

Program 4.11.B: Develop guidelines for site-specific geologic and geotechnical reports.

Program 4.11.C: Require peer review of geotechnical engineering reports if it is determined that City staff does not have the technical expertise to review such reports.

The Project would include construction grading and would be subject to these requirements, consistent with the General Plan, and Chapter 15.28 of Title 15 of the Benicia Municipal Code.

4.5.3 Significance Criteria

Based on California Environmental Quality Act (CEQA) Guidelines Appendix G, a project would cause adverse impacts related to geology and soils if it would:

- a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
 - i. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault. Refer to Division of Mines and Geology Special Publication 42;
 - ii. Strong seismic ground shaking;
 - iii. Seismic-related ground failure, including liquefaction;
 - iv. Landslides;
- b) Result in substantial soil erosion or the loss of topsoil;
- c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on-or off-site landslide, lateral spreading, subsidence, liquefaction or collapse;
- d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property; or
- e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste disposal systems where sewers are not available for the disposal of wastewater.

4.5.4 Discussion of No Geology and Soils Impacts

Review and comparison of the Project characteristics with the significance criteria stated above, clearly show that no impact would result for the last geology and soils criterion. The following discusses the reasoning supporting this conclusion:

- e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste disposal systems where sewers are not available for the disposal of wastewater.**

Implementation of the Project would not involve the use of septic tanks or alternative wastewater treatment disposal systems to handle wastewater generation. Surface water run-off and wastewater produced by Refinery operations are currently treated at the Project's wastewater treatment plant. Septic systems would not be an element of the Project and therefore, the ability

of the soils on the Project site to accommodate septic systems is not considered here. No impact is anticipated.

4.5.5 Discussion of Impacts and Mitigation Measures

a.i) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault.

Impact 4.5-1: The Project would not expose people or structures to potential adverse effects involving rupture of a known earthquake fault. (*Less than Significant*)

The State of California, through the Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act) prohibits the development of structures for human occupancy across active fault traces.⁶ Under the Alquist-Priolo Act, the CGS must establish zones on either side of an active fault that delimits areas susceptible to surface fault rupture. These zones are referred to as fault rupture hazard zones and are shown on official maps published by the CGS.

The closest active fault to the Project area mapped under the Alquist-Priolo Act is the Concord-Green Valley fault which is oriented north-south and is located approximately two miles east of the Project area (USGS, 2013; CDMG, 1993). The Project area is located approximately 1.7 miles outside of the fault rupture hazard zone for this fault. Although fault rupture is not necessarily bound by the limits of the hazard zone, it is considered unlikely to occur in areas outside of the mapped fault rupture hazard zone. The Project area is situated in close proximity to the east-dipping Lake Herman fault which runs along the eastern portion of the Refinery property (Graymer *et al.*, 2002). This is a pre-Quaternary fault (no displacement has occurred during the previous 1.6 million years) and the CGS does not delineate this as an active fault under the Alquist-Priolo Act. No active faults are known to traverse through the Project area and the possibility of surface fault rupture on-site is very low (City of Benicia, 1999). Therefore, based on the current Project design, which does not include housing or facilities for human occupancy, the potential for damage to property or injury/loss of life to people as a result of fault rupture is considered less than significant.

⁶ The Alquist-Priolo Act designates zones that are most likely to experience fault rupture, although surface fault rupture is not necessarily restricted to those specifically zoned areas. The zones are defined by the California Geological Survey (CGS). An active fault is defined by the State of California as a fault that has had surface displacement within Holocene time (approximately the last 11,000 years). A potentially active fault is defined as a fault that has shown evidence of surface displacement during the Quaternary (last 1.6 million years), unless direct geologic evidence demonstrates inactivity for all of the Holocene or longer. This definition does not, of course, mean that faults lacking evidence of surface displacement are necessarily inactive. Sufficiently active is also used to describe a fault if there is some evidence that Holocene displacement occurred on one or more of its segments or branches. A structure for human occupancy is one that is intended for supporting or sheltering any use or occupancy, which is expected to have a human occupancy rate of more than 2,000 person hours per year (Hart, 1997).

a.ii) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking.

Impact 4.5-2: The Project would not expose people or structures to potential adverse effects involving strong seismic ground shaking. (*Less than Significant*)

The Project site is located in the San Francisco Bay Area, a seismically active region of California with numerous active faults. Seismic activity in the region is dominated by the San Andreas Fault system, which includes the San Andreas, Hayward, and Calaveras faults. Several other faults, including the Rodgers Creek, Concord-Green Valley, Southampton, and West Napa faults also accommodate some of this movement and are considered active.

ABAG has developed Earthquake Shaking Hazard Maps, which predict the potential for ground shaking during major earthquakes on the active faults in the Bay Area. The Shaking Hazard Maps rank degrees of ground shaking intensity based on the Modified Mercalli Intensity (MMI) scale. The Project site may be subject to strong seismic ground motions. This analysis considered an earthquake on the Concord-Green Valley fault due to the proximity of this fault to the Project site. This fault is capable of generating a Maximum Credible Earthquake (MCE) of Mw 7.1. The Working Group on California Earthquake Probabilities (USGS, 2008) assigns a 3% probability to the occurrence of a Mw 6.7 or larger earthquake on the Concord-Green Valley fault over the next 30 years. A Mw 6.7 earthquake on the Concord-Green Valley fault is predicted to result in shaking intensities of MM-VIII (very strong) at the Project site (ABAG, 2013). According to the CGS Probabilistic Seismic Hazard Assessment (PSHA), the peak ground acceleration at the Project site could reach 0.5 g (CGS, 2013).⁷

Predicting seismic events is not possible, nor is providing mitigation that can entirely reduce the potential for injury and damage that can occur during a seismic event. Although some structural damage is typically not avoidable during an earthquake, building codes, construction ordinances, and modern construction techniques and materials have been developed to reduce structural damage and minimize major injury during a seismic event. This is especially true in California where many of the seismic design criteria and standards contained in the CBC originated. The CBC is based on the International Building Code and contains informed and current seismic design criteria used throughout California. The project is required by California law to comply with the seismic design criteria set forth in the CBC. While building codes assume that some damage will occur during an earthquake, they are designed to prevent loss of life and limb and reduce the potential of structural collapse.

Seismic design consistent with current professional engineering and refinery industry standards would be employed in the proposed construction for resistance to strong ground shaking. At a minimum, the CBC design criteria, in conjunction with FRA regulations to ensure track meets or exceeds federal safety standards, would be required during design and construction of all elements of the Project. Under requirements of the CBC, the underlying soils on the project site would be investigated to determine the response of those underlying materials to ground shaking

⁷ g is gravity = 980 centimeters per second squared. Acceleration is scaled against acceleration due to gravity or the acceleration with which a ball falls if released at rest in a vacuum (1.0 g). Acceleration of 1.0 g is equivalent to a car traveling 100 meters (328 feet) from rest in 4.5 seconds.

generated during an earthquake. The earthquake design requirements of the CBC are used to determine a Seismic Design Category for a project that combines the occupancy categories with the level of expected ground motions at the site to determine appropriate design specifications. Further, the design specifications for the Project are required to incorporate consideration of the response of the soils underlying the project site under earthquake loads as well as other loads (flood, snow, wind, etc.) to conform to Federal Track Safety Standards (49 CFR § 213). Therefore, considering that laws and regulations are currently in place that will ensure design and construction in compliance with modern engineering standards, the potential for substantial damage to property or injury/loss of life as a result of strong seismic ground shaking is less than significant.

a.iii) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction.

Impact 4.5-3: The Project would not expose people or structures to potential adverse effects involving seismic-related ground failure, including liquefaction. (*Less than Significant with Mitigation*)

Seismic shaking can also trigger secondary ground-failures caused by liquefaction. Liquefaction is a phenomenon where saturated subsurface soils lose strength because of increased pore pressure and exhibit properties of a liquid rather than those of a solid. The soils most susceptible to liquefaction are clean, loose, uniformly graded, saturated, and fine-grained and occur close to the ground surface, usually at depths of less than 50 feet.

Seismic hazard mapping prepared by the Association of Bay Area Governments (ABAG, 2013), indicates that the Project site is located in a very low risk area for liquefaction. However, geotechnical investigations conducted in the vicinity of the Project (Kleinfelder, 2013a) have identified subsurface conditions having the potential for seismically induced liquefaction, including settlement and lateral migration towards Sulphur Springs Creek. Liquefaction could result in vertical surface settlement of several inches and horizontal ground displacement of several feet, which could cause damage to Project components, specifically new railroad track.

The February 2013 geotechnical investigation (Kleinfelder, 2013a) reported that the extent of liquefiable soil layers were not fully determined and concluded based on available information that the layers were relatively thin (typically less than five feet in thickness). Based on this conclusion, a subsequent, focused investigation (Kleinfelder 2013b) was conducted in November 2013 to assess the full lateral extent of the liquefiable soils and determine the potential for lateral spreading. Specifically, the scope of the November 2013 investigation required detailed seismic deformation analyses to provide refined estimates of the magnitude and distribution of horizontal displacements and vertical settlements associated with liquefaction and lateral spreading at the Project site.

Results of the November 2013 geotechnical investigation and deformation analysis identified lateral spreading displacements ranging from 8 inches to 39 inches and horizontal ground separation up to 6 inches. The horizontal displacements would be generally greatest along the

bank of Sulphur Springs Creek (east edge of existing Avenue A) and diminish toward the west (Kleinfelder, 2013b). The deformation analysis calculated that total seismic settlements (vertical displacements) would range between 5 inches and 11 inches and differential settlement across an 8.5 foot railroad tie length would be up to 3 inches.

Results of the previous geotechnical investigations identified the potential for lateral spreading and vertical displacement during seismic ground shaking. Unless properly designed to overcome the damage that the predicted ground displacement could cause, the ground movement during an earthquake could result in damage to tracks and other facilities during and immediately following a large regional earthquake.⁸ The potential for liquefaction to cause lateral and vertical soil displacement is therefore considered a significant impact requiring mitigation. Implementation of Mitigation Measures 4.5-1 and 4.5-2 would reduce the impact relating to liquefaction and other seismic-related ground failure, such as lateral and vertical soil displacement, to a less-than-significant level.

Mitigation Measure 4.5-1: Consistent with the geotechnical investigations and deformation analysis conducted to evaluate the potential for liquefaction hazards, the Valero Benicia Refinery shall incorporate into the final project design all recommendations to overcome lateral displacement, horizontal ground separation, and vertical settlement as provided by the licensed geotechnical engineer. Specifically, the Valero Benicia Refinery, in its design of the railroad project element located in areas identified as underlain by liquefiable or problematic soils, shall design for total seismic lateral displacements of 8 inches to 39 inches. Railroad ties and slabs shall be analyzed to evaluate the effect of up to a 6 inch wide horizontal ground separation and all recommendations to overcome such horizontal ground separation provided by the licensed geotechnical engineer incorporate into the final project design. A differential settlement of 2 inches across the gage width shall be analyzed to evaluate rail car tipping potential and all recommendations provided by the licensed geotechnical engineer incorporate into the final project design. All geotechnical design shall comply with seismic design requirements of CBC.

Mitigation Measure 4.5-2: Valero Benicia Refinery shall include into its current track inspection program, regular and, in the event of a seismic incident with potential for track damage, post-earthquake inspections of the proposed track sections to ensure compliance with Federal Railroad Administration (FRA) track safety standards. Additionally, in the event of an incident with potential for track damage, such as an earthquake and associated secondary ground failure (such as liquefaction or lateral spreading) track inspection shall occur after the occurrence and before the operation of any train over that track.

Significance after Mitigation: Less than significant.

⁸ It should be noted that, according to the applicants consultant, Industrial Railways Company (IRC), the proposed track sections can undergo seismic related settlement of 2 inches across the track gage width and maintain compliance with 49 CFR § 213.63 for Class 1 track (IRC, 2013). Settlement of track, such as that proposed as part of the Project, is expected during routine operations and Federal Track Safety Standards (49 CFR § 213) allow for such settlement while maintaining safe operations (IRC, 2013).

a.iv) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving landslides.

Impact 4.5-4: The Project would not expose people or structures to potential adverse effects involving landslides. (*Less than Significant*)

The Refinery site is partially located on bedrock slopes and slopes covered with relatively unconsolidated colluvium. However, the topography within the vicinity of the Project elements is relatively flat and approximately 0.2 miles from any noted slopes that could be subjected to seismically-induced landslides in the event of a major earthquake in the region. Additionally, ABAG (2013b) has mapped areas at risk of rainfall-induced landslides based on historic landslide information and the Project area has not been subject to historic rainfall-induced landslides or earth flows. The proposed rail line extension is located directly adjacent (within 50 to 80 feet) to Sulphur Springs Creek (see Figure 3-3, Site Plan, in the Project Description) which flows southeast towards Suisun Bay and is characterized by shallow creek banks. Therefore this portion of the Refinery is not considered to be at risk of slope failure; the potential for adverse effects involving landslides would be less than significant.

b) Result in substantial soil erosion or the loss of topsoil

Impact 4.5-5: The Project would not result in substantial soil erosion or loss of topsoil. (*Less than Significant*)

Given that the majority of the Project site is developed and is an operating refinery, the Project is not expected to expose soils that could result in substantial loss of topsoil or significant, long-term erosion. However, temporary erosion hazards could be an issue during construction. Construction activities associated with the Project would require land disturbing activities such as grading, earthmoving, backfilling, and compaction that would expose soils to the effects of wind and stormwater runoff, and could result in erosion or soil loss (see Section 4.8, *Hydrology and Water Quality*, for additional discussion of sedimentation).

In order to minimize erosion impacts during construction, the Applicant would implement best management practices (BMPs) as required under the National Pollutant Discharge Elimination System (NPDES) issued to Valero by the San Francisco Bay Regional Water Quality Control Board. BMPs are individual or combined measures that can be implemented in a practical and effective manner on the Project site which, when applied, prevent or minimize the potential release of contaminants into surface waters and groundwater. The NPDES permit requires Valero to prepare and maintain a Stormwater Pollution Prevention Plan (SWPPP). Consistent with the SWPPP, the contractor would be required to implement BMPs to protect stormwater quality, including minimizing erosion and soil loss during construction activities. Construction activities would be required to employ the specific erosion control BMPs presented in the SWPPP, typical examples of which include use of silt fencing, sandbag barriers, and placement of straw bales secured by stakes. Since BMPs have been recognized as methods to effectively prevent or minimize the potential release of contaminants into surface waters and groundwater, the potential for erosion impacts or loss of top soil during Project construction would be less than significant.

- c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.**

Impact 4.5-6: The Project would not be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in liquefaction. (*Less than Significant*)

The Project area is predominantly underlain by compacted fill consisting of native unconsolidated deposits and bedrock. The fill material is somewhat well compacted sandy clay, with abundant rock fragments common throughout. The fill material ranges from 18 on up to 53 feet in topographically low areas, on top of 2 to 13 feet of natural stiff clay that rests on bedrock. In general, the fill is moderately to highly expansive, and is strong and only slightly to moderately compressible (Woodward-Clyde, 1993, Kleinfelder 2013b). As described under Impacts 4.5-2 and 4.5-3, above, the results of the geotechnical investigation (Kleinfelder, 2013b) will be incorporated into the Project design to ensure that the Project is consistent with the requirements of the CBC as well as the Federal Railroad Administration (Valero Benicia Refinery, 2013). These requirements will ensure that the Project would have the structural fortitude to withstand anticipated ground shaking and seismically induced ground failures without significant damage. With compliance with applicable construction requirements in the California Building Code, and the design criteria recommendations from the geotechnical investigation that will be incorporated into the Project design, this impact would be less than significant.

- d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property.**

Impact 4.5-7: The Project would be located on expansive soil. (*Less than Significant*)

In general, the effects of expansive soils can damage foundations, concrete slabs, and aboveground structures over long periods of time. Previous studies (discussed in detail in Sections 4.5.2.2 and 4.5.2.5) have determined that clay-rich soils are present on the site. Additionally, the upper 10 feet of engineered fill that underlies the Project site is comprised of stiff, moderately expansive clay (Kleinfelder, 2013a). While these soil conditions are not unique in comparison to other areas, the soils identified are potentially moderately expansive. Standard engineering and building practices common to construction in California would be employed to address expansive soils encountered on site, such as compacting and replacement of soils. Typically, expansive soils can be re-engineered or replaced with engineered fills during grading and prior to construction to reduce the potential for adverse effects. For the Project, backfilling excavated areas with either imported fill or reuse of excavated material, if appropriate, and compacted as an engineered fill would eliminate the potential effects of expansive soils. Treatment of subsurface soils underneath the proposed facilities at the Project site according to measures designed by a geotechnical engineer would also eliminate potential hazards of expansive soils. Because soil conditions are not unique or particularly hazardous, and methods to address expansive soils are common engineering practices, this impact would be less than significant.

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4.6 Greenhouse Gas Emissions

4.6.1 Introduction

This section analyzes the Project's relationship to greenhouse gas emissions. The section discusses the physical and regulatory setting; the baseline for determining environmental impacts; the criteria used for determining the significance of environmental impacts; and potential impacts associated with construction, operation, and maintenance of the Project.

4.6.2 Setting

4.6.2.1 Background on Greenhouse Gases and Climate Change

Gases that trap heat in the atmosphere are called greenhouse gases (GHGs). GHGs allow sunlight to enter the atmosphere, but trap a portion of the outward-bound infrared radiation, which warms the air. The process is similar to the effect greenhouses have in raising the internal temperature.

Both natural processes and human activities emit GHGs. The accumulation of GHGs in the atmosphere from natural processes regulates the Earth's temperature. Emissions from human activities, however, such as fossil fuel-based electricity production and the use of motor vehicles have elevated the concentration of GHGs in the atmosphere. GHGs emitted by human activities are known as "anthropogenic" GHGs. This accumulation of GHGs has contributed to an increase in the temperature of the Earth's atmosphere and the resulting "global climate change." Global climate change is a change in the average weather on Earth that can be measured by wind patterns, storms, precipitation, and temperature. Most scientists agree that there is a direct link between increased emissions of GHGs and long term global temperature increases.

The principal GHGs are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), sulfur hexafluoride (SF₆), perfluorocarbons (PFCs), and hydrofluorocarbons (HFCs). GHG emissions are often quantified and reported as CO₂ equivalents (CO₂e) to standardize and account for the difference in global warming potential from various GHG gases. For example, SF₆ is a GHG commonly used in the utility industry as an insulating gas in circuit breakers and other electronic equipment. SF₆, while comprising a small fraction of the total GHGs emitted annually world-wide, is a much more potent GHG with 23,900 times the global warming potential as CO₂. Therefore, one pound of SF₆ is assigned the standardized equivalent value of 23,900 pounds of CO₂e, which is the standard equivalent GHG unit of measure. Large emission sources are reported in million metric tons of CO₂e.¹

The effects of global warming on weather and climate are likely to vary by region, but are expected to include the following direct effects (IPCC, 2014):

- Warmer and/or fewer cold days and nights over most land areas;

¹ The term metric ton is commonly used in the U.S. to refer to the metric system unit, tonne, which is defined as a mass equal to 1,000 kilograms. A metric ton is approximately 1.1 short tons and approximately 2,204.6 pounds.

- Warmer and/or more frequent hot days and nights over most land areas;
- Heavy precipitation events. Increase in the frequency, intensity, and/or amount of heavy precipitation; and
- Increased incidence and/or magnitude of extreme high sea level.

Also, there are many secondary effects that are projected to result from climate change, including impacts to agriculture, changes in disease vectors, and changes in habitat and biodiversity. In California, secondary effects of climate change may also include decrease in snow pack, more high ozone days, more large forest fires, and more drought years (CARB, 2014a and CNRA, 2013). While the possible outcomes and the feedback mechanisms involved are not fully understood and much research remains to be done, the potential for substantial environmental, social, and economic consequences over the long term is great.

Anthropogenic GHG emissions in the United States are derived mostly from the combustion of fossil fuels for transportation and power production. Approximately three-quarters of the anthropogenic CO₂ emissions generated in the United States come from the exploration for, and use of, fossil fuels for energy. Approximately one-third of the GHG emissions come from electricity production, such as power plants; approximately one-third derive from transportation; and a majority of the remaining sources include industrial processes, agriculture, forestry, other land uses, and waste management (USEPA, 2013).

Table 4.6-1 summarizes statewide emissions of GHG from relevant source categories for 2006 through 2012. As shown in the Table, California produced 458.67 million metric tons of CO₂e emissions in 2012 from a variety of sources. Oil refineries generated approximately 7% of GHG emissions produced in California in 2012 (CARB, 2014b).

**TABLE 4.6-1
CALIFORNIA GREENHOUSE GAS EMISSIONS (million metric tons CO₂e)**

Emission Inventory Category	2006	2007	2008	2009	2010	2011	2012	
Transportation	189.18	189.27	178.02	171.47	170.46	168.13	167.38	36%
Electric Power	104.54	113.94	120.15	101.32	90.3	88.04	95.09	21%
Commercial and Residential	41.89	42.11	42.44	42.65	43.82	44.32	42.28	9%
Industrial	90.28	87.1	87.54	84.95	88.51	88.34	89.16	19%
Recycling and Waste	7.8	7.93	8.09	8.23	8.34	8.42	8.49	14%
High Global Warming Potential	11.08	11.78	12.87	13.99	15.89	17.35	18.41	
Agriculture	37.75	37.03	37.99	35.84	35.73	36.34	37.86	
Total Gross Emissions	482.52	489.16	487.1	458.45	453.05	450.94	458.67	100%

SOURCE: CARB, 2014b

Emission inventories developed for the City of Benicia *Climate Action Plan 2010 GHG Emissions Inventory Update* reveal that activities of the City's government generated approximately 6,160 metric tons of CO₂e emissions in 2000 and the community as a whole

generated 3,138,900 metric tons CO₂e in 2000 and 3,885,770 metric tons CO₂e in 2010. The commercial/industrial category (excluding the Refinery, which is considered a “large emitter”), generated approximately 48% of the community-wide emissions in 2010. Transportation accounted for 44%, residential 6%, and solid waste 1% of the total community-wide emissions in 2010 (excluding large emitters) (City of Benicia, 2014).

4.6.2.2 Regulatory Setting

Federal

The USEPA began to regulate greenhouse gases under the Clean Air Act in 2009. To date, USEPA has adopted two final rules relating to GHGs:

40 CFR Part 98. Mandatory Reporting of Greenhouse Gases Rule. In general, this rule requires mandatory reporting of GHG emissions for facilities that emit more than 25,000 metric tons of CO₂e emissions per year (USEPA, 2014b). Facilities, such as petroleum refineries, are subject to the regulation regardless of the quantity of GHG emissions. Valero currently reports Refinery GHG emissions as required by this regulation.

40 CFR Part 52. Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule. USEPA has mandated that Title V requirements apply to facilities whose stationary source CO₂e emissions exceed 100,000 short tons per year (USEPA, 2014a). In addition, at a facility that currently emits 100,000 short tons per year of CO₂e, Prevention of Significant Deterioration (PSD) applies to projects that increase GHG emissions by 75,000 short tons of CO₂e. The Project would not trigger PSD for CO₂e emissions under this regulation.

The USEPA is currently developing new GHG regulations for existing and new fossil fueled power plants and oil refineries. These regulations will affect the new source review process under the CAA. At the time of this writing, however, these regulations have not yet been issued.

State of California

The State of California has begun to regulate GHG emissions through legislation, rules, and executive orders.

Assembly Bill 1493

In 2002, Governor Gray Davis signed Assembly Bill (AB) 1493. AB 1493 required that CARB develop and adopt, by January 1, 2005, regulations that achieve “the maximum feasible reduction of greenhouse gases emitted by passenger vehicles and light-duty trucks and other vehicles determined by CARB to be vehicles whose primary use is noncommercial personal transportation in the State.”

To meet the requirements of AB 1493, in 2004 CARB approved amendments to the California Code of Regulations (CCR) adding GHG emissions standards to California’s existing standards for motor vehicle emissions. Amendments to CCR Title 13, Sections 1900 and 1961 (13 CCR 1900, 1961), and adoption of Section 1961.1 (13 CCR 1961.1) require automobile manufacturers to meet fleet-average GHG emissions limits for all passenger cars, light-duty trucks within

various weight criteria, and medium-duty passenger vehicle weight classes (i.e., any medium-duty vehicle with a gross vehicle weight rating less than 10,000 pounds that is designed primarily for the transportation of persons), beginning with the 2009 model year. For passenger cars and light-duty trucks with a loaded vehicle weight (LVW) of 3,750 pounds or less, the GHG emission limits for the 2016 model year are approximately 37% lower than the limits for the first year of the regulations, the 2009 model year. For light-duty trucks with LVW of 3,751 pounds to gross vehicle weight of 8,500 pounds, as well as medium-duty passenger vehicles, GHG emissions would be reduced approximately 24% between 2009 and 2016.

On September 15, 2009, USEPA and the Department of Transportation's National Highway Safety Administration (NHTSA) proposed a national program to reduce GHG emissions and improve fuel economy for new cars and trucks sold in the United States. The combined USEPA and NHTSA standards that make up the proposed national program would apply to passenger cars, light-duty trucks, and medium-duty passenger vehicles, covering model years 2012 through 2016. They require these vehicles to meet an estimated combined average emissions level of 250 grams of CO₂ per mile, equivalent to 35.5 miles per gallon (mpg) if the automobile industry were to meet this CO₂ level solely through fuel economy improvements. Under the proposed national program, automobile manufacturers would be able to build a single light-duty national fleet that satisfies all requirements under both the national program and the standards of California and other states, while ensuring that consumers still have a full range of vehicle choices. In order to promote the adoption of the national program, CARB has adopted amendments to the GHG emissions standards for new passenger vehicles from 2009 through 2016. All mobile sources would be required to comply with these regulations as they are phased in.

Executive Order S-3-05

In 2005, in recognition of California's vulnerability to the effects of climate change, Governor Arnold Schwarzenegger established Executive Order S-3-05, which set forth a series of target dates by which statewide emissions of GHGs would be progressively reduced, as follows:

- By 2010, reduce GHG emissions to 2000 levels;
- By 2020, reduce GHG emissions to 1990 levels; and
- By 2050, reduce GHG emissions to 80% below 1990 levels.

Assembly Bill 32 – California Global Warming Solutions Act

In December 2008, CARB approved the AB 32 Scoping Plan outlining the state's strategy to achieve the 2020 GHG emissions limit. The Scoping Plan estimates a reduction of 174 million metric tons CO₂e from the transportation, energy, agriculture, forestry, and high climate-change-potential sectors, and proposes a comprehensive set of actions designed to reduce overall GHG emissions in California, improve the environment, reduce dependence on oil, diversify California's energy sources, save energy, create new jobs, and enhance public health. The Scoping Plan expanded the list of the nine Early Action Measures into a list of 39 Recommended Actions contained in Appendices C and E of the Scoping Plan (CARB, 2009). Of these measures, the five that may be relevant to the Refinery are presented in Table 4.6-2; however, these measures are not directly applicable to the Project.

**TABLE 4.6-2
RECOMMENDED ACTIONS OF CLIMATE CHANGE SCOPING PLAN RELEVANT TO THE REFINERY**

ID #	Sector	Strategy Name and Description
I-1	Industry	Energy Efficiency and Co-Benefits Audits for Large Industrial Sources
I-3	Industry	GHG Leak Reduction from Oil and Gas Transmission*
I-4	Industry	Refinery Flare Recovery Process Improvements
I-5	Industry	Removal of CH ₄ Exemption from Existing Refinery Regulations
T-2	Transportation	Low Carbon Fuel Standard

* This recommended action is related to the transmission of natural gas, not crude oil.

SOURCE: CARB, 2009

The Scoping Plan must be updated every five years to evaluate the mix of AB 32 policies to ensure that California is on track to achieve the 2020 GHG reduction goal. CARB has initiated activities to update the AB 32 Scoping Plan and has released a first update to the Scoping Plan Update in May 2014 (CARB, 2014a).

Executive Order S-1-07

Executive Order S-1-07, which was signed by Governor Schwarzenegger in 2007, proclaims that the transportation sector is the main source of GHG emissions in California, generating more than 40% of statewide emissions. It establishes a goal to reduce the carbon intensity of transportation fuels sold in California by at least 10% by 2020. This order also directs CARB to determine whether this low carbon fuel standard (LCFS) could be adopted as a discrete early-action measure as part of the effort to meet the mandates in AB 32.

On April 23, 2009, CARB approved the proposed regulation to implement the LCFS. The LCFS will reduce GHG emissions from the transportation sector in California by about 16 million metric tons by 2020. The LCFS is designed to reduce California's dependence on petroleum, create a lasting market for clean transportation technology, and stimulate the production and use of alternative, low-carbon fuels in California. The LCFS is designed to provide a durable framework that uses market mechanisms to spur the steady introduction of lower carbon fuels. The framework establishes performance standards for each year starting in 2011 that fuel producers and importers must meet. One standard is established for gasoline and the alternative fuels that can replace it. A second similar standard is set for diesel fuel and its replacements.

The standards are "back-loaded;" that is, there are more reductions required in the last 5 years, than the first 5 years. This schedule allows for the development of advanced fuels that are lower in carbon than today's fuels and the market penetration of plug-in hybrid electric vehicles, battery electric vehicles, fuel cell vehicles, and flexible fuel vehicles. It is anticipated that compliance with the LCFS will be based on a combination of strategies involving lower carbon fuels and more efficient, advanced-technology vehicles.

The LCFS baseline fuels are 1) reformulated gasoline mixed with corn-derived ethanol at 10% by volume, and 2) low sulfur diesel fuel. The lower carbon fuels may be ethanol, biodiesel, or blends of these fuels with gasoline or diesel as appropriate. Compressed natural gas and liquefied natural gas are also low carbon fuels. Hydrogen and electricity are also low carbon energy sources for vehicles and result in significant reductions of GHGs when used in fuel cell or electric vehicles due to vehicle power train efficiency improvements over conventionally-fueled vehicles. As such, these fuels are included in the LCFS as low carbon options. Other fuels may be used to meet the standards and are subject to meeting existing requirements.

Cap-and-Trade Program

The AB 32 Scoping Plan identified a cap-and-trade program as one of the strategies California will employ to reduce the GHG emissions that cause climate change. This program has put California on the path to meet its goal of reducing GHG emissions to 1990 levels by the year 2020, and ultimately achieving an 80% reduction from 1990 levels by 2050. Under AB 32, reporting of GHGs is required by major sources, such as electricity generation facilities, refineries, cement plants, facilities that produce over 25,000 metric tons of CO₂e from combustion sources, suppliers, and others. Under the cap-and-trade program, an overall limit on GHG emissions from capped sectors has been established and facilities that emit 25,000 metric tons or more of CO₂e per year, such as the Refinery, are able to trade permits (allowances) to emit GHGs.

CARB designed the California cap-and-trade program to be enforceable and to meet the requirements of AB 32. The development of this program included a multi-year stakeholder process and consideration of potential impacts on disproportionately impacted communities. The program started 2012, with an enforceable compliance obligation beginning with 2013 GHG emissions. Trading creates incentives to reduce GHGs below allowable levels through investments in clean technologies. With a carbon market, a price on carbon is established for GHGs. Market forces spur technological innovation and investments in clean energy. Cap-and-trade is intended to be an environmentally effective and economically efficient response to climate change.

Senate Bill 97

In 2007, the California State Legislature passed SB 97, which required amendment of the CEQA Guidelines to incorporate analysis of, and mitigation for, GHG emissions from projects subject to CEQA. The amendments took effect March 18, 2010. The amendments added Section 15064.4 to the CEQA Guidelines, specifically addressing the potential significance of GHG emissions. Section 15064.4 neither requires nor recommends a specific analytical methodology or quantitative criteria for determining the significance of GHG emissions. Rather, the section calls for a “good faith effort” to “describe, calculate or estimate” GHG emissions and indicates that the analysis of the significance of any GHG impacts should include consideration of the extent to which the project would:

- Increase or reduce GHG emissions;
- Exceed a locally applicable threshold of significance; or

- Comply with “regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of greenhouse gas emissions.”

The CEQA Guidelines also state that a project may be found to have a less-than-significant impact related to GHG emissions if it complies with an adopted plan that includes specific measures to sufficiently reduce GHG emissions (14 Cal. Code Regs. §15064(h)(3)). Some jurisdictions have adopted “Climate Action Plans” to be used in connection with CEQA review. Importantly, however, the CEQA Guidelines do not require or recommend a specific analytical methodology or provide quantitative criteria for determining the significance of GHG emissions.

Bay Area Air Quality Management District 2010 Clean Air Plan

On September 15, 2010, the Bay Area Air Quality Management District (BAAQMD) Board of Directors adopted the final *Bay Area 2010 Clean Air Plan* (2010 CAP).² The 2010 CAP control strategies include revised, updated, and new measures in the three traditional control measure categories, including stationary sources measures, mobile source measures, and transportation control measures. In addition, the Bay Area 2010 CAP identifies two new categories of control measures, including land use and local impact measures and energy and climate measures (BAAQMD, 2010).

City of Benicia Climate Action Plan

On September 15, 2009, the Benicia City Council adopted the Benicia Climate Action Plan, which identifies specific measures on how the City can achieve GHG reduction targets. The Climate Action Plan established targets for City government operations and community-wide activities. The City government goal is to reduce GHG emission 25% below 2000 levels by 2010 and 33% below 2000 by 2020. According to the City’s 2010 GHG emissions update, the City reduced GHG emissions 21% below 2000 levels in 2010, missing its reduction target by 4% (City of Benicia, 2014). The community-wide emission reduction goal is to maintain 2005 emission levels by 2010 and reduce emissions to 10% below 2000 levels by 2020. In 2010, community-wide emissions with large industrial emitters had increased from 2005 by 24% while community-wide emissions without large industrial emitters increased by 41% (City of Benicia, 2014). Objective IC-4, *Encourage the Refinery to Continue to Reduce Emissions*, directly applies to the Refinery as do Strategy IC-4.1, *Continue Implementing Capital Improvement Programs*, and Strategy IC4.2, *Investigate Onsite Energy Production* (City of Benicia, 2009).

4.6.2.3 Project Baseline

Under CEQA, the project baseline normally consists of the physical environmental conditions in the vicinity of the project as they exist at the time the lead agency publishes a Notice of Preparation of an EIR or, if no such notice is published, when the lead agency commences CEQA

² The BAAQMD is currently in the process of updating this plan and held a public workshop on February 28, 2014 to initiate development of this plan.

review³ (CEQA Guidelines Section 15125(a)). When existing conditions regularly fluctuate, however, this baseline may not be representative of conditions as they exist over time. In such situations, a lead agency has discretion to select a baseline that represents an average of recent conditions. (*Communities for a Better Environment v. South Coast Air Quality Management District* (2010) 48 Cal.4th 310, 328.)

As is widely recognized, refinery operations regularly fluctuate over time. While refineries tend to operate at capacity for extended periods, refineries also undergo periodic multi-week unit-specific and plant-wide shutdowns for scheduled maintenance (referred to as a turnaround) These scheduled maintenance activities can be as frequent as annually or be as infrequent as once every six years. Market forces can also cause refineries to vary their production to meet market demand. For the reasons described, the annual average based on three previous years of operation is more representative of a refinery's baseline operation than a single point in time. This approach is consistent with the Project baseline defined in Section 4.1, *Air Quality*.

Annual average baseline GHG emissions for the Project were estimated using a baseline period of 3 years from December 2009, through November 2012. (The applicant filed the Use Permit Application for this project in December 2012.) Baseline emissions include maritime emissions from the following sources: ocean going vessel main engines from the California Coastal Waters boundary (approximately 71 nautical miles west of the Golden Gate Bridge) to the Refinery marine terminal; the vessel's auxiliary engines and auxiliary boilers; and the tugboats that would be required to escort and to position the ocean going vessels at the marine terminal.

The baseline does not include emissions from the sources outside of California: pumps and heaters to move oil from the well by pipeline to the marine terminal; pumps to load oil into the ocean going vessels; and vessel engines to transport the oil from its port of origin to the California Coastal Waters west of the Golden Gate Bridge. The baseline emissions scenario is conservative because it assumes that ocean going vessels would leave State-controlled waters due west of Golden Gate Bridge. It is possible that they could travel within State-controlled waters along the California coast, which could increase their related baseline emissions within the State by a factor of up to 10.

4.6.3 Significance Criteria

Based on CEQA Guidelines Sections 15064.4 and 15064.7(c), as well as Appendix G, a project would cause adverse impacts associated with GHG emissions if it would:

- a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment; or
- b) Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases.

³ Although the NOP for the EIR was published in August 2013, the City began to commence the CEQA review for the Project through the preparation of the Initial Study / Mitigated Negative Declaration after Valero filed its Use Permit Application in December 2012.

Analysis Methodology

GHG emission estimates for the Project presented in this section were prepared by Environmental Resource Management (ERM), a consultant of the Applicant, and independently reviewed by the City's consultant, Environmental Science Associates (ESA). ESA determined that the emission estimates were acceptable for incorporation in this analysis. GHG emissions from locomotives were estimated for the small line haul round trip and switching operations within the Refinery and for the large line haul round trip between inland California state boundary and the Refinery. Because there is uncertainty regarding the exact route(s) that the crude by rail trains would use to enter the state and arrive at the Roseville rail yard, an average of the track length between the Roseville rail yard and the Nevada state line and the track length between the Roseville rail yard and the Oregon state line (approximately 195 miles of mainline track) was used, to estimate in-state GHG emissions from large line haul. For details of data, calculations, and assumptions used to determine Project-related GHG emissions that would be associated with the Project, refer to Appendix E.

As explained in Section 4.1.3, the BAAQMD adopted Thresholds of Significance in 2010, including certain thresholds for GHG emissions. Due to pending litigation the BAAQMD is no longer recommending that the Thresholds be used as a "generally applicable measure" of a project's significant air quality impacts. Lead agencies remain free, however, to apply any significance thresholds that are based on substantial evidence in the record including, but not limited to, the same thresholds that the BAAQMD adopted in 2010.

The BAAQMD's *Revised Draft Options and Justification Report (2009)* recommended an operational significance threshold of 10,000 metric tons per year of CO₂e for projects involving stationary sources within the jurisdiction of the BAAQMD. The threshold level of 10,000 metric tons of CO₂e per year represents a capture rate of approximately 95% of all GHG emissions from stationary sources in the San Francisco Bay Area Air Basin. This threshold level was calculated as an average of the combined CO₂ emissions from all stationary source permit applications submitted to the BAAQMD during a three year analysis period (BAAQMD, 2009). This threshold is consistent with the Executive Order S-3-05 GHG emissions reductions goal of 80% below 1990 levels by 2050, which is roughly equivalent to 90% below current levels by 2050. This emissions reduction goal goes beyond the AB 32 emissions reduction goal established for 2020. The BAAQMD recommended that the stationary source threshold be used for land use projects that would accommodate processes and equipment that would emit GHG emissions and would require a BAAQMD permit.

The Project would require a BAAQMD permit and would result in emissions of GHG within the Bay Area and within other parts of California. Because the effects of GHG emissions are not local and have no relevance to the individual air basins where the emissions are generated, the City of Benicia has determined, based on the 2009 Report and the evidence cited therein, that the 10,000 metric ton threshold is conservative and appropriate to assess the significance of Project-related emissions that would be generated within California. Therefore, the Project-related net annual operational GHG emissions generated within the State would be considered to result in a

significant impact on the environment if the net emissions would be more than 10,000 metric tons CO₂e per year.

The BAAQMD's 2009 Report did not identify a significance threshold for construction-related GHG emissions. However, the City has elected to use an approach to the determination of significance of GHG construction emissions based on guidance developed by the South Coast Air Quality Management District (SCAQMD). For construction related GHGs, SCAQMD recommends that total emissions from construction be amortized over 30 years and added to operational emissions and then compared to the operations significance threshold (SCAQMD, 2008). Similar to the SCAQMD's recommended approach for construction emissions, this analysis amortizes the construction emissions over a 30-year project lifetime then compares those emissions to the significance threshold of 10,000 metric tons CO₂e per year.

CEQA requires the City to consider whether the Project might conflict with the implementation of any applicable plan designed to address climate change. The analysis below considers potential conflicts between the Project and the following three such plans: 1) CARB's 2008 Climate Change Scoping Plan in 2008, as updated on May 22, 2014 (CARB, 2014a); 2) the 2010 CAP (BAAQMD, 2010); and 3) the City of Benicia Climate Action Plan (City of Benicia, 2009).

4.6.4 Discussion of No Greenhouse Gas Emissions Impacts

Review and comparison of the setting circumstances and Project characteristics with the significance criteria stated above, clearly show that no impact would result for the second GHG emissions significance criterion. The following discusses the reasoning to support this conclusion.

b) Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases.

As discussed above, the City of Benicia Climate Action Plan Objective IC-4 is to *Encourage the Refinery to Continue to Reduce Emissions* applies to the Refinery (City of Benicia, 2009). Although the Project may result in an increase in GHG emissions (see Impact 4.6-1 discussion, below), the Project would not directly conflict with the City's established strategies to support Objective IC-4; including Strategy IC-4.1, *Continue Implementing Capital Improvement Programs*, and Strategy IC4.2, *Investigate Onsite Energy Production* (City of Benicia, 2009). Therefore, the Project would not conflict with the Climate Action Plan.

In addition, the Project would not conflict with any of the 39 Recommended Actions identified by CARB in its Climate Change Scoping Plan, including the five Recommended Actions that may be relevant to the overall operations of the Refinery (see Table 4.6-2), because none of the recommended actions are directly applicable to the Project. Also, pursuant to State law the Refinery currently participates in the AB 32 emissions reporting and cap-and-trade programs. Any change in GHG emissions generated at the Refinery due to implementation of the Project would be accounted for in these programs. Furthermore, the Project would not result in any potential conflicts related to implementation of measures identified in the BAAQMD's 2010 CAP. There would be no impact.

4.6.5 Discussion of Impacts and Mitigation Measures

- a) **Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment.**

Impact 4.6-1: The Project would generate direct and indirect GHG emissions. (*Less than Significant*)

Construction Emissions

The majority of Project-related GHG construction emissions would be generated onsite due to the use of heavy-duty off-road equipment that would include excavators, graders, front loaders, dump trucks, cranes, paving equipment, etc., to relocate a portion of an existing spill containment berm, and to construct the proposed rail car unloading rack, unloading rail spurs, and ancillary facilities, such as an aboveground crude oil pipeline, spill containment structures, a firewater pipeline, groundwater wells, and a service road. The equipment operation hours per day and number of required work-days would vary depending on the specific type of equipment and on the construction activity; however, for the purposes of this analysis, it is assumed that construction activities at the site would occur during two shifts each day for an average of 10 hours per shift, 7 days a week, for 25 weeks. GHG emissions would also be generated by construction worker daily commutes and by heavy-duty diesel tractor trailer trucks that would be required to haul materials (e.g., concrete, asphalt, rails) and debris to/from the Project site.

Table 4.6-3 sets forth a summary of the GHG construction emissions that the Project would generate. As indicated in the table, total GHG construction emissions that would be generated over the 6-month construction period in the form of CO₂e would be approximately 601 metric tons. These emissions amortized over a 30-year period equal approximately 20 metric tons per year. As described in the analysis methodology, the total emissions from construction are added to operational emissions and then compared to the operations significance threshold (see Table 4.6-5, below). For details of the GHG construction emissions calculations and assumptions, refer to Appendix E.

**TABLE 4.6-3
PROJECT CONSTRUCTION GREENHOUSE GAS EMISSIONS**

Sources	CO ₂ e Emissions (metric tons)
Equipment Exhaust	474
Onsite Vehicle Exhaust	24
Off site Vehicle Exhaust	103
Total Emissions	601
Amortized Emissions	20 per year

SOURCE: ERM, 2013a, see Appendix E.1

Operational Emissions in California

Table 4.6-4 identifies (1) the Refinery's total maritime emissions of GHGs over the three-year baseline period; (2) the three-year average to be used as the baseline for maritime emissions (14,260 metric tons of CO₂e); and (3) the portion of those baseline maritime emissions that the Project would eliminate (11,707 metric tons of CO₂e). For additional information about the GHG baseline associated with the Project, refer to Section 4.6.2.3, *Project Baseline*, and Appendix E.2.

**TABLE 4.6-4
BASELINE MARINE VESSEL GHG EMISSIONS WITHIN CALIFORNIA**

Marine Vessel Baseline Emissions	CO₂e (metric tons)
Total Emissions over Baseline Period	42,780
Annual Average Emissions over Baseline Period	14,260
Estimated Baseline Emissions Displaced by Project	11,707

NOTES: Total crude delivered by marine vessel during the 3-year baseline period was 93,361,985 barrels, which equals an annual average of approximately 31,120,662 barrels. It is estimated that the Project would displace approximately 25,550,000 barrels per year of crude oil delivered by marine vessel.

SOURCES: ERM, 2014 and ESA, 2014, see Appendix Sections E.2 and E.5.

As Table 4.6-5 shows, Project operations would result in a net increase of approximately 6,726 metric tons of CO₂e per year for the state compared to the existing baseline emissions. This increase in emissions is less than the conservative significance threshold of 10,000 tons of CO₂e per year. Therefore, the emissions of GHG that would be generated by the Project would not be cumulatively considerable and would represent a less-than-significant impact.

**TABLE 4.6-5
PROJECT ANNUAL NET GHG EMISSIONS GENERATED WITHIN CALIFORNIA**

Sources	California CO₂e Emissions (metric tons/year)
Trains - Long Line Haul from California State Line to Roseville ^a	13,158
Trains – Long Line Haul from Roseville to Refinery	4,589
Trains – Short Line Haul at Refinery	135
Trains – Switching at Refinery	351
Electricity Consumption ^b	180
Amortized Construction Emissions	20
Total Project Emissions	18,433
Marine Vessel Emissions Displaced (Baseline)	-11,707
Total Net Emissions	6,726
Significance Threshold	10,000
Significant Impact?	No

^a Train emissions from the state line to Roseville were estimated by ESA based on ERM, 2013b.

^b Indirect GHG emissions associated with electricity consumption were provided by Valero (2013).

SOURCES: ERM, 2013b and 2014, and ESA 2014, see Appendix Sections E.2, E.3, and E.5.

Operational Emissions Outside of California

As explained in Section 4.1, trains travelling between the Refinery and North American oil fields would generate locomotive emissions outside of the State. In order to understand the Project's net impact on climate change, however, one must consider the maritime emissions that the Project would eliminate. The baseline includes emissions from marine vessels travelling between the Refinery and shipping ports throughout the world, including ports in Alaska, South America, and the Middle East.

In order to compare the Project's increase in locomotive emissions with the Project's decrease in baseline maritime emissions, ESA developed emissions factors for GHG emissions from locomotives hauling 100-car trains and marine vessels based on calculations provided by Valero. The emission factors, set forth in Table 4.6-6, are stated in metric tons of CO₂e emitted for delivery of one million barrels of crude oil for each thousand miles of distance traveled⁴ between the source and the Refinery.

TABLE 4.6-6⁵
EMISSIONS FACTORS COMPARISON FOR 1,000,000 BARRELS DELIVERED
PER 1,000 MILES TRAVELLED OUTSIDE OF CALIFORNIA

Sources	Metric tons CO ₂ e per thousand miles hauled per million barrels delivered
Locomotives – large line haul	1,321
Marine Vessel Main & Aux Engines, Open Ocean	876

SOURCE: ESA, 2014; See Appendix E.5

Table 4.6-7 presents estimates of GHG emissions that would be generated outside of California due to transport of the Project maximum quantity of crude oil by marine vessels and trains. Emissions from marine vessel operation outside California have been estimated using a composite nautical distance for crude oil delivered from source countries of origin during the baseline period. Due to the uncertainty of the origins of the crude oil that would be delivered by rail, the total Project-related GHG emissions that would be generated outside of State cannot be precisely calculated. GHG emissions have been estimated using average estimated distance from two potential North American sources.

-
- ⁴ The mileage is the one-way distance from the terminal to the Refinery; the emissions are doubled to include the trip to return to the terminal.
- ⁵ The estimates provided in Table 4.6-7 do not include the following emissions, which occur in California: locomotive emissions associated with small-line (25-rail car trains) hauling or switching that would occur at or in the vicinity of the Refinery, and the marine vessel emissions do not include emissions from main and auxiliary engines and auxiliary boiler operation associated with slow cruise in reduced speed zone, vessel maneuvering, or hoteling at the Refinery dock (i.e., operation of main and auxiliary engines and boilers at/near the dock) or emissions associated with tugboat escorts and berthing, because it would be overly speculative to attempt to estimate such emissions.

**TABLE 4.6-7
EXAMPLES OF GHG EMISSIONS OUTSIDE OF CALIFORNIA**

Emission Sources for Example Crude Oil Origins	Example One-Way Distance (miles)	Metric tons CO₂e per 25,550,000 Barrels Delivered per Year (round trip)
Project Locomotives – large line haul from composite North American Origin	1,500	101,219
Baseline Marine Vessel Engines - Alaskan Origin	2,000	89,540
Baseline Marine Vessel Engines – South American Origin	4,000	179,080
Baseline Marine Vessel Engines –Middle East Origin	8,500	380,554
Baseline Marine Vessel Engines – Composite Baseline Origin	7,305	327,044
Net Emissions with Alaskan Origin Baseline	--	11,679
Net Emissions with South American Origin Baseline	--	-77,861
Net Emissions with Middle East Origin Baseline	---	-279,325
Net Emissions with Composite Baseline Origin Baseline	---	-225,825

* This estimate excludes emissions from operation of any pipeline to terminal of origin. The weighted average of sea distances between various ports from which crude oil was imported during the baseline period and the Refinery terminal.

SOURCE: ESA, 2014; See Appendix E.5

As indicated in Table 4.6-6, delivery of crude oil by large line haul tank cars would result in lower overall emissions outside of the State than delivery of crude oil by marine vessel from the composite baseline origin. Net GHG emissions that would be generated outside of the State are highly dependent on the origin of the crude oil source and due to the uncertainty in the origins of the crudes that would be delivered by rail as well as the origins of the crudes that would be displaced, the net Project emissions estimates presented in Table 4.6-7 are disclosed for comparison purposes only.

Mitigation: None required.

4.7 Hazards and Hazardous Materials

4.7.1 Introduction

The Project would allow the Refinery to receive shipments of crude oil by rail. These shipments would replace some of the crude oil shipments currently delivered by marine vessel. This section evaluates the Project's potential impacts based on hazards. The section examines risks associated with the accidental release of crude oil from railroad tank cars, including fires, explosions, inhalation of vapors, and environmental damage. The section also examines the health risks associated with routine operations, such as exposure to locomotive emissions.

The section discusses the environmental setting, regulatory setting, significance criteria, potential risks, and their significance.

4.7.2 Setting

The existing setting includes the existing Project area conditions and the programs, procedures, and regulations that are designed to minimize the potential for accidents related to the Project.

4.7.2.1 Regional Setting

The existing Refinery receives crude oil by pipeline and marine vessel. Current marine vessel shipments come from various locations in the world, including Alaska, South America, and the Middle East. These shipments enter the San Francisco Bay through the Golden Gate and proceed to the Refinery dock in Benicia. Although accidents and spills could occur anywhere along the shipping route, from this regional perspective, only the last part of that route is known with relative certainty and is discussed in detail here.

4.7.2.2 Local Setting

The existing Refinery routinely receives, processes, and transports various hazardous materials. These materials exhibit one or more hazardous characteristics, such as combustibility, flammability, or toxicity. Flammable materials can ignite, causing significant fires, explosions, or the release of toxic hazardous materials. Operations at the Refinery are subject to strict safety protocols and process safety management programs that are intended to minimize the possibility of accidental releases.

For this analysis, the study area includes the rail corridor between Roseville and Benicia, the unloading facility, and those portions of San Francisco Bay that could be affected by a maritime oil spill. The analysis does not attempt to consider any impacts that might occur along train routes on the way to Roseville. Any such analysis would be speculative, because crude oil shipments heading to the Refinery could come from oil producing regions all over North America. The study area includes:

- Residences and businesses near the Rail Unloading facility;

- Residences and businesses located along the transportation route; and
- Environmental sensitive areas, including the Suisun Marsh along the train route from Roseville to Benicia.

The analysis also considers the San Francisco Bay, to the extent that the Project would reduce the risk of a crude oil spill from a ship traveling to the port in Benicia.

Airports and Air Hazards

Airport Influence Areas are used in land use planning to identify areas travelled by aircraft as they approach and depart an airport, or as they fly within established airport traffic patterns. The Project is located approximately seven miles northwest from Buchanan Field Airport in the City of Concord, approximately 12 miles southeast from Napa County Airport, in Napa County, and approximately 15 miles southwest from Travis Air Force Base.

Wildland Fire

The Project area is within a developed industrial land use area. The California Department of Forestry and Fire Protection (CAL FIRE) Fire Hazard Severity Zoning (FHSZ) maps ranks land zones under State and Local Responsibility regarding wildland fire hazard. The Project area (loading racks and railroad spurs) within the Refinery is classified as mostly unzoned within the Refinery block and a portion of the northern boundary of the Refinery property is listed as Moderate and High within the Local Responsibility Area.¹ An area just south of the main Refinery and Park Road containing Valero's main crude tank farm (see Figure 3-2) is surrounded by a CAL FIRE local responsibility area of moderate to high severity zones. Note that CAL FIRE indicates that no portion of the City of Benicia is within a Very High Fire Hazard Severity Zone (CAL FIRE, 2008).

4.7.2.3 Regulatory Setting

A variety of laws, regulations, and industry standards govern the handling and transport of crude oil. The Federal Oil Pollution Prevention regulations (40 CFR 112), as implemented under the Refinery's Emergency Management Plan, require that the Refinery have Spill Prevention Control and Countermeasure (SPCC) plans and Facility Response Plans (FRPs) to address oil spill prevention, preparedness, and response measures. The Refinery already has an approved SPCC and FRP, but the plans must be modified to cover the shipment of crude oil by rail. The modified plans must include any changes in site security measures, personnel training, testing procedures, inspection and record-keeping procedures, secondary containment and oil spill controls, emergency notification procedures, and reporting requirements. These modified plans must describe how the handling of crude oil by rail will be implemented as compared with the existing approach.

¹ The City of Benicia Fire Department is responsible for the Local Responsibility Area within the City of Benicia.

Federal and State

Hazardous Materials Management

Under the Federal Emergency Planning & Community Right-To-Know Act (EPCRA), businesses must retain manufacturers' Safety Data Sheets (SDS) for each hazardous chemical product. Each SDS sets forth information about the chemical in question, including its hazards, guidelines for handling and storage, and accidental release response measures. EPCRA also requires businesses to submit hazardous chemical inventory forms to the State Emergency Response Commission, Local Emergency Planning Committee, and local fire department annually on March 1st.

In California, businesses meet the federal requirements by complying with the California Hazardous Materials Business Plan program (CA Health and Safety Code § 25504 [a-c]). The Hazardous Materials Business Plans describe hazardous materials inventories, storage container types and locations, emergency response and evacuation procedures, and employee hazardous materials training program. The Solano County Department of Resource Management, Environmental Health Services Division Enforcement (SCDRM) enforces the hazardous materials the Hazardous Materials Business Plan requirements as they apply to the Refinery. SCDRM is the Certified Unified Program Agency (CUPA) for Solano County under state law.

Hazardous Waste Management

The Federal Resource Conservation and Recovery Act of 1976 (RCRA) sets forth a “cradle-to-grave” regulatory program governing the generation, transportation, treatment, storage, and disposal of hazardous waste. Under RCRA, individual states may implement their own hazardous waste programs in lieu of RCRA as long as the state program is at least as stringent as federal RCRA requirements.

In California, the Department of Toxic Substances Control (DTSC) implements the federal RCRA requirements under the California Hazardous Waste Control Law. DTSC's hazardous waste regulations establish criteria for identifying, packaging, labeling, and managing of hazardous wastes. The requirements are implemented through a permit program governing treatment, storage, disposal, and transportation of hazardous waste. The regulations require hazardous waste generators to prepare a Hazardous Waste Contingency Plan describing hazardous waste storage and secondary containment facilities, emergency response and evacuation procedures, and employee hazardous waste training program. While DTSC generally retains authority to implement and enforce its hazardous waste management regulations, much of the day-to-day regulation is delegated to the SCDRM as the local CUPA.

Federal Regulation of Oil Transport by Rail

The Federal Railroad Administration (FRA) is a department within the U.S. Department of Transportation (USDOT). FRA adopts and enforces railroad safety regulations, including regulations relating to track safety, grade crossings, rail equipment, operating practices, and the transport of hazardous materials by rail. The FRA inspects rail facilities throughout the country in order to ensure compliance with its own regulations, and those adopted by the Pipeline and Hazardous Materials Safety Administration (PHMSA). The FRA operates through a number of

regional offices. The Region 7 office, headquartered in Sacramento, governs rail activities in Arizona, California, Nevada, and Utah.

PHMSA is another department within the USDOT. Pursuant to the Hazardous Materials Transportation Act, PHMSA adopts regulations governing the transport of hazardous materials by rail, highway, air, and water. The PHMSA regulations are set forth in Chapter I of Subtitle B of Title 49 of the Code of Federal Regulations (CFR). The FRA enforces the requirements set forth in PHMSA regulations.

The National Transportation Safety Board (NTSB) is an independent federal agency. The NTSB reviews transportation accidents, including rail accidents, and makes recommendations to FRA and PHMSA for regulatory changes.

The American Association of Railroads (AAR) is an industry trade association that represents railroads, including the major freight railroads in the United States, Canada, and Mexico. AAR adopts standards for the design and construction of tank cars carried by its members. In some cases, these standards are more stringent than the requirements set forth in FRA or PHMSA regulations. In addition, USDOT's predecessor delegated to AAR regulatory authority to approve the construction, alteration, repair, and conversion of tank cars and to certify facilities engaged in these activities.

The PHMSA regulations classify hazardous materials based on each material's hazardous characteristics. Crude oil is assigned to hazard Class 3, based on specified characteristics of flammability and combustibility (49 CFR 173.120). The pertinent PHMSA regulations governing rail transport are summarized as follows:

- 49 CFR 172, *Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, Training Requirements, and Security Plans*, addresses numerous aspects of safe rail transport, including requirements pertaining to the hazardous materials classification of crude oil.
- 49 CFR 173, *General Requirements for Shipments and Packages*, specifies requirements for bulk packaging including the type of tank car a hazardous material must be transported in based on its assigned Packing Group.
- 49 CFR 174, *Carriage by Rail*, specifies handling, loading, and unloading requirements for the safe transport and shipping of hazardous materials, which must be performed by qualified personnel. This part also addresses correct placarding of rail cars to indicate the hazard classifications of the materials, and segregation of incompatible materials.
- 49 CFR 176, *Carriage by Vessel*, provides further details on vessel carriage requirements for different classes of hazardous materials.
- 49 CFR 179, *Specifications for Tank Cars*, provides design standards and construction requirements for rail tank cars including tank wall thickness, tank mounting, welding certification, pressure relief devices, protection of fittings, loading/unloading valve requirements, coupler vertical restraints systems, tank-head puncture-resistance systems, and thermal protection systems.

Under PHMSA regulations, all crude oil must be shipped in a tank car built to the “DOT-111” specification. DOT-111 tank cars are non pressure tank cars. The cars have a minimum shell thickness of 7/16 inch and a design pressure of up to 500 pounds per square inch gage (psig). DOT-111 tank cars are used to transport a variety of hazardous materials, including crude oil and ethanol. The DOT-111 design has been in use since the 1960’s.

Different “packaging” requirements apply to different crude oils transported by rail. PHMSA regulations assign hazardous materials to “Packing Groups” based on the risks posed by the transport of each hazardous material. Packing Group I indicates great danger; Packing Group II indicates medium danger; and Packing Group III indicates minor danger (49 CFR 171.8). Materials assigned to Packing Group I are subject to the most stringent packaging requirements, while crude oils assigned to Packing Group III are subject to the least stringent requirements.

Individual crude oils can be classified as Packing Group I, II, or III materials depending on their boiling points and flash points. Any crude oil with a boiling point below 95° Fahrenheit is assigned to Packing Group I. Packing Group II includes any crude oil with a boiling point above 95° and a flash point below 73° Fahrenheit. Packing Group II crude oils are less volatile than Packing Group I, although more volatile than Packing Group III crude oils. Packing Group III includes any crude oil with a boiling point above 95° and a flash point between 73° and 140° Fahrenheit.

Recent and Ongoing Developments in the Regulation of Crude Transport by Rail

In response to recent rail accidents involving crude oil and ethanol, federal regulatory agencies and AAR have taken a variety of actions designed to reduce the risk of accidental releases from DOT-111 tank cars. The effort to reduce risk is ongoing, and further regulatory changes are expected in the relatively near future.

The first of these rail accidents occurred at a highway/rail grade crossing in Cherry Valley, Illinois on June 19, 2009. A freight train carrying ethanol in DOT-111 tank cars derailed, causing the release of ethanol from thirteen tank cars. The ethanol caught fire. At the time of the derailment, several motor vehicles were stopped on either side of the grade crossing waiting for the train to pass. The fire fatally injured an occupant in one of the motor vehicles, and seriously injured two other occupants. Five occupants of other vehicles were also injured. The accident prompted a mandatory evacuation of approximately 600 residences within a ½ mile radius of the grade crossing (NTSB, 2012a).

In its 2012 Accident Report, the NTSB identified a number of causes of the Cherry Valley accident and the ensuing release, including the fact that the track structure was washed out by a flash flood. The NTSB also concluded that design of the DOT-111 tank cars was “inadequate,” making the cars “subject to damage and catastrophic loss of hazardous materials during derailment” (NTSB, 2012a).

In 2012, NTSB issued a safety recommendation urging PHMSA to adopt more stringent specifications for DOT-111 tank cars that carry ethanol or crude oil and are assigned to Packing Groups I or II (NTSB, 2012b). The recommendations included making the tank head and shell

more puncture resistant and requiring that bottom outlet valves are designed to remain closed during accidents when the valve and operating handle are subjected to impact forces.

Also in response to the Cherry Valley accident, AAR's North American Tank Car Committee began to consider possible changes to the DOT-111 design that would help prevent releases. In March 2011, the AAR filed Petition P-1577 with the PHMSA, asking PHMSA to adopt more stringent standards for DOT-111 tank cars (AAR, 2011a). PHMSA has not yet acted on the AAR Petition. PHMSA has, however, instituted a rulemaking to address the AAR Petition along with seven other petitions and four NTSB recommendations relating to transportation of hazardous materials by rail (PHMSA, 2013). The rulemaking will address, among other issues, the adequacy of the DOT-111 tank cars. The PHMSA rulemaking may well result in more stringent regulations governing the design of tank cars that carry crude oil and other hazardous materials.

Rather than wait for action on its PHMSA Petition, on August 31, 2011, AAR voluntarily imposed more stringent standards for the design of DOT-111 tank cars. AAR issued the new standards through Casualty Prevention Circular 1232 (CPC-1232) (AAR, 2011b). CPC-1232 established the following requirements for DOT-111 tank cars:

- Thicker, tank shell and heads;
- Higher tensile strength, normalized steel to improve the ability of tank cars to survive an accident;
- Protective, steel head shields at both ends of tank car;
- Consolidated top fittings located beneath a robust steel protective housing; and
- A reclosing pressure relief device to reduce the likelihood of over-pressure if the car is involved in an accident and pool fire.

DOT-111 tank cars that meet these standards are often referred to by the number "1232," and shall be referred to here as "1232 Tank Cars" (see Figure 4.7-1). DOT-111 tank cars that do not comply with CPC 1232 are often referred to as "legacy" DOT-111 tank cars, and are referred to here as "DOT-111 Legacy Tank Cars." As a result of CPC-1232, all DOT-111 tank cars ordered after October 1, 2011 must meet the standards for 1232 Tank Cars. As of April, 2013, approximately one third of the DOT-111 tank cars used to transport crude oil in North America are 1232 Tank Cars, while the rest are DOT-111 Legacy Tank Cars (AAR, 2014).

In addition, in just the last year, PHMSA, FRA, NTSB, and AAR have taken a number of actions in response to certain accidents involving the rail transportation of crude oil from the Bakken Shale formation in North Dakota. These incidents are summarized as follows:

- On July 6, 2013, a train carrying Bakken crude oil in 72 DOT-111 Legacy Tank Cars derailed in the downtown area of Lac-Mégantic, Canada. The waybills described the Bakken crude oil as a Class 3 hazardous material, assigned to Packing Group III. The engineer stopped the train at a designated crew change point, left the lead locomotive engine idling, and departed the area leaving the train unattended on the mainline track. A fire was later reported on one of the train's unattended locomotive engines and local emergency personnel

EVOLUTION OF RAIL INDUSTRY TANK CAR STANDARDS FOR CRUDE OIL

The railroad industry is proposing to increase the federal tank car design and construction standards for new tank cars used to transport crude oil. This proposal comes after a previous upgrade proposal which the industry voluntarily adopted and has been observing since October 2011. This graphic shows the additional tank car components included in the latest rail industry proposal.

HIGH CAPACITY PRESSURE RELIEF VALVE

Current Standard:
No requirement

Latest Rail Industry Proposal:
Requires a high capacity pressure relief device to protect against a rise in internal pressure resulting from fire. Provides for faster release of product.

TOP FITTINGS PROTECTION

Current Standard:
Requires top fittings protection to protect the integrity of valves and fittings used to load product in the event of an accident.

Latest Rail Industry Proposal:
Contains the same requirement.

STEEL TANK

Current Standard:
Requires a minimum ½ inch thick steel tank for unjacketed cars and a minimum ⅝ inch thick steel tank for jacketed cars.

Latest Rail Industry Proposal:
Requires a minimum ¾ inch thick steel tank.

HEAD SHIELDS

Current Standard:
Requires minimum ½ inch thick half height head shields at both ends of the tank car to improve puncture resistance.

Latest Rail Industry Proposal:
Requires ½ inch thick full-height head shields at both ends of the tank car.

BOTTOM OUTLET HANDLES

Current Standard:
No requirement

Latest Rail Industry Proposal:
Requires bottom outlet handle reconfiguration to prevent the handle from inadvertently opening the bottom outlets in the event of an accident.

JACKET AND THERMAL PROTECTION

Current Standard:
Requires a minimum ½ inch thick steel tank OR a ⅝ inch thick steel jacket.

Latest Rail Industry Proposal:
Requires the addition of both a ¾ inch thick steel jacket around the tank car and thermal protection.

Source: Association of American Railroads, February 2014

SOURCE: Association of American Railroads, February 2014

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Figure 4.7-1
Evolution of Rail Industry Tank Car
Standards for Crude Oil

responded. An employee of the rail line also arrived on scene. After the responders departed, the unattended train began to move and gather speed, travelling uncontrolled for 7.4 miles down a descending 1.2% grade into the town of Lac-Mégantic. The train reached a top speed of 60-70 miles per hour. Sixty-three of the tank cars derailed and, of these, at least 60 released a total of 1.6 million gallons of crude oil. The spilled oil ignited immediately, and the resulting fire engulfed the tank cars and the surrounding area. A total of 47 people died in the accident. Thirty buildings were destroyed and 2,000 people were evacuated. Approximately 26,000 gallons of crude oil was discharged into the Chaudière River (NTSB, 2014a).

- On November 8, 2013, a train derailed in Aliceville, Alabama. The train was carrying 90 DOT-111 Legacy Tank Cars with Bakken crude oil from North Dakota to a refinery in the Gulf Coast. Approximately 12 of the tank cars released crude oil and caught fire. There were no reported injuries.
- On December 30, 2013, a train carrying 106 DOT-111 Legacy Tank Cars with Bakken crude oil collided with a grain train in Casselton, North Dakota. A total of 34 cars from both trains derailed, including 20 that were carrying Bakken crude oil. These cars released their contents, exploded and burned for over 24 hours. There were no reported injuries. Over 1,400 residents were evacuated from the scene.
- On April 30, 2014 in Lynchburg, Virginia, a train carrying crude oil tank cars derailed. Some of the cars that derailed were Legacy DOT-111 Tank Cars, while some were 1232 Tank Cars. One of the 1232 Tank Cars ruptured and released crude oil that ignited (Oil Daily, 2014). In addition, over 33,000 gallons of Bakken crude oil was released into the James River. There were no reported injuries.

These accidents triggered the following responses from federal regulators and the AAR:

- On August 2, 2013, FRA issued Emergency Order No. 28 establishing additional requirements for unattended trains. The requirements are designed to ensure that unattended trains, locomotives, and tenders on the mainline track or siding are properly secured against unintended movement. The Order was prompted by the Lac-Mégantic accident, which involved an unattended train (FRA, 2013a).
- Also on August 2, 2013, PHMSA and FRA issued joint Safety Advisory 2013-06. The advisory recommended eight specific actions that railroads and shippers should take relating to unattended trains, procedures for securing trains, safety and security plans, and proper classification of hazardous materials for shipment (FRA/PHMSA, 2013b).
- On September 6, 2013 PHMSA published an Advanced Notice of Proposed Rulemaking. This rulemaking will address, among other topics, the need to enhance the standards for DOT-111 tank cars used to transport Packing Group I and II hazardous materials, including crude oil (78 FR 54849; PHMSA, 2013).
- On November 14, 2013, AAR submitted comments in response PHMSA's advance notice of rulemaking. In the comments, AAR recommended that PHMSA adopt tank car standards that are even more stringent than those adopted by AAR in CPC-1232. AAR recommended that PHMSA adopt standards for new cars, and require retrofit of existing cars, to include:
 - an outer steel jacket around the tank car and thermal protection,
 - full-height head shields, and
 - high-flow capacity pressure relief valves.

AAR also recommended that PHMSA require additional safety upgrades for 1232 Tank Cars, including:

- installation of high-flow-capacity relief valves, and
- design modifications to prevent bottom outlets from opening in the case of an accident.

AAR also recommended that PHMSA aggressively phase out older-model tank cars used to move flammable liquids that cannot be retrofitted to meet new federal requirements, and eliminate the option for rail shippers to classify a flammable liquid with a flash point between 100 and 140 degrees Fahrenheit as a combustible liquid. The tank standards that AAR is currently recommending are displayed in Figure 4.7-1.

- On November 20, 2013, PHMSA and FRA issued joint Safety Advisory 2013-07 relating to the proper classification of crude oil for purposes of the packing group requirements. (FRA/PHMSA 2013c). The Advisory expressed the concern that, based on its low flash point, the Bakken crude involved in the Lac-Mégantic incident should not have been classified as a Packing Group III material. The Advisory stressed the importance of proper classification based on flash point and other hazardous characteristics. The Advisory also announced a joint FRA/PHMSA compliance initiative called “Operation Classification.” The initiative involves unannounced inspections at oil producing sites to ensure that crude oil has been properly tested and classified before it is loaded onto a tank car. The initiative has informally been referred to as the “Bakken Blitz.”
- On January 2, 2014, PHMSA issued a Safety Alert reinforcing the need to properly characterize crude oil offered for shipment (PHMSA, 2014). The Alert specifically noted that, because of its low flash point and/or low boiling point, light sweet crude such as Bakken should typically be assigned to Packing Group I or II.
- On January 21, 2014, NTSB issued Safety Recommendations R-14-4, 14-5, and 14-6 to PHMSA relating to the Lac-Mégantic incident (NTSB, 2014a). NTSB reported its finding that, based on its flash point, the Bakken crude oil released in the Lac-Mégantic incident was improperly characterized as a Packing Group III material, and should have been assigned to Packing Group II. NTSB recommended, among other things, that PHMSA and FRA work together to require shippers to accurately characterize hazardous materials offered for shipment to ensure that they are assigned to the correct packing group.
- On January 23, 2014, NTSB issued Safety Recommendations R-14-1, 14-2, and 14-3 to FRA relating to the Lac-Mégantic incident (NTSB, 2014b). NTSB repeated its findings relating to mischaracterization of Bakken crude oil and recommended that FRA, among other things, audit shippers and railroads to ensure that they are using the correct shipping classifications.
- On February 21, 2014, DOT and AAR announced an agreement relating to the transport of crude oil by rail (USDOT/AAR, 2014). AAR and its individual members (including Union Pacific Railroad) agreed to take the following eight specific actions designed to reduce the risk of transporting crude by rail:
 - Increase track inspections;
 - Upgrade braking systems;

- Apply the route planning and route selection requirements set forth in 49 CFR 172.820² to the routing of crude oil trains (the requirements do not currently apply to trains transporting crude oil);
 - Establish a maximum speed limit of 40 miles per hour for DOT-111 Legacy Tank Cars carrying crude oil through federally designated “high threat urban areas.” (These areas include cities along the route from Roseville to Benicia);
 - Continue to work with local communities to address their concerns about crude-by-rail transport in their areas;
 - Install wayside wheel bearing detectors on tracks at 40-mile intervals. These devices monitor train wheels and can detect potential defects before they cause an accident;
 - Increase emergency response training;
 - Conduct planning for emergency response capability.
- On March 6, 2014, USDOT issued Emergency Order DOT-OST-2014-0025. (USDOT, 2014a). Among other things, the Order requires shippers to assign crude oil to Packing Groups I or II, thereby assuring that Bakken and other highly volatile crude oils cannot be mischaracterized and assigned to Packing Group III.
 - On May 7, 2014, USDOT issued Emergency Order DOT-OST-2014-0067. (USDOT, 2014b). The Order requires railroads to notify the State Emergency Response Commission for each state in which the railroad transports Bakken crude oil. The notice must contain certain prescribed information, including the number of trains, the train routes, and the characteristics of the crude oil. Absent the required notice, railroads are prohibited from transporting Bakken crude oil. The Order allows states to effectively plan emergency response procedures for an accident involving Bakken crude oil.
 - On May 7, 2014, FRA and PHMSA issued a joint Safety Advisory relating to the transport of Bakken crude by rail. (FRA/PHMSA, 2014). The Advisory recommended that shippers and railroads use the rail tank car designs with the “highest level of integrity reasonably available within their fleet” for the shipment of Bakken crude oil. The Advisory also specifically advised shippers and railroads to avoid the use of DOT-111 Legacy Tank Cars for shipping Bakken crude oil, to the extent reasonably practicable.

Accidental Release Prevention

Under federal and state laws, certain facilities must assess the potential for accidental releases of toxic, reactive, flammable, or explosive chemicals, and establish programs to minimize the frequency and extent of accidental releases. These laws include the U.S. Environmental Protection Agency Risk Management Plan (RMP) Rule; the California Accidental Release Programs (CalARP); and the California Occupational Safety and Health (Cal/OSHA) Process Safety Management (PSM) standard. The PSM standard addresses workplace and employee safety on-site. The RMP and CalARP regulations address on-site incidents that might have offsite consequences for the general public

² Section 172.820 requires rail carriers to analyze the safety and security risks for each transportation route. The analysis must take into account a variety of relevant factors including, among others, the volume of hazardous materials transported, the density of rail traffic, trip length, track type, class and maintenance schedule, track grade and curvature, signals and train control system, environmentally sensitive or significant areas, and venues along the route (49 CFR 172 app. D). The analysis must also identify and analyze practicable alternative routes.

Fire Protection-Flammable Liquid and Compressed Gas Storage

The Refinery is required to comply with the California Fire Code and National Fire Protection Association (NFPA) codes that address requirements for flammable and combustible liquid and compressed gas storage including pressure vessel installation, water mains, foam fire protection systems, and water supply reliability requirements. The Benicia Fire Department has local jurisdiction over proper implementation of fire code requirements.

Worker Safety

Occupational safety standards exist in federal and State laws to minimize worker safety risks from both physical and chemical hazards in the work place. The Cal/OSHA and the federal Occupational Safety and Health Administration are the agencies responsible for assuring worker safety in the workplace.

Cal/OSHA assumes primary responsibility for developing and enforcing standards for safe workplaces and work practices within the State. The Cal/OSHA PSM rule is discussed above under Accidental Release Prevention. Worker entry into confined spaces, such as bulk storage tanks, must be performed in accordance with OSHA confined space procedures, including training for participants, planning, provisions for access/egress, monitoring, and supervision. Work requiring welding, grinding, demolition, repair, and installation require hot work (cutting torches, welding, grinding, etc.). Hot work within the Refinery environment must be performed under the facility hot work program that is designed in accordance with OSHA requirements and industry guidelines. At sites known to have hazardous materials present (hydrocarbons, lead based paint, asbestos, contaminated soil, etc.), a site safety plan must be prepared to protect workers. The site safety plan establishes policies and procedures to protect workers and the public from exposure to known and potential hazards at the site. Additional information on Valero's Process Safety Management programs are discussed in Chapter 3, *Project Description*, and in this section, see Impact 4.7-7 below.

In addition, regulations protecting worker safety during crude oil unloading from tank cars are under the supervision of Cal/OSHA. The State requirements under California Code of Regulations, Title 8 are designed to protect workers and the public from health and safety hazards during crude oil handling related to rail transport. Cal/OSHA requires that employers provide employees with information and training on hazardous chemicals that may be encountered in their work area and instructions on ways to protect themselves in the event of a spill or release of hazardous substances.

Emergency Response

California has developed an emergency response plan to coordinate emergency services provided by federal, State, and local government and private agencies. Responding to hazardous materials incidents is one part of this plan, as is responding to intentional acts of destruction. Another part of the plan involves development of a downstream evacuation plan for areas within the potential inundation area. For Solano County, the plan is administered by the California Emergency Management Agency, which coordinates the responses of other agencies, including the California

Environmental Protection Agency, California Highway Patrol, California Department of Fish and Wildlife, Regional Water Quality Control Board, and local fire departments.

Crude Oil Tank Car Movements

Union Pacific Railroad (UPRR) is a common carrier, which is a company that transports goods for any person or company and that is responsible for the loss of goods during transport. UPRR transports all materials (hazardous or otherwise) in accordance with applicable federal law, industry standards, and other operating rules to safely and efficiently move freight. Specifically, 49 CFR 130 - Oil Spill Prevention and Response Plans, requires transporters of oil (both non-hazardous and hazardous) to have a written emergency response plan. UPRR's Hazardous Material Emergency Response Plan (HMERP) meets this requirement. Additionally, UPRR's Hazmat Team is trained to respond and manage incidents involving the release, or potential release, of hazardous materials during an incident.

Local

Benicia General Plan

The *City of Benicia General Plan* (1999) identifies the following goals and policies relating to hazardous materials:

Goal 4.7: Ensure that existing and future neighborhoods are safe from risks to public health that could result from exposure to hazardous materials.

Policy 4.7.1: Actively recruit industries and businesses that sustain environmental quality and have sound, responsible environmental policies, such as “best available control technology” (BACT), source reduction, reduced use of hazardous materials in production, and reduced waste.

Policy 4.7.2: Establish a “Community Right to know” program to promote general public understanding of Benicia toxics problems as they affect current and future generations.

Goal 4.8: Protect sensitive receptors from hazards.

Policy 4.8.1: Evaluate potential hazards and environmental risks to sensitive receptors before approving development.

Goal 4.16: Require hazardous materials and hazardous waste management handling and disposal procedures that are protective of human health and the environment.

4.7.2.4 Project Baseline

Baseline conditions reflect the ongoing operation of the Refinery as it existed at the time of the preparation of the Initial Study (Spring 2013), including the shipment of crude oil by marine vessel.

4.7.3 Significance Criteria

Based on California Environmental Quality Act (CEQA) Guidelines Appendix G, a project would cause adverse impacts related to hazards and hazardous materials if it would:

- a) Create a significant hazard to the public or the environment through the routine transport, use or disposal of hazardous materials;
- b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;
- c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances or waste within one-quarter mile of an existing or proposed school;
- d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment;
- e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would result in a safety hazard for people residing or working in the project area;
- f) For a project within the vicinity of a private airstrip, would result in a safety hazard for people residing or working in the project area;
- g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan; or
- h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands.

4.7.3.1 Approach to Analysis

Within each impact area, this analysis compares existing conditions with existing-plus-project conditions, and applies an appropriate qualitative or quantitative significance threshold. An increased cancer risk, for example, is considered significant if the risk exceeds 10 in 1 million. The risk of an accidental release of hazardous materials is subject to a qualitative evaluation, taking into account the applicable regulatory framework, the probability that an accident will occur, and the potential consequences of an accident.

4.7.4 Hazardous Properties of Crude Oil to be Shipped by Rail

The consequences of a release of crude oil for a rail tank car depend on the properties of the crude oil and the area into which the crude oil is released. Relatively lighter crude oil has a lower flash point than relatively heavier crude oil. Therefore, relatively lighter crude oil is more likely to ignite upon release, causing a fire and/or explosion.

As explained in Section 3.3.1.1 *Types of Crude Oil*, crude oil is a mixture of hydrocarbon compounds. While most of the compounds are liquid at room temperature, some are vapors at room temperature. Methane, ethane, propane, butane, and pentane, for example, are vapors at room temperature. Some crude oils also contain various sulfur compounds, including hydrogen sulfide, a toxic gas that can cause adverse acute health effects above certain concentrations and exposure duration.

Crude oil produced from an oil well usually undergoes some processing, separation, or treatment near the well location prior to being loaded onto tank cars. Processing includes the separation of water and solids from the oil as well as the separation of light vapors from the liquid crude oil. Depending on the characteristics of the crude oil reservoir, hydrogen sulfide might be present in the vapors produced with the crude. Most of the hydrogen sulfide and vapors are removed from crude oil before it is loaded onto a tank car.

As explained above, shippers must characterize crude oil that they offer to railroads for shipment based on initial boiling point and flash point. Crudes with relatively lower boiling points and/or lower flash points are more easily ignited by heat, sparks or flames than crudes with relatively high boiling points and/or flash points. Crude oil vapors can form an explosive mixture with oxygen. Inhalation of vapor or contact with the material may irritate or burn skin or eyes. Fire may produce irritating, corrosive and/or toxic gases.

4.7.5 Discussion of No Hazards and Hazardous Materials Impacts

Based on the facts and reasoning set forth below, no impact would result for three hazards criteria.

- d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment.**

The Valero Benicia Refinery is listed by the State Water Resources Control Board as having potentially contaminated ground water, and performs ongoing groundwater monitoring, remediation, and reporting activities. The Project is compatible with Valero's groundwater compliance activities. The Project would be constructed entirely within the Refinery, where no public access is allowed. As the Project involves the installation of underground equipment and other new construction that would involve soil disturbance, there is the potential to encounter contaminated soil or groundwater. If contamination is encountered, construction work would follow legally required procedures to protect worker and public health and safety. Excavated soils would be segregated and sampled relative to the profiling requirements of the accepting landfill, and disposed of in accordance with policies of the accepting landfill and applicable regulations.

For these reasons, the potential presence of hazardous materials on the site would not create a hazard to the public or to the environment. No impact would occur.

- e) **For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would result in a safety hazard for people residing or working in the project area.**

The Project is not located within an airport use plan. No impact would occur.

- f) **For a project within the vicinity of a private airstrip, would result in a safety hazard for people residing or working in the project area.**

There are no private airstrips in the vicinity of the Project. Therefore, there are no impacts anticipated from a private airstrip. No impact would occur.

4.7.6 Discussion of Impacts and Mitigation Measures

- a) **Create a significant hazard to the public or the environment through the routine transport, use or disposal of hazardous materials.**

General Railroad Safety

UPRR is a common carrier by rail and would be responsible for transporting crude oil to the Refinery if the Project were approved. Federal law requires common carriers like UPRR, to transport hazardous materials, such as ethanol or crude oil, for its customers. If a customer delivers the hazardous material in conformity with applicable DOT requirements, UPRR must transport the hazardous material.

UPRR transports all commodities in accordance with applicable federal laws and industry standards. To maximize safety and security when moving hazardous materials, UPRR has implemented additional voluntary rules to secure trains operating on their 23-state network. UPRR invests substantially in efforts to improve hazardous materials transportation safety, funding an array of security and hazardous materials-related initiatives that exceed mandatory compliance measures. UPRR has indicated that it is continuously improving safety when it comes to transporting crude oil and other hazardous materials. Every day, as part of this effort, UPRR inspects tracks, locomotives, and cars carrying crude oil and other hazardous liquids. UPRR conducts extensive training and preparedness programs involving specialized safety training for rail personnel, as well as local first responders (UPRR, 2013).

It should be noted that UPRR does not produce hazardous materials, own the tank cars that move the hazardous materials, load or unload those tank cars, or select the origin point or destination where the hazardous materials are shipped. In addition, UPRR has procedures in place to ensure that equipment is properly secured, including several checks and balances to control the risk of an uncontrolled movement. Project trains are expected to move directly from Roseville to Benicia, and will be attended at all times. To maximize safety and security, UPRR has implemented additional procedures to secure an unattended train or locomotives (UPRR, 2013). These include:

- Designate trains carrying loads of hazardous materials that will not be left unattended on main line tracks or sidings outside of yards or terminals unless specifically authorized.

- Develop a written plan that specifies locations and circumstances under which it is safe to leave unattended trains or vehicles transporting hazardous material loads.
- Develop a process for employees securing unattended trains or vehicles that include specific communications with the train dispatchers.
- Review, verify and adjust as necessary protocols related to securing unattended trains or vehicles.
- Implement operating rules and instructions regarding job briefings that include appropriate securement protocols.
- Implement procedures for inspecting equipment for proper securement in cases where an emergency responder has been on, under or between equipment.

Impact 4.7-1: The Project could pose a significant hazard to the public or environment during operation of the Project or routine transport or disposal of hazardous materials. (*Less than Significant*)

The operation of the Project and transportation of crude oil by rail would increase the frequency of emissions of toxic air contaminants (TACs) from locomotive emissions, and from equipment fugitive emissions. Crude oil delivered by tank car would be stored in existing crude storage tanks and the crude brought in by rail will displace crude brought in by marine vessel. Therefore, there would be no increase in fugitive emissions from storage tanks. A health risk assessment performed for the Project (see Appendix E.6) including operations at the new unloading facility and along the UPRR mainline between the Refinery and the Roseville rail yards, shows that the cancer risk from the increase in exposure to TACs ranges from 0.3 to 8 in one million, which is less than the significance threshold of 10 in one million. Also, the maximum chronic and acute hazard indices of 0.014 and 0.0113, respectively, are less than the significance threshold of 1.0. Thus, the potential risk to the public and environment for the routine transport of crude oil by rail for the Project is considered to be less than significant.

Mitigation: None required.

b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment.

Impact 4.7-2: The Project could pose significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment. (*Less than Significant*)

If the Project were approved and constructed, trains would transport crude oil on UPRR's mainline tracks from the Roseville Yard to the Refinery's unloading facility. Each train, carrying up to 50 cars of crude oil, would pass through the cities of Roseville, Sacramento, Davis, Dixon, Vacaville, Fairfield, Suisun City, and Benicia. The Refinery would receive two trains per day, 7 days per week (730 train visits per year).

If a train carrying crude oil from the Roseville Yard to the Refinery were to derail, and one or more tank cars were to rupture, crude oil could be released into the environment.⁴ If an ignition source is present, the released crude oil could ignite and/or explode. This section b) performs a qualitative analysis of this risk. The analysis takes into account the following factors: (1) the probability of an accidental release of crude oil from a train; (2) the consequences of a release; (3) the reduction in the risk of accidental releases from a marine vessel, based on the reduction in marine trips that would be caused by the Project; (4) the recent history of accidents involving DOT-111 tank cars carrying crude oil; and (5) the regulatory requirements designed to prevent releases and/or mitigate the consequences in the event of a release from trains.

If a release were to occur, the consequences depend largely on the amount and location of release. A release in any area could, depending on the specific circumstances, require a significant hazardous materials cleanup. A release of a relatively small amount of crude may not have significant consequences if it were to occur along the line in a rural area other than the Suisun Marsh. If a release in an urban area were to ignite and/or explode, depending on the specific circumstances, the release could result in property damage and/or injury and/or loss of life. As explained in Section 4.2, *Biological Resources*, a release into the Suisun Marsh could result in significant damage to biological resources.

As explained above, there is a variety of federal regulations designed to prevent the accidental release of crude oil from trains, and minimize the consequences of any such release. FRA and PHMSA closely regulate the rail transport of crude oil and other hazardous materials. Crude oil must be classified, assigned to a packing group subject to packaging requirements, and transported in rail cars that meet certain specifications. The transport of crude oil by rail is subject to requirements for handling, loading and unloading, and the placement of placards to alert emergency response teams as to the contents of each car. FRA routinely inspects the facilities of shippers and railroads to ensure that all regulatory requirements are being met.

In order to identify the probability of an accidental release of crude oil from a Valero train, the City retained Dr. Christopher Barkan to conduct a quantitative assessment. Dr. Barkan is Professor and Executive Director of the Rail Transportation and Engineering Center at the Department of Civil and Environmental Engineering at the University of Illinois at Urbana-Champaign. He and his colleagues prepared a report that is attached hereto as Appendix F.

The annual rate of crude oil release accidents on the route between Roseville and Benicia was estimated. Consistent with recent industry practice a release event in which a tank car loses more than 100 gallons of crude oil was considered significant. It was assumed that the Refinery would use 1232 Tank Cars for all shipments, based on Valero's commitment to do so. The risk analysis took into account major risk factors, including the route's FRA track class, method of operation, tank car safety design and the proposed volume of petroleum crude oil traffic over the route.

⁴ Not every tank car derailment results in a spill, fire, or explosion. This analysis focuses on derailments that result in a release of crude oil.

The estimated risk of an accident resulting in a release of more than 100 gallons is approximately 0.009 per year, which corresponds to an estimated frequency of occurrence of once per 111 years. The risk of a release along the portion of the route traversing the Suisun wetland area has an even lower annual risk of 0.00381, which corresponds to an estimated frequency of once per 262 years.

According to the report, these risk estimates are probably conservative, meaning that they probably overstate the actual risk. This is because the rate of hazardous materials releases from trains has declined since the rate estimates were developed; the accident rate has been declining for decades, and this trend will likely continue based on continued investment in infrastructure and new safety technologies; the analysis does not take into account the safety practices adopted by AAR earlier this year. In addition, the pending PHMSA rulemaking could result in new tank car standards that are even more stringent than those for 1232 Tank Cars.

The report also compared the likelihood of an accident involving a Valero train travelling from Roseville to Benicia with the likelihood of automobile accidents, based on recent US federal data on highway safety in terms of incidents per million vehicle miles traveled. The risk of a motor vehicle accident is 22 times higher than the risk of a Valero train release. Considered on an annual basis, the average US driver is 6.3 times more likely to be involved in a motor vehicle accident, and 1.9 times more likely to be involved in an accident involving injuries or fatalities, than the occurrence of a release incident on the Roseville to Benicia route.

Although the Project involves a risk of an accidental release from tank cars (albeit very low at 0.009), the Project also involves a corresponding reduction in the risk of an accidental maritime release from vessels carrying crude oil to the Refinery. For harbor and mooring accidents, the probability of an accident as reported by FEMA is 0.001 accidents per transit, and about 0.15 of these accidents would result in a spill (FEMA, 1989). Assuming current baseline transits for marine terminal (approximately 89 ships per year); the estimated baseline probability of an accidental release resulting in a spill would be 0.0267 releases per year (or once every 37.5 years). With operation of the Project, marine vessel deliveries would be reduced by up to 82% per year and the probability of a maritime release in San Francisco Bay would be lowered to 0.0048 releases per year (once in 208 years).

As also explained above, in the past year there have been several significant accidents involving the release of Bakken crude oil from rail cars, including the incidents in Lac-Mégantic, Aliceville, Casselton, and Lynchburg. All of these incidents involved a significant fire and/or explosion. The Lac-Mégantic was the only incident involving injuries or loss of life, although the loss in that event can only be described as catastrophic. The Lac-Mégantic and Lynchburg events both resulted in a significant discharge of crude oil into a waterway.

These incidents raise the concern that a release of Bakken crude is more likely to result in a fire or explosion because of its low flash point and/or low boiling point than other crude oils. Since Bakken is one of the available North American crudes that Valero might purchase and transport by rail to Benicia, it is important to consider those incidents, and the regulatory requirements adopted in their aftermath. It is also important to consider how the circumstances in those incidents compare to the Project's train trips.

The accident in Lac-Mégantic was caused by human error – the decision to leave an idling train unattended at the top of a steep grade. DOT’s Emergency Order No. 28 substantially reduces the risk of such an occurrence in the United States by imposing a variety of requirements relating to unattended trains and the securing thereof.

The accidents in Lac-Mégantic, Aliceville, and Casselton all involved DOT-111 Legacy Tank Cars. If the Project were approved, Valero here would use only 1232 Tank Cars to transport oil from Roseville to Benicia. This substantially reduces the risk of release in the event of derailment as compared with the use DOT-111 Legacy Tank Cars because, as explained above, 1232 Tank Cars are designed according to more stringent requirements. Had the trains in Aliceville or Casselton been using 1232 Tank Cars, it is possible that crude oil might not have been released. (Since the train in the Lac-Mégantic incident was travelling at a rate of 63 miles per hour when it derailed, it is unlikely that the use of 1232 Tank Cars would have prevented a release, although it might have reduced the severity somewhat).

At the same time, it is important to recognize that, in the Lynchburg incident, one of the 1232 Tank Cars ruptured (Oil Daily, 2014).

As explained above, in the past year the following actions by FRA, PHMSA, and AAR will significantly reduce the risk of further incidents involving Bakken crude oil:

- DOT and AAR agreed to a program involving more track inspections, better braking systems, maximum speed limits, installation of wayside wheel bearing detectors every 40 miles, additional training and planning for emergency response, and application of route planning and selection requirements to crude by rail.
- FRA Emergency Order No. 28 established additional requirements to ensure that unattended trains, locomotives, and tenders on the mainline track or siding are properly secured against unintended movement.
- DOT Emergency Order 2014-25 mandated that all crude oil be transported according to the requirements for Packing Groups I or II, even if the material in question might otherwise meet the requirements for Packing Group III. This will ensure a higher level of protection for all shipments of crude oil, including Bakken.
- As part of the “Bakken Blitz” compliance initiative, the FRA began unannounced inspections at oil producing sites to ensure that crude oil has been properly tested and classified before it is loaded onto a tank car.
- DOT Emergency Order 2014-0067 required railroads to notify the State Emergency Response Commission for each state in which the railroad transports Bakken crude oil so that adequate emergency response procedures are in place in the event of an incident.

In addition, PHMSA is currently considering more stringent regulations for the transportation of crude by rail, including requirements for tank car design that are even more stringent than those set forth in CPC-1232. AAR has already advocated such an approach in its rulemaking comments. PHMSA’s review will benefit from the lessons learned from all recent incidents, and the input of FRA and NTSB. Union Pacific and Valero will comply with any revised regulations, thereby reducing the risk of an accident, and the potential consequences of an accident, even further.

In conclusion, the risk of an accidental release of crude oil from a train travelling from Roseville to Benicia is considered insignificant based on the following:

- Although the consequences of a release are potentially severe, the likelihood of such a release is very low. The probability of an accidental release of crude oil from a tank car traveling to the Refinery involving more than 100 gallons of crude oil is just 0.009 per year.
- An extensive body of rules and regulations adopted by FRA, PHMSA, and AAR are designed to minimize the risk of an accidental release of crude oil from tank cars.
- Although there have been a number of recent fires involving Bakken crude oil, the DOT, FRA, PHMSA, NTSB, and AAR have moved aggressively to identify the causes of those incidents and reduce the risk of similar incidents. The transport of Bakken crude to the Refinery, if any, will be subject to the new, more stringent requirements.
- The Project would significantly reduce the risk of an accidental release of crude oil from a vessel in San Francisco Bay. If the Project were approved and constructed, the risk of maritime spill would be reduced from 0.0267 (once every 37.5 years) to 0.0048 (once every 208 years).

Finally, it bears noting that federal law preempts the ability of state and local governments to regulate rail activity and/or impose any requirements that burden the unrestricted movement of trains in interstate commerce. While the City can identify and disclose the risks posed by rail transport of crude oil, it must rely on the federal authorities to ensure that any such risks are mitigated as appropriate.

Mitigation: None required.

Impact 4.7-3: The Project could create a hazard to the public or environment through reasonably foreseeable upset or accident conditions during train maneuver at the rail unloading facility. (*Less than Significant*)

There is also a potential that a tank car could derail while being maneuvered onto the side-track unloading area at the Refinery. FRA has published ten-year accident statistics for UPRR on side track maneuvers (FRA, 2013d). The average accident rate for these maneuvers was reported to be about 15 accidents per million yard switching miles. Assuming that the travel distance during these maneuvers is about one mile per train visit, the probability of a derailment or other accident at this location on an annual basis is estimated to be 0.01, or once in one hundred years. In addition, assuming a reasonable worst case scenario where one entire tank car contents spilled, from such an accident (30,000 gallons), the Project's spill containment system is designed to hold the entire contents of a spill plus any firefighting water and firefighting foam fire suppression system that might be used to prevent a fire. Thus, the impact would be less than significant.

Mitigation: None required.

Impact 4.7-4: The Project could create a hazard to the public or the environment through reasonably foreseeable upset or accident conditions during the line hookup and crude oil transfer from a tank car at the unloading facility. (*Less than Significant*)

An accident may occur at the rail unloading facility when a rail car is coupled to the manifold during unloading operations. For this operation a hard-piped elbow would be connected to the bottom drain at the tank car to be unloaded. Then one end of a flexible hose would be connected to the elbow and the other end connected to the manifold. It is possible that the hose connection could leak and crude oil would drain and be contained in to the sump below the tank car. Although such an event may have a higher probability of occurring than a derailment at the unloading facility, the amount of crude oil that could be released would be much smaller before remedial action could take place, such as closing the valve at the bottom of the tank car. To minimize the likelihood and the volume in the event of an oil spill at the unloading rack, hardware design on the rack includes a sight/flow glass for each tank car to verify that the contents have been emptied prior to decoupling the hose, a check valve between the offloading header and each tank car to prevent backflow from the offloading header, and manually operated block valves on both ends of the offloading hose. Since the volume released would be relatively small, contained on site, and under controlled conditions, the impact would be less than significant. Even so, the sump under the unloading facility has the capacity to receive and contain a volume almost nine times greater than the capacity of one tank car. This containment volume is significantly larger than the EPA 40 CFR 112.9 SPCC, which requires 100% of a single storage container and sufficient freeboard to contain precipitation. Given this, even if the contents of one entire tank car were released during an unloading operation, the impact would remain contained and less than significant.

Mitigation: None required.

Impact 4.7-5: The Project could create a hazard to the public or the environment through reasonably foreseeable upset or accident conditions due to corrosion of process related equipment handling crude oil. (*Less than Significant*)

Comments received during the EIR scoping (see Appendix B) speculated that this Project will result in the processing of increased amounts of heavy sour crudes, specifically crudes from Canadian tar sands, and that Refinery metallurgy may not be adequate to handle the unique chemical composition of tar sands crudes. Among the various crude oils that could be imported by rail are crude oils that may contain acid or other contaminants that could increase corrosion in tanks, piping and equipment. Without adequate monitoring and maintenance, the comments stated, increased corrosion could lead to failure of the tanks, piping or equipment.

The corrosion of carbon steel piping and other equipment used to refine crude petroleum is not a new concern. Extensive information is available on organic acid corrosion and sulfidation corrosion from authoritative sources such as the API and National Association of Corrosion Engineers along with guidance and recommended practices for monitoring and control of process streams potentially susceptible to these corrosion mechanisms.

As discussed in Chapter 3, *Project Description*, the redesign and physical improvements to the Refinery made as a result of the VIP enable the Refinery to process heavy sour crudes and, in fact, various crude oils, from various sources, are currently imported and processed at the Refinery. Due to the processing capability of the refinery, the physical characteristics of the

various crudes, including the acid or other contaminants, contents must be within acceptable ranges, so that the crude blend remains within the acceptable range for safe processing.

In addition to the VIP improvements that are in place, two particular programs are in place as part of the Refinery's safety systems to manage the effects of corrosion on piping, process equipment, and tanks. The first is the Management of Change (MOC) process. Management of change requires that employers have procedures in place to manage changes to process chemicals, technology, equipment, and procedures. Before crude oils are processed at the Refinery they are evaluated for their potential impact on equipment and operations. This includes a review of the acid content of the material (Total Acid Number [TAN]) and sulfur content. Only after this extensive review are any new materials approved for processing. Monitoring of changes continues with routine sampling of crude receipts as well as sampling of process streams for corrosion, dew point, and other parameters necessary to insure safe operations.

The second program in place to address effects of corrosion on piping, process equipment, and tanks is the Mechanical Integrity (MI) program. The MI program is an integral part of the Refinery's Process Safety Management (PSM) program. The MI program includes an extensive plan for the ongoing field monitoring and evaluation of piping and equipment to determine the actual condition of the equipment. An array of hundreds of thousands of condition monitoring locations (CML) has been established to gather data to determine pipe thicknesses and corrosion rates. The positive material identification (PMI) element of the MI program is utilized to positively verify the actual materials of construction that are in place in the Refinery. Valero's PMI program includes a special procedure for identification of low-silicon carbon steel material that may be susceptible to corrosion. Under this comprehensive MI program, strategies are developed for CML monitoring frequencies and to forecast the timing for equipment replacement or repair. As a direct result of this program, and not only as a result of VIP, various upgrades have been made at the Refinery to continue to safely process a variety of crude oils.

As a Cal/OSHA Voluntary Protection Program (Cal/VPP) Star Site since 2006, the Refinery's safety management systems have undergone extensive reviews by Cal/OSHA and their auditors. This includes a thorough review of the MOC and MI programs. Cal/VPP is designed to recognize employers and their employees who have implemented safety and health programs that effectively prevent and control the hazards inherent to our business. These programs go beyond minimal Cal/OSHA standards and provide the best feasible protection at the Refinery.

Given that existing Refinery processes are already in place to monitor and manage corrosion from crude oil, this impact is considered less than significant.

Mitigation: None required.

- c) **Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances or waste within one-quarter mile of an existing or proposed school.**

Impact 4.7-6: Operation of the Project could emit hazardous emissions or handle hazardous or acutely hazardous materials, substances or waste within one-quarter mile of an existing or proposed school. (*Less than Significant*)

There are no schools within a 1/4 mile radius of the Refinery and the Project facilities (unloading racks and rail spurs) within the Refinery. No direct impact would result from operation of the proposed facilities within the Refinery.

Along the UPRR mainline between the Refinery and the yards in Roseville, California some portion of 27 school properties are located within an approximately 1/4 mile radius of the UPRR mainline. Table 4.7-1 lists these schools.

**TABLE 4.7-1
SCHOOLS WITHIN 1/4 MILE OF THE UPRR MAINLINE**

School Name	City	County
Crystal Middle School	Suisun City	Solano
Our Christian Scholastic Academy	Suisun City	Solano
Children's World Learning Center	Suisun City	Solano
Armijo High School	Fairfield	Solano
Holy Spirit School	Fairfield	Solano
Grange Middle School	Fairfield	Solano
Vanden High School	n/a	Solano
Travis Community Day	n/a	Solano
Dixon High School	Dixon	Solano
Maine Prairie High School	Dixon	Solano
Linford L Anderson Elementary School	Dixon	Solano
University of California Davis	Davis	Yolo
Families First NPS	Davis	Yolo
River City Christian Academy	West Sacramento	Yolo
Westfield Village Elementary	West Sacramento	Yolo
Washington Elementary	Sacramento	Sacramento
Sacramento Montessori School	Sacramento	Sacramento
Mustard Seed School	Sacramento	Sacramento
Woodlake Elementary	Sacramento	Sacramento
Martins' Achievement School	n/a	Sacramento
Aero Haven Elementary	n/a	Sacramento
Kohler Elementary	n/a	Sacramento
Northwood Elementary	Sacramento	Sacramento
Miles P. Richmond School	n/a	Sacramento
Hillsdale Elementary	n/a	Sacramento
Highlands High School	n/a	Sacramento
Placer Christian Academy	Roseville	Placer

SOURCE: ESRI, Tele Atlas North America, 2010, ESA, 2014

The intent of this criteria per CEQA §21151.4 is to ensure that construction or alteration of a facility within 1/4 mile of a school is disclosed and potential impacts from hazardous emissions or the handling of hazardous or acutely hazardous materials. Given that the schools identified along the existing UPRR mainline are already in place as is the UPRR mainline that there are no alternations or proposed construction for this Project within any school, the proximity of these schools to the indirect Project impacts from railroad emissions transporting the crude by rail would likely represent a less than significant impact per the intent of CEQA §21151.4. In addition, the health risk assessment (see Appendix E.6) discussed above for Impact 4.7-1, considered TAC emissions from the operation of Project trains along the UPRR mainline. The health risk assessment found a less than significant impact for the nearest receptors along the mainline and in all cases these receptors were much closer to the mainline than the school properties listed in Table 4.7-1, also see Section 4.1.5, for a full discussion of this analysis. Consequently, given the intent of CEQA §21151.4 and the results of the health risk assessment (see Appendix E.6); this impact is considered less than significant.

Mitigation: None required.

g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.

Valero Emergency Response

The Refinery's emergency notification procedures, including notification to City of Benicia Dispatch and the public, are contained in Section 203 of Valero's Emergency Procedures Manual (EPM) see Appendix G. In the event of an emergency, courtesy notification may also be provided to the California Governor's Office of Emergency Services (Cal-OES). If a release of a hazardous substance exceeds regulatory reportable quantities, Valero would also contact the appropriate state or federal agencies.

The Valero Fire Department maintains its own equipment to respond to emergencies within the Refinery. Under agreements with the City of Benicia, equipment and resources to operate the equipment, may also be dispatched at the request of the City of Benicia Fire Department. A copy of Valero's EPM is on file with the City of Benicia Fire Department. A list of Apparatus and Equipment available on Valero property is listed in Section 206 of Valero's EPM see Appendix G.

Refinery operators are qualified and trained annually on fire response, hazmat and rescue. Certified Emergency Medical Technicians (EMT's), fire truck operators, and personnel trained in oil spill response are on site at all times. Valero currently has approximately 30 certified EMT's on staff. There is at least one EMT on site at all times. The Refinery is also staffed with a Registered Nurse during weekday business hours and has access to an off-site medical clinic staffed and available 24 hours a day.

Valero's Oil Spill Contingency Plan contains a list of oil spill response equipment available on site. Annual refresher training is conducted for refinery personnel trained in oil spill response.

Periodic tabletop and equipment deployment drills are conducted with various federal, state, county, and local agencies.

The City of Benicia Fire Department has access to Valero property through three gates. These include two gates from East Second Street, and one gate on Park Road. To expedite access of City of Benicia Fire Department personnel to the Valero facility, a list of all Benicia Fire Department members is on file with Valero security personnel.

The Refinery also has a separate agreement for emergency mutual aid with other refineries in the Bay area. Per the agreement with all members of the Bay Area Petrochemical Mutual Aid Organization (PMAO), members provide mutual aid to other member facilities in case of an emergency, contingent upon the availability of responders or equipment at the time of the event. The PMAO Manual outlines the response for different types of events.

An example of a recent response was the August 6, 2012 fire at the Chevron Richmond Refinery. All responding members of the PMAO were on site during that event. Valero provided one fire engine with three firefighters along with the Valero Fire Chief to assist in the emergency response. Valero's fire engine connected to the Chevron refinery fire water system and provided 1,250 gpm of firewater flow to the base of the fire. Valero was on site a total of 6 hours until the fire was extinguished.

Valero Spill Response

The Refinery utilizes a multi-level organization based on the Incident Command System to provide immediate, efficient and flexible response to spills associated with the operation of its facilities. The initial level of response is provided by trained operating personnel, the Refinery Process Team-Spill Response Team, who are on-duty 24 hours per day. If the demands of the incident require capabilities beyond those of this team, the Spill Management Team (SMT) is activated. The SMT is initially staffed using on-call Benicia Refinery personnel. In general, the SMT should be capable of managing a response to any of the planning scenarios described in the Oil Spill Contingency Plan.

The structure of the Refinery SMT is based on the National Interagency Incident Management System Incident Command System. The organization permits immediate scale-up to meet the requirements of any size incident. Coordination with state and federal Incident Commanders is maintained using the Unified Command approach, regardless of the level of activation of Valero resources.

In the event of an incident that results in the accidental spill or release of oil outside the Refinery, the Incident Command System would be immediately activated. As representatives of various agencies are deployed in the response, a Unified Command would be established and populated by Federal, State and Local agency personnel including but not limited to the following agencies:

- U.S. Coast Guard
- California Office of Spill Prevention and Response

- California Department of Fish and Wildlife
- U.S. EPA
- Solano County Department of Environmental Management
- Local Police and Fire Departments

Additional agency representatives would be integrated into the incident command organization as required by the extent of the event and scope of the response. In addition, Valero has standing agreements with experts in the field of oil spill containment and recovery, such as NRC Environmental Services. These firms also maintain an inventory of containment boom and other specialized materials that can be deployed immediately upon discovery of an accidental release.

Any release of oil in an environmentally sensitive area, whether from a pipeline, marine vessel or train cargo, would activate the Incident Command organization described above. Together with the regulatory agencies, Valero would participate in the incident to:

- Ensure the safety of the public and response personnel
- Control the source of the spill
- Maximize protection of environmentally sensitive areas
- Manage coordinated response efforts
- Contain, recover and dispose of material in accordance with an established Waste Plan
- Recover and rehabilitate injured wildlife
- Remove oil from impacted areas
- Minimize economic impacts from business interruptions, and
- Keep stakeholders and the public informed of response activities.

UPRR Hazardous Material Emergency Response

Details of UPRR emergency response are provided in their HMERP (see Appendix H). In general, should an incident happen involving hazardous materials (such as crude oil), UPRR would contact the appropriate agencies / first responders to contain the incident and stay on scene until control/clean up is finished. UPRR personnel from their Roseville, California office would be responsible for incidents that may happen between Roseville and the Refinery. In addition, UPRR currently has three (3) emergency response contractors in northern California that cover Benicia. Two of the contractors are US Coast Guard approved Oil Spill Response Organizations (OSROs). One of the OSRO certified contractors is located in the Benicia area.

Impact 4.7-7: The Project could impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan. (*Less than Significant with Mitigation*)

Valero personnel respond to emergencies at the Refinery while the City of Benicia has overall responsibility for emergency response and evacuation plans within the City. The main feature of the Project that could interfere with evacuation plans is the amount of time during which project-related rail traffic would block Park Road outside the Refinery's southern border. As discussed in Section 14, *Public Services*, of the IS/MND (see Appendix A) and Section 4.11.5,

Transportation/Traffic, the Project with implementation of Mitigation Measure 4.11-4, would not pose a potentially significant new delay on this road and thus, is considered to be a less than significant impact on emergency/evacuation response plans.

Mitigation: Implement Mitigation Measure 4.11-4.

Significance after Mitigation: Less than significant.

- h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands.**

Impact 4.7-8: Operation of the Project could expose people or structures to significant risk, injury, or loss from wildland fires. (*Less than Significant*)

Construction of the Project (loading racks and railroad spurs) would occur within the Refinery property within the unzoned CAL FIRE local FHSZ and would not pose and risk to starting wildland fires or being affected by wildland fires. Similarly, operation of the loading racks and railroad spurs pose no risk to or from potential wildland fires. Furthermore, the Valero Fire Department personnel would respond to all emergencies within the Refinery and would address any such fire risks as needed. No impact.

As discussed in Section 4.7.2.2 above, an area just south of the main Refinery and Park Road containing Valero's main crude tank farm (see Figure 3-2) located on a small hill, is surrounded by a CAL FIRE Local Responsibility Area of FHSZ of moderate to high severity (CAL FIRE, 2008). These moderate and high FHSZ areas extend to the east from this small hill and cover a portion of the likely railroad spur used by UPRR to deliver and remove tank cars from the Refinery. Given that the existing crude tank farm is between 1,000 to 1,300 feet separated by local roads and other railroad tracks from this railroad spur and that the existing conditions already includes routine movements of rail cars and locomotives, the addition of the Project's railroad operations is expected to be a less than significant impact to potential wildland fires in the vicinity of this Local Responsibility Area.

Mitigation: None required.

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4.8 Hydrology and Water Quality

4.8.1 Introduction

This section addresses potential changes in hydrology, water quality, groundwater, and flooding conditions that could result from implementation of the Project. This section describes the existing hydrologic setting; provides an overview of applicable federal, state, and local regulatory framework; presents an analysis of potential environmental impacts; and where appropriate, identifies suitable mitigation measures to reduce the intensity of potential impacts. Information sources used to prepare this section include documents from various local, state, and federal agencies, and numerous published documents and maps related to the topic.

4.8.2 Setting

4.8.2.1 Regional Setting

The Project site is located within the Valero Benicia Refinery, situated within rolling, low elevation hills (ranging up to 200 feet above mean sea level) along the northern shores of the Carquinez Strait and Suisun Bay, just to the west of the Sacramento-San Joaquin River Delta. Several small drainage catchments are located in the area and are referred to as the Lake Herman/Sulphur Springs Creek watershed. Lake Herman Reservoir, which impounds Sulphur Springs Creek, is located north of the Refinery. Below the reservoir, Sulphur Springs Creek traverses a narrow band of marshland and discharges to Suisun Bay. Along the eastern border of the Refinery, this creek flows through an engineered channel through the Benicia Industrial Park. Other small ephemeral tributaries to Sulphur Springs Creek flow from west to east near the Refinery property. Tidal marshlands lying near or below sea level characterize the Suisun Bay margin and represent the endpoints of the Napa Valley and Sonoma Valley alluvial plains, both located to the north and west of the Refinery.

The Refinery property is within the San Francisco Bay Area Hydrologic Basin and is bounded to the east by the Suisun-Fairfield Valley Groundwater Basin and to the west by the Napa-Sonoma Valley Groundwater Basin (Woodward-Clyde, 1993). The water bearing units within the region consists of Sonoma Volcanic rocks, Pleistocene alluvium, and recently deposited alluvium. Natural recharge is principally from infiltration of precipitation that falls on the valley floor and the surrounding hills within the drainage basin. Some limited infiltration occurs from streams in areas where the water table is lower than the stream channels. Regional groundwater flow (gradient) is generally from the recharge areas in the hills northwest of the Refinery toward the tidal marshes of Suisun Bay and the Carquinez Strait. Groundwater quality in the region ranges from generally good in the alluvial sediments to poor in the tidal marsh sediments. The groundwater in the estuarine sediments is brackish to saline (Woodward-Clyde, 1993).

Climate

The Project area is characterized by a Mediterranean climate with mild, wet winters and dry, warm summers. Both summer and winter temperatures are moderated by proximity to the

San Francisco Bay and the Pacific Ocean; summer temperatures rarely reach those characteristic of inland valleys, and winter temperatures rarely reach freezing. The mean annual temperature is 63 degrees Fahrenheit with prevailing winds from west to southeast. Annual rainfall averages 19 inches and falls mostly from December through April (City of Benicia, 2013).

4.8.2.2 Project Setting

Surface Water

The Project is located within the existing Refinery property, an area that has been extensively modified by industrial development. Much of the process area surfaces and the roadways within the Refinery, including most locations affected by the Project, are covered with impervious asphalt and concrete and as a result, storm water runoff is generally rapid and surface infiltration rates are very low. For details on local topography and site soils, see Section 4.5, *Geology and Soils*.

The storm drainage system at the Refinery is divided into three major drainage parcels. One parcel, where the Project is proposed, includes the main Refinery area, administration building, and tank farm. The other two parcels contain the crude oil tank farm and the wastewater treatment plant (WWTP). Within each of the drainage parcels, storm water may be handled three different ways. First, some specific areas are diked or otherwise contained such that storm water flows are collected and may be detained before they are released to the wastewater treatment plant. This controlled system allows the Refinery to regulate the volume of storm water flow that enters the wastewater treatment plant at any given time. Second, there are areas where storm water runoff is not collected or detained, and drains directly into a collection system that transports the flows to the wastewater treatment plant. Finally, there are areas (primarily undeveloped) where storm water drains to a system of outfalls that are permitted under the National Pollutant Discharge Elimination System (NPDES); these outfalls eventually drain to Suisun Bay. The Refinery's storm water system for each of the major drainage parcels is described below with emphasis on the parcel encompassing the Project.

Main Refinery Area

The main Refinery area covers approximately 176 acres. The majority of runoff from the main Refinery area flows to the wastewater treatment plant through the storm water drainage system. Dikes enclose approximately 108 acres of this drainage area. Drainage from the diked areas is controlled (detained) by manually operated valves so storm water can be stored and drained to the treatment plant after the storm ends. Runoff from the remaining 68 acres is not controlled and flows directly to the treatment plant. Storm water is treated at the plant and discharged to San Francisco Bay via NPDES-permitted outfall 001. The Refinery's non-industrial storm water is discharged via Outfalls 002 through 017, which discharge to either Sulphur Springs Creek (which ultimately flows to Suisun Bay) or to the City of Benicia stormwater drainage system which flows to the Carquinez Strait.

Crude Tank Farm

The crude tank farm is located south of and is geographically separated from the main Refinery. Runoff from this diked crude tank farm area can be stored and released to the WWTP via the storm drain system after the storm ends. Runoff from areas outside of diked areas surrounding the crude tanks would not come into contact with crude oil; therefore, it is discharged to Sulphur Springs Creek (and ultimately to Suisun Bay) through NPDES-permitted discharge point 006.

Wastewater Treatment Plant

This drainage area covers approximately 20 acres and surrounds Valero's WWTP, all of which is diked. Approximately half of this drainage area is covered by three surface water impoundments that include an equalization pond, a retention pond, and a final pond. If a storm event causes flows in excess of the treatment plant capacity, WWTP influent is diverted to the ponds.

Wastewater Treatment and Storm Water Discharges

The Refinery wastewater and most of the storm water runoff is collected and managed in the existing wastewater treatment system that is regulated by San Francisco Regional Water Quality Control Board (SFRWQCB). The Refinery treats and discharges process wastewater, storm water runoff from process and non-process areas, and extracted groundwater and monitoring well purge water from on-site remediation activities. The average process and utility waste water flow uses approximately 55 percent of the hydraulic capacity of the treatment plant. The remaining 45 percent of capacity is available for treating storm water runoff.

Treated wastewater is discharged into Suisun Bay through Outfall 001 via a 12-inch pipe with three diffusion ports. Outfall 001 is located at a depth of 18 feet about 1,100 feet offshore and west of the Suisun Reserve Fleet Anchorage. The diffuser at the end of the pipe provides a minimum dilution ratio of 10:1.

Water Quality

During periods of wet weather, rain carries pollutants and sediments from all parts of a watershed into surface water bodies such as open storm drains, streams, rivers, reservoirs, or marshes. In a developed setting, such as the Refinery property, natural drainage patterns have been altered and storm water runoff, as well as non-storm discharges (irrigation water, washdown water, etc.), pick up sediments and contaminants from land surfaces and transport these pollutants into surface and possibly groundwater. Storm water discharges from industrial storm sewer systems in industrialized areas can be a concern because of the potential for high concentrations of typical pollutants found in these discharges.

The Refinery is regulated by the SFRWQCB for effluent discharges from their wastewater treatment plant and discharges of all storm water associated with industrial activity from the Refinery to Suisun Bay and Carquinez Strait (waters of the United States). The Refinery operates under a NPDES permit administered by the SFRWQCB. Storm water runoff is currently discharged through the storm water outfalls that service the Refinery property.¹ The storm water

¹ Storm water outfalls in the vicinity of the Project include EFF-003 through -004 and EFF-007 through -010.

outfalls are permitted under the Refinery NPDES permit, which sets storm water outfall discharge limits and monitoring requirements. Routine water quality monitoring is conducted on outflows from one outfall (Outfall 001) into Suisun Bay, eleven outfalls (Outfall 002, 003, 004, 005, 006, 007, 008, 009, 010, 011, and 017) into Sulphur Springs Creek, and five outfalls (Outfall 012, 013, 014, 015, and 016) into Carquinez Strait.

Storm water discharges and water quality at the Refinery's 16 storm water outfalls are managed through application of an existing Storm Water Pollution Prevention Plan (SWPPP), which incorporates the NPDES discharge limits and monitoring requirements as well as incorporates procedures, pollution prevention strategies, and best management practices (BMPs) used to meet these discharge limits. The SWPPP was originally prepared to comply with SFRWQCB Order Number 2002-0112 (NPDES Permit No. CA0005550) adopted in October, 2002 (URS, 2002). In 2011, the SWPPP was revised to comply with Order Number R2-2009-0079, issued by the SFRWQCB in 2009 to be effective from January 1 through December 31, 2014. The current discharge limitations for untreated storm water and wastewater treatment plant effluent are outlined in the SFRWQCB NPDES Order. Its purpose is to describe storm water and effluent discharges generated from the Refinery and, based on the discharge types and concentrations, provides effluent and receiving water quality limitations and special discharge provisions in accordance with the Clean Water Act.

Receiving Waters and Beneficial Uses

Discharges from the Refinery property ultimately drain into Suisun Bay and the Carquinez Strait, the channel between Suisun Bay and San Pablo Bay of the San Francisco Delta system. Suisun Bay and the Carquinez Strait receiving waters, which include the Suisun Marsh, are tidally influenced water bodies, with significant fresh water inflows during the wet weather season that allow frequent flushing and dilution. Additionally, the Project is located adjacent to Sulphur Springs Creek, which parallels the proposed rail alignment to the east.

In accordance with State policy for water quality control, the SFRWQCB employs a range of beneficial use definitions for surface waters, groundwater, marshes, and mudflats that serve as the basis for establishing water quality objectives and discharge conditions and prohibitions. The SFRWQCB has identified existing and potential beneficial uses supported by the key surface water drainages throughout the Bay Area in the San Francisco Bay Basin Water Quality Control Plan (Basin Plan; SFRWQCB, 2011). The beneficial uses designated in the Basin Plan for Suisun Bay, Carquinez Strait, and Sulphur Springs Creek are identified in Table 4.8-1. The State Water Resources Control Board's Water Quality Assessment has indicated that Carquinez Strait and Suisun Bay have elevated levels of selenium, mercury, and PCBs in aquatic organisms, sediment, and the water column (SFRWQCB, 2010). On May 12, 1999, the U.S. Environmental Protection Agency (EPA) added dioxins and furan compounds, chlordane, dieldrin, and 4,4'-DDT to the Board's list (SFRWQCB, 2010).

**TABLE 4.8-1
DESIGNATED BENEFICIAL USES**

Waterbody	Freshwater Replenishment	Industrial Service Supply	Industrial Process Supply	Commercial and Sport Fishing	Estuarine Habitat	Fish Migration	Rare Species Preservation	Fish Spawning	Warm Freshwater Habitat	Wildlife Habitat	Water Contact Recreation	Noncontact Water Recreation	Navigation
Sulphur Springs Creek	E								E	E	E	E	
Suisun Bay		E	E	E	E	E	E	E		E	E	E	E
Carquinez Strait		E	E	E	E	E	E	E		E	E	E	E

E = existing beneficial use

SOURCE: RWQCB, San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan), December, 2011.

Groundwater and Groundwater Quality

The primary regional groundwater water-bearing formations include the Recent and Pleistocene (up to two million years old) alluvial deposits and the Pleistocene Huichica formation.

Groundwater in the region is used for agriculture and to a smaller degree for domestic use.

Agricultural use of groundwater is heavy in the Suisun Valley north of the Refinery because of the extensive thickness of the older alluvium there, but is very limited in the low lying hills northwest of the Refinery because of the limited occurrence of water-bearing formations.

Although some local valleys may have sufficient thickness of saturated material that could potentially yield up to 10 gallons per minute (gpm), much of the Benicia area, including the Refinery and the down-gradient vicinity, are underlain by low permeable, fractured bedrock, which has very limited storage capacity and well yield. Because of its limited overall potential for groundwater development, the Benicia area has not been extensively studied as a groundwater basin (Woodward-Clyde, 1993).

Generally, water table elevations follow the topography at the site (Woodward-Clyde, 1993). The depth to water is a function of water table depth and the proximity to the edge of a particular terrace. Depth to water at the Refinery ranges from 2 to 50 feet below ground surface (bgs) (URS, 2001), but in general is approximately 10 feet below existing grade at the Project site (Stantec 2010). The prevailing direction of groundwater flow within the Refinery property is generally toward Sulphur Springs Creek, which flows in a channel that parallels the eastern boundary of the Refinery (Woodward-Clyde, 1993). The groundwater on the east side of Sulphur Springs Creek (i.e., across the creek from the Refinery) appears to flow west into the creek.

Groundwater quality in the Refinery area ranges from good in the upland areas of the facility to brackish to saline in the areas along Suisun Bay. Free phase liquid hydrocarbons have been observed in monitoring wells at various locations within the Refinery property (Woodward-Clyde 1993). Soil and groundwater investigations have been conducted at the Refinery since 1988. As required by SFRWQCB Order No. 91-094, a Refinery-wide site assessment began in November

1991 for the purpose of characterizing soil and groundwater contamination and developing a remediation plan (URS, 2001). Several investigations have been conducted since the initial investigations and have included other areas besides those at the main Refinery area. A follow-up SFRWQCB Order No. 97-077 rescinded SFRWQCB Order No. 91-094 and required additional investigation and the development of a Remedial Action Plan (RAP) (URS, 2001). URS Corporation (URS) prepared and revised a RAP for the Refinery in July 2001. The RAP addresses free-phase product plumes and associated dissolved-phase groundwater constituents at the Refinery and specific remedial recommendations.

Flooding

The Federal Emergency Management Agency (FEMA) has prepared flood maps identifying areas that would be subject to flooding (Special Flood Hazard Areas). The Special Flood Hazard Areas are rated by FEMA according to risk of flooding and depth of flooding. The Special Flood Hazard Areas are typically defined by the 1-percent annual chance flood (also referred to as the base flood or 100-year flood) and the 0.2-percent-annual-chance (or 500-year) flood. Within these Special Flood Hazard Areas, various zones (described below, as relevant to the Project) have been defined that provide additional information on flooding and flood risks:

- **Zone AE** – 100-year floodplains, with base flood elevations determined.
- **Regulatory Floodway (RF)** – The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. Development in these floodways is regulated to ensure that there are no increases in upstream flood elevations.
- **Zone X** – 500-year floodplains and areas of reduced flood risk due to protection from levees from the 1 percent annual chance flood.
- **Area of Minimal Flood Hazard** – Areas outside the 500-year floodplain.

The majority of the Project site is designated as a Special Flood Hazard Area (SFHA) that is within the 100-year flood zone associated with Sulphur Springs Creek. North of Bayshore Road the Project site is designated as Zone RF. In the immediate vicinity of Bayshore Road, the Project site is designated as Zone RF and Zone AE. Approximately 500 linear feet of the proposed rail alignment south west of Bayshore Road is in an area of minimal flood hazard or in Zone X (FEMA, 2013).

Tsunamis

Tsunamis (seismic sea waves) are long period waves that are typically caused by underwater disturbances (landslides), volcanic eruptions, or seismic events. Areas that are highly susceptible to tsunami inundation tend to be located in low-lying coastal areas such as tidal flats, marshlands, and former bay margins that have been artificially filled but are still at or near sea level. The Suisun Bay has been determined to be at moderate risk to tsunamis. The Project would be located on a developed land parcel that does not lie in a mapped area with flood risks associated with tsunami or tidal flooding (CEMA, 2009).

Seiche

A seiche is a free or standing wave oscillation(s) of the surface of water in an enclosed or semi-enclosed basin, such as Suisun Bay, that may be initiated by an earthquake. Due to the relatively large size of Suisun Bay with an inlet to the east and an outlet to the west, the hazard of seiche waves is interpreted to be low. In addition, there is no historic record of such waves occurring in Suisun Bay during recent strong earthquakes.

4.8.2.3 Regulatory Setting

Federal

Clean Water Act

The federal Clean Water Act (CWA) (33 U.S.C. 1251 – 1376) establishes the basic structure for regulating discharges of pollutants into the waters of the U.S. and gives the U.S. EPA the authority to implement pollution control programs such as setting wastewater standards for industry. The CWA sets water quality standards for all contaminants in surface waters. The statute employs a variety of regulatory and non-regulatory tools to reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. The U.S. Army Corps of Engineers has jurisdiction over all waters of the U.S. including, but not limited to, perennial and intermittent streams, lakes, and ponds, as well as wetlands in marshes, wet meadows, and side hill seeps. Under Section 401 of the CWA every applicant for a federal permit or license for any activity which may result in a discharge to a water body must obtain State Water Quality Certification that the proposed activity will comply with state water quality standards.

The NPDES permit program under the CWA controls water pollution by regulating point and nonpoint sources that discharge pollutants into “waters of the U.S.” California has an approved state NPDES program. The U.S. EPA has delegated authority for NPDES permitting to the California State Water Resources Control Board (SWRCB), which has nine regional boards. The SFRWQCB regulates water quality in the Project Site and surroundings.

Section 303(d) of the CWA requires that each state identify water bodies or segments of water bodies that are “impaired” (i.e., not meeting one or more of the water quality standards established by the state). These waters are identified in the Section 303(d) list as waters that are polluted and need further attention to support their beneficial uses. Once the water body or segment is listed, the state is required to establish Total Maximum Daily Load (TMDL) for the pollutant causing the conditions of impairment. TMDL is the maximum amount of a pollutant that a water body can receive and still meet water quality standards. Generally, TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. The intent of the Section 303(d) list is to identify water bodies that require future development of a TMDL to maintain water quality. Carquinez Strait and Suisun Bay are included on the 2006 California 303(d) List as impaired water bodies resulting from the presence of chlordane, DDT, dieldrin, dioxin compounds, exotic species, furan compounds, mercury, PCBs, and selenium. The 2006 303(d) list identifies probable sources for each pollutant, such as industrial point sources discharges, municipal point source discharges, natural sources, non-point sources, and mining.

Executive Order 11988 and National Flood Insurance Program

Under Executive Order 11988, FEMA is responsible for management of floodplain areas defined as the lowland and relatively flat areas adjoining inland and coastal waters subject to a one percent or greater chance of flooding in any given year. FEMA also administers the National Flood Insurance Program, which requires that local governments covered by federal flood insurance pass and enforce a floodplain management ordinance that specifies minimum requirements for any construction within the one percent annual chance flood zone. FEMA prepares FIRMs that are used to identify areas prone to flooding.

FEMA prepared a Flood Insurance Rate Map (FIRM) that delineated flood hazard zones for Benicia and adjacent portions of Solano County. The zones detail low-lying areas that would be subject to flooding during a 100-year storm. The lower reaches of the Sulphur Springs Creek Watershed downstream of Lake Herman are included in the mapped flood hazard zones. A Storm Water Master Plan that includes flood control improvements has been adopted by the Refinery and has addressed these flood hazard conditions.

Oil Pollution Act

Enacted in 1990, this Act (Public Law No. 101-380) amends the CWA to create a comprehensive oil spill and prevention response scheme. Spill Prevention Control and Countermeasure Plans must be prepared by owners or operators of facilities that have or could reasonably be expected to discharge a certain amount of oil. These plans should contain preventative (failsafe) and contingency (cleanup) plans for controlling accidental discharges, and for minimizing the effect of such events.

State

Porter-Cologne Water Quality Control Act and California's Water Boards

The Porter-Cologne Water Quality Control Act (Division 7 of the California Water Code) provides the basis for water quality regulation within California. This Act establishes the authority of the SWRCB and the nine RWQCBs. The SWRCB administers water rights, water pollution control, and water quality functions throughout the state, while the RWQCBs conduct planning, permitting, and enforcement activities. The Project site lies within the jurisdiction of the RWQCB, San Francisco Bay region.

The Porter-Cologne Water Quality Control Act requires the SWRCB to adopt statewide water quality control plans, the purpose of which is to establish water quality objectives for specific water bodies. In the San Francisco Bay region, the Water Quality Control Plan, known as the Basin Plan, is the RWQCB's master policy document. The Act also authorizes the NPDES program, which establishes effluent limitations and quality requirements for discharges to waters of the State. In the San Francisco Bay region, the RWQCB has included permit requirements for storm-water runoff under the NPDES program since 1991.

Regional Water Quality Control Basin Plan

The SFRWQCB prepared the *San Francisco Bay Basin Water Quality Control Plan* (Basin Plan) for the San Francisco Bay region. The Basin Plan contains descriptions of the legal, technical, and

programmatic bases of water quality regulation in the region and describes beneficial uses of major surface waters and their tributaries (RWQCB, 2011). For development under the Project, the SFRWQCB is responsible for regulating construction activities to ensure the protection of the beneficial uses of any receiving waters.

Construction Activity Permitting

Storm water discharges from construction activities on one acre or more are regulated by the SFRWQCB and are subject to the permitting requirements of the NPDES General Permit for Discharges of Stormwater Runoff Associated with Construction Activity (General Construction Permit, 99-08-DWQ). Effective July 1, 2010, dischargers without an existing site NPDES permit have been required to obtain coverage under the Construction General Permit Order 2009-0009-DWQ² adopted on September 2, 2009. The General Construction Permit states that construction activity covered by an individual NPDES Permit for storm water discharges is not required to obtain coverage under the General Permit (General Finding #29).

The General Construction Permit requires the preparation and implementation of a SWPPP for construction activities and specifies minimum qualifications for a SWPPP developer and a SWPPP practitioner. The SWPPP must be prepared before the construction begins, and in certain cases, before demolition begins. The SWPPP must include specifications for BMPs that would need to be implemented during Project construction. BMPs are measures that are undertaken to control degradation of surface water by preventing soil erosion or the discharge of pollutants from the construction area. The SWPPP must describe measures to prevent or control runoff after construction is complete and identify procedures for inspecting and maintaining facilities or other project elements. Required elements of a SWPPP include:

1. Site description addressing the elements and characteristics specific to the site;
2. Descriptions of BMPs for erosion and sediment controls;
3. BMPs for construction waste handling and disposal;
4. Implementation of approved local plans;
5. Proposed post-construction controls; and
6. Non-storm water management.

Examples of typical construction BMPs include scheduling or limiting activities to certain times of year, installing sediment barriers such as silt fence and fiber rolls, maintaining equipment and vehicles used for construction, tracking controls such as stabilizing entrances to the construction site, and developing and implementing a spill prevention and cleanup plan. Non-storm water management measures include installing specific discharge controls during certain activities, such as paving operations, and vehicle and equipment washing and fueling. The California Stormwater Quality Association established BMPs for the State of California in the *California Storm Water Best Management Practice Handbook* (2003) to effectively reduce degradation of surface waters to an acceptable level.

² As amended by 2010-0014-DWQ and 2012-006-DWQ.

As explained above, however, Valero holds an NPDES permit issued by the SFRWQCB, NPDES No. CA0005550. The NPDES permit which requires Valero to prepare and maintain an SWPPP. Therefore, Valero need not obtain coverage under the Construction General Permit Order. As specified in Section 5 of the Valero SWPPP, BMPs for Erosion Control and Construction Activities, developed in accordance with the NPDES permit issued by the SFRWQCB, any construction permit executed in a drainage area that is not covered under the NPDES permit will be performed in a way consistent with the requirements of the General Permit for Construction Activities. Additionally, the Valero SWPPP includes the required elements detailed above for a SWPPP prepared and implemented as part of the requirements for the Construction General Permit.

Dewatering Permit

Construction activities such as excavation and trenching in areas with shallow groundwater would require dewatering, which could be subject to the SWRCB construction dewatering permit requirements. Dewatering operations are regulated under State requirements for storm water pollution prevention and control. Discharge of non-storm water from a trench or excavation that contains sediments or other pollutants to sanitary sewer, storm drain systems, creek bed (even if dry), or receiving waters is prohibited. Discharge of uncontaminated groundwater from dewatering is a conditionally exempted discharge by the RWQCB. However, the removed water could potentially be contaminated with chemicals released from construction equipment or sediments from excavation. Therefore, disposal of dewatering discharge would require permits either from the RWQCB for discharge to surface creeks and groundwater or from local agencies for discharge to storm or sanitary sewers. The SWRCB lists non-storm water discharge controls specifically for dewatering operations.

The control measures would be implemented by the Project sponsor during construction activities at the Project site. Discharge of water resulting from dewatering operations would require an NPDES Permit, or a waiver (exemption) from the RWQCB, which would establish discharge limitations for specific chemicals (if they occur in the dewatering flows). The Project plans to contain and route water from dewatering operations to its wastewater treatment plant for treatment and discharge under the Refinery NPDES permit.

Local

City of Benicia General Plan

The *City of Benicia General Plan* (City of Benicia, 1999) addresses water resources goals and policies for local water bodies including the Carquinez Strait, Lake Herman, and Suisun Marsh. Specifically, the following policy and programs may apply to the components of the Project:

Policy 3.22.1: Avoid development that will degrade existing lakes and streams.

Program 3.22.1A: Require that all development in watershed flowing into lakes and unchannelized streams include features to preserve run-off water quality.

Program 3.22.1B: Require a minimum setback of 25 feet from the top of bank of streams and ravines. Development within the setback is not allowed.

Policy 4.12.1: Regulate runoff from new development so that post-development site peak flow rates are not greater than pre-development levels.

Policy 4.12.2: Upgrade existing drainage facilities as necessary to correct localized drainage problems.

Policy 4.14.1: Implement non-point source pollution strategies.

Program 4.14.C: Provide information to the public on provisions of the City's Stormwater Pollution Prevention Plan (SWPPP) program and preparation of SWPPPs for all construction projects of five acres or more. Implement Best Management Practices (BMPs) for stormwater runoff and erosion controls for all developments.

Additionally, the General Plan identifies the Refinery as a hazardous waste site. When handling any hazardous substances involved with the groundwater extraction at the site or during construction of the components of the Project, the site must be in compliance with permitting and other regulatory requirements.

City of Benicia Grading Ordinance

Chapter 15.28: Grading and Erosion Control

- Section 15.28.070 Application Contents: Applications for excavating, grading and filling permits shall be accompanied by two sets of plans and specifications 24 inches by 36 inches in size prepared at a scale of 1 inch = 40 feet or greater. Unless waived by the City Engineer, the plans shall be prepared by an engineer licensed by the State of California.
- Section 15.28.070 Application Contents: A Storm Water Pollution Prevention Plan for sites over five acres and a copy of the Notice of Intent (NOI) form required for the State Water Resources Control Board's General Construction Activity Storm Water Permit.
- Section 15.28.070 Application Contents: For all grading work an erosion control plan shall be submitted to include the placement of structural and nonstructural storm water controls that prevent erosion during construction and post-construction.
- Section 15.28.130 Excavating, Grading, and Filling – Regulations: All graded surfaces and materials, whether filled, excavated, transported or stockpiled, shall be wetted, protected, covered or contained in such a manner as to prevent any nuisance from dust, sediment site runoff, or spillage upon adjoining property or streets. Best Management Practices incorporating erosion controls and other controls (i.e. dust palliative) shall be applied to the site when directed by the City Engineer. Equipment and materials on the site and on hauling routes should be used in such a manner as to avoid excessive dust, site runoff, or spillage upon streets or storm drain inlets. This may include limiting work during windy periods.
- Sediment controls and other Best Management Practices shall be constructed on all developments, as determined by the City Engineer, to manage runoff into biologically sensitive areas or onto adjacent property and to control sediment during construction until permanent erosion controls have been established. The sediment and silt collected on site shall then be removed and the resulting material hauled from the site or used as topsoil.

City of Benicia Flood Hazard Reduction Ordinance

Chapter 15.48 of the City's Municipal Code sets forth provisions for flood hazard reduction with specific requirements applicable to the Project for construction projects designed to minimize the risks of flood hazards.

- Section 15.48.010 Standards of construction - Anchoring. In all areas of special flood hazard, all new construction and substantial improvements shall be anchored to prevent flotation, collapse or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy.
- Section 15.48.010 Standards of construction - Construction Materials and Methods. In all areas of special flood hazard, all new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage and also shall be constructed using methods and practices that minimize flood damage. Electrical, heating, ventilation, plumbing and air conditioning equipment and other service facilities shall be designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding. All new construction and substantial improvements within Zones AH, AO or VO³ shall have adequate drainage paths around structures on slopes to guide floodwaters around and away from proposed structures.
- Section 15.48.010 Standards of construction - Elevation and Floodproofing. New construction and substantial improvement of any structure in Zone AH, AO or VO shall have the lowest floor, including basement, elevated six inches above the highest adjacent grade to a height equal to or exceeding the depth number specified in feet on the FIRM, or at least two feet if no depth number is specified. Upon the completion of the structure the elevation of the lowest floor, including basement, shall be certified by a registered professional engineer or surveyor to be properly elevated. Such certification shall be provided to the floodplain administrator.
- Section 15.48.010 Standards of construction - Elevation and Floodproofing. Nonresidential structures, together with attendant utility and sanitary facilities, shall:
 - be floodproofed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water;
 - have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy; and,
 - be certified by a registered professional engineer or architect that the standards of subsection (C)(3) of Section 15.48.010 of the City's Municipal Code are satisfied. Such certifications shall be provided to the floodplain administrator.
- Section 15.48.010 Standards of construction - Elevation and Floodproofing. For all new construction and substantial improvements, fully enclosed areas below the lowest floor that are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or meet or exceed the following minimum criteria:

³ Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually areas of ponding or sheet flow where on sloping terrain) where average depths are between one and three feet.

- either a minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided. The bottom of all openings shall be no higher than one foot above grade. Openings may be equipped with screens, louvers, valves or other coverings or devices; provided, that they permit the automatic entry and exit of floodwaters; or
 - be certified to comply with a local floodproofing standard approved by the Federal Insurance Administration.
- 15.48.050 Floodways. Located within areas of special flood hazard (established in Section 15.40.070 of the City's Municipal Code) are areas designated as floodways. Since the floodway is an extremely hazardous area due to the velocity of floodwaters which carry debris, potential projectiles, and erosion potential, the following provisions apply:
 - all encroachments, including fill, new construction, substantial improvements, and other development are prohibited within the floodway unless certification by a registered professional engineer or architect is provided demonstrating that encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge and, if satisfied, shall comply with all other applicable flood hazard reduction provisions of the City's Municipal Code.

Suisun Marsh Protection Plan

The Suisun Marsh Protection Plan, adopted in 1976, contains policies which regulate the marsh's primary management area of 89,000 acres of tidal marsh, managed wetlands, adjacent grasslands, and waterways, as well as a secondary management area of approximately 22,500 acres of significant buffer lands. The Suisun Marsh Local Protection Program was also subsequently adopted by Solano County in the 1980s to implement the Suisun Marsh Protection Plan. Neither the Refinery nor the Project site is located within the boundaries of the SMLPP (see Section 4.9, *Land Use*, for further explanation of the Suisun Marsh Local Protection Program).

4.8.2.4 Project Baseline

Baseline conditions reflect the ongoing operation of the Refinery as it existed at the time of the issuance of the NOP (August 2013), as an oil Refinery, including ongoing operations and maintenance activities.

4.8.3 Significance Criteria

Based on California Environmental Quality Act (CEQA) Guidelines Appendix G, the Project would cause adverse impacts to hydrology and water quality if it would:

- a) Violate any water quality standards or waste discharge requirements;
- b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted);

- c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site;
- d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface run-off in a manner which would result in flooding on-or off-site;
- e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;
- f) Otherwise substantially degrade water quality;
- g) Place housing within a 100-year flood hazard area as mapped on a Federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map;
- h) Place within a 100-year flood hazard area structures that would impede or redirect flood flows;
- i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam; or
- j) Result in or cause inundation by seiche, tsunami, or mudflow.

4.8.4 Discussion of No Hydrology and Water Quality Impacts

- g) Would the project place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?**

The Project does not include the construction of housing. No impact would result from the Project.

- j) Would the project result in or cause inundation by seiche, tsunami, or mudflow?**

The Project would be limited to earthmoving, grading and changes to dikes, addition of rail spurs and a loading rack, as well as modifications to piping that would allow crude oil to be delivered by tank car; these actions would not expose people or structures to a significant risk of loss, injury, or death involving inundation by seiche, tsunami, or mudflow. The influence of an ocean-borne tsunami wave would dissipate prior to reaching the City of Benicia, because of the distance of the Project area from the Golden Gate in San Francisco Bay. The Refinery site is not located within a designated tsunami inundation area (CEMA, 2009). Additionally, the chances of a tsunami generated east of the Golden Gate are very low because the fault structures in the Bay Area displace laterally. Seiches form in enclosed bodies of water. The risk from seiche is considered minimal because there are no enclosed water bodies in the immediate vicinity of the Project site. Lake Herman, the closest enclosed large water body is approximately 1.5 miles north of the Project site. The possibility of mudflow is minimal because the Project area is relatively flat with no steep slopes in the immediate vicinity. The Project would not exacerbate nor be subject to the risks of tsunami, seiche, or mudflows.

4.8.5 Discussion of Impacts and Mitigation Measures

a, f) Would the project violate any water quality standards or waste discharge requirements or otherwise substantially degrade water quality?

Impact 4.8-1: The Project would not violate any water quality standards or otherwise substantially degrade water quality. (*Less than Significant with Mitigation*)

Construction activities associated with the Project would require land disturbing activities such as grading, earthmoving, backfilling, and compaction. Additionally, Project construction would involve use of chemicals and solvents such as fuel and lubricating grease for motorized heavy equipment. Such construction activities could dislodge soil and cause sedimentation or inadvertent spills of construction related chemicals into waterways resulting in adverse water quality impacts. Sulphur Springs Creek is directly adjacent to the Project and these impacts could be significant in the immediate vicinity of construction activities as well as further downstream if Best Management Practices (BMPs) are not employed to minimize or avoid release of pollutants. Construction or grading activities occurring on land parcels of one acre or more in size are subject to a General Construction Permit under the NPDES permit program under section 402(p) of the federal Clean Water Act. However, the SFRWQCB confirmed that storm water runoff generated during Project construction activities would not require coverage under the General Permit for Construction Activities based on measures currently contained and required in Valero's SWPPP (RWQCB, 2013) for the Refinery property. Implementation of a storm water management plan (SWMP) as described below in Mitigation Measure 4.8-1 would ensure that the Project would not substantially degrade water quality, water quality standards, or waste discharge requirements during construction. Implementation of standard construction procedures and precautions would also ensure that the water quality impacts related to the handling of chemicals from Project construction would be less than significant.

Based on geotechnical information developed for the Project site (Valero, 2013), encountering groundwater during grading and excavation is not anticipated. As described in Section 4.8.2.2, Project Setting, the groundwater table varies across the Project area⁴ (URS, 2001; Stantec, 2010), but in general is approximately 10 feet below existing grade at the Project site. Additionally, the groundwater levels are likely to be lower than 10 feet below grade during summer months when the grading and excavation work are scheduled to occur (Valero, 2013). Therefore, it is anticipated that interception of the groundwater table during excavation and grading would be minimal. However, excavation during Project construction could intercept the shallow groundwater table at some locations and could require dewatering. Where groundwater is intercepted during construction, it will be extracted and contained in holding tanks and subsequently processed at the facility's wastewater treatment plant and discharged into the Carquinez Strait via a wastewater effluent outfall regulated under the Refinery NPDES permit. Impacts to water quality, water quality standards, or waste discharge requirements relating to construction dewatering of groundwater would be less than significant.

⁴ Depth to water at the Refinery ranges from 2 to 50 feet below ground surface (bgs) (URS, 2001).

The majority of the Project site is developed and is an operating Refinery; the Project would not result in any substantial increase in impervious area or storm runoff. The SFRWQCB regulates water quality in the Project area. The Refinery operates under a NPDES permit administered by the RWQCB. Wastewater produced on the Refinery site by Refinery operations is currently treated at the Refinery's wastewater treatment plant and discharged into the Carquinez Strait via a waste water effluent outfall regulated under the Refinery NPDES permit. Long-term storm runoff generated at the Project site would be similar to the existing runoff on-site. Storm water runoff would continue to be discharged through the storm water outfalls that service the Refinery property.⁵ The storm water outfalls are permitted under the Refinery NPDES permit, which sets storm water outfall discharge limits and monitoring requirements. Storm water discharges and water quality at the Refinery's 16 storm water outfalls are managed through application of an existing SWPPP, which incorporates the NPDES discharge limits and monitoring requirements as well as incorporates procedures, pollution prevention strategies, and BMPs used to meet these discharge limits. The SWPPP was originally prepared to comply with SFRWQCB Order Number 2002-0112 (NPDES Permit No. CA0005550) adopted in October, 2002 (URS, 2002). In 2011, the SWPPP was revised to comply with Order Number R2-2009-0079, issued by the SFRWQCB in 2009 to be effective from January 1 through December 31, 2014. In the event of an incident that results in the accidental spill or release of oil on-site, including release of crude oil from a train on the Refinery property, the Refinery has an existing efficient and flexible response plan for spills associated with the operation of its facilities (discussed in detail in Section 4.7, *Hazards and Hazardous Materials*). Impacts to water quality, water quality standards, or waste discharge requirements related to long-term operations would be less than significant.

The Suisun Marsh is crossed by Union Pacific Railroad (UPRR) mainline railroad tracks that would be used to transport crude feedstocks to the Refinery. The accidental spill or release of crude oil from a train during long-term operations related to this transport route crossing Suisun Marsh could result in potential indirect Project impacts relating to water quality. The approximately 730 trains that would transport crude oil through the Marsh each year would introduce a risk of an oil spill if a train was to derail *and* the integrity of the tank car was compromised in a manner resulting in a breach and the accidental release of oil. As discussed in detail in Section 4.7, *Hazards and Hazardous Materials*, the risk of a release of crude oil from a train carrying crude oil to the Refinery is not significant because the likelihood is extremely low. The layout of the track through Suisun Marsh is flat and reasonably straight, without tight turns. This reduces the potential for derailments or runaway train incidents. Based on the layout of the track through the Suisun Marsh and the safe transport record for UPRR trains through the Roseville to Benicia corridor, as well as the comprehensive analysis for Impact 4.7-2, presented in Section 4.7.5, the likelihood of a derailment resulting in indirect impacts to water quality, water quality standards, or waste discharge requirements is very low. Therefore, the impact would be less than significant.

Mitigation Measure 4.8-1: The Applicant and/or its contractor shall prepare and implement a storm water management plan (SWMP) for construction of the Project. The proposed project is covered under the Applicant's National Pollutant Discharge Elimination System (NPDES) permit and storm water pollution prevention plan (SWPPP). A notice of

⁵ Storm water outfalls in the vicinity of the Project include EFF-003 through -004 and EFF-007 through -010.

intent (NOI) application and notice of termination (NOT) application are not required. Implementation of the SWMP shall start with the commencement of construction and continue through the completion of the Project. The SWMP shall identify pollutant sources (such as sediment) that may affect the quality of storm water discharge and implement best management practices (BMPs) consistent with the California Stormwater Quality Association's BMP Handbook for Construction to reduce pollutants in storm water. The Applicant or the construction contractor shall install erosion and storm water control measures on the construction site such as installation of a silt fence and other BMPs, particularly at locations close to storm drains and water bodies. The BMPs shall also include practices for proper handling of chemicals such as avoiding fueling at the construction site and overtopping during fueling and installing spill containment pans.

Significance after Mitigation: Less than significant.

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- b) **Would the project substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?**

Impact 4.8-2: The Project could require withdrawal of groundwater or result in a substantial increase in impervious surface area within the Refinery. (*Less than Significant*)

The Project would not require withdrawal of groundwater. The Project would not result in a substantial increase in impervious surface area within the Refinery. The Project site is currently predominantly paved. The Refinery is not located in a water supply groundwater basin and, although groundwater in the region is used for agriculture and domestic use, the volume and extent of groundwater underlying the Refinery is minimized by a lack of thick alluvial deposits (URS, 2001). Additionally, the potential use of groundwater underlying the Refinery site is restricted due to existing groundwater contamination (Stantec, 2010). As discussed in a, f) above, excavation during Project construction could intercept the shallow groundwater table and could require dewatering, but such dewatering activities would be minimal and temporary in nature and as such, there would be no impacts to groundwater supplies or aquifers. The impact would be less than significant.

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- c) **Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?**

Impact 4.8-3: The Project could alter streams or the existing drainage within the Refinery. (*Less than Significant*)

The Project site is predominantly paved. The Project elements would be built in an area that is currently graded and would not substantially alter the existing drainage pattern of the site. Storm

water runoff would continue to be collected by the existing storm drains and discharged through the Refinery's NPDES-permitted outfalls. There would be no substantial change above the current baseline in runoff flow rates nor would the Project increase erosion or siltation off-site. Proposed Project construction activities could cause soil erosion in the vicinity of soil disturbing activities [see a, f), above]. However, construction would be short-term and, as addressed above, would employ BMPs to minimize or avoid the release of sediment from the construction site. There would be no alteration of streams or the existing drainage patterns that could result in substantial erosion or siltation on- or off-site. The impact would be less than significant.

- d) Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?**

Impact 4.8-4: The Project could substantially change runoff flow rates or increase the potential for flooding. (*Less than Significant*)

There would be no substantial change in runoff flow rates nor would the Project increase the potential for flooding. As stated in c) above, there would be no alteration of streams or the existing drainage patterns. Within the Refinery property, addition of new Project components would not substantially increase the impervious surface areas or increase the storm runoff generated at the Project site. Storm water runoff would be collected by the existing on-site storm drains and discharged through the existing NPDES-permitted outfalls servicing the Refinery site. The runoff produced at the location of the Project would be accommodated within the existing capacity of the storm water conveyance system. Therefore, there would be no increase in the rate or volume of surface runoff that could result in on- or off-site flooding. The impact would be less than significant.

- e) Would the project create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?**

Impact 4.8-5: The Project could increase storm water runoff. (*Less than Significant*)

As discussed in items a, c, d, and f) above, storm water runoff would be collected by the existing storm conveyance system and discharged through the NPDES-permitted outfalls or treated at the Refinery wastewater treatment plant and discharged into Carquinez Strait. The runoff would be accommodated within the existing storm water drainage system and would be similar in nature to the existing site runoff quantities. The impact would be less than significant.

h) Would the project place within a 100-year flood hazard area structures which would impede or redirect flood flows?

Impact 4.8-6: The Project could place structures within a 100-year flood hazard areas at risk. (*Less than Significant*)

Review of the Federal Emergency Management Agency (FEMA) Federal Insurance Rate Maps (FIRM) for the Project area indicate that the majority of the Project site along Sulphur Springs Creek and north of Bayshore Road is designated as “Zone RF”, a Special Flood Hazard Area (SFHA) that is within the 100-year flood zone (FEMA, 2013). The southern portions of the proposed rail alignment are in areas of minimal flood hazard or in Zone X, with some sections crossing Zone RF and Zone AE in the vicinity of Bayshore Road (FEMA, 2013). Construction of aboveground facilities within a flood hazard zone could potentially impede or redirect flood flows. Aboveground facilities that are not designed to withstand inundation can be damaged during flood events. Due to the Project being within a 100-year flood zone, Project components would be required to include in the design criteria flood hazard mitigation measures in accordance with the City of Benicia Floodplain Management Policy (City of Benicia, 1999). The flood hazard mitigation measures incorporated into the design criteria for the Project would comply with construction standards established by the California Building Code. Further, the Project elements are not habitable structures for human occupancy. Additionally, construction of new unloading facilities and rail track within the mapped 100-year flood hazard zone would be unlikely to displace floodwaters, raise flood elevations, create new flooding impacts (e.g., by causing flooding of existing facilities or structures that previously would not have been inundated), and/or exacerbate existing flooding problems (e.g., by increasing the severity or frequency of flooding relative to pre-Project conditions). Therefore, it is unlikely that the Project would substantially displace or redirect flood flows. The impact would be less than significant.

i) Would the project expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?

Impact 4.8-7: The Project could place people or structures within inundation areas for flooding. (*Less than Significant*)

The Project area is within the mapped dam inundation zone for Lake Herman Dam (ABAG, 1995). Although unlikely, catastrophic failure of this dam would potentially expose people or structures to a significant risk of loss, injury, or death involving flooding. However, all dams are routinely inspected and evaluated for seismic integrity as overseen by the California Division of Safety of Dams (DSOD). When a dam is found to have a failure potential, the water level behind the dam is reduced to allow for partial collapse without loss of water as required by DSOD (ABAG, 2013). Thus, the probability of dam failure resulting in significant loss, injury, or death is low (ABAG, 2013). Given the low risk of dam failure, and because the proposed facilities would be designed to withstand natural hazards, potential impacts related to dam failure are considered less than significant. According to maps compiled by the San Francisco Bay Conservation and Development Commission (BCDC), a projected sea-level rise of 55 inches by

the year 2100 would affect large areas around the Bay perimeter. The maps indicate that the Project site would be located within an area of anticipated inundation that is consistent with the 100-year flood zone designated by FEMA (BCDC, 2011). Flooding hazards to people or structures related to the 100-year flood zone designated by FEMA are discussed under Impact 4.8-6, above. The impact would be less than significant.

4.9 Land Use and Planning

4.9.1 Introduction

This section discusses land use planning issues, including the Project's consistency with local land use and zoning and applicable local plans, policies, and regulations. The applicable plans and their relevant policies discussed in this section include the *City of Benicia General Plan* (General Plan), Benicia Zoning Ordinance, and the San Francisco Bay Conservation and Development's *San Francisco Bay Plan* (Bay Plan) and *Suisun Marsh Protection Plan*.

4.9.2 Setting

4.9.2.1 Regional Setting

The City of Benicia is located in the southernmost section of Solano County, overlooking the Carquinez Strait, which connects San Pablo Bay to the west and Suisun Bay and the Sacramento Delta to the east. Benicia is located adjacent to the Interstate 680 corridor and to Interstate 80 (I-80) via Interstate 780 (I-780). The City is also home to the Port of Benicia, a deep water privately operated port. Benicia is forty miles from Oakland International and fifty miles from San Francisco International Airports. Union Pacific Railroad operates two major rail lines and related trackage serving Benicia businesses. The City of Benicia encompasses 14 square miles, and is located 35 miles northeast of San Francisco and 57 miles southwest of Sacramento.

4.9.2.2 Project Setting

The Refinery is located at 3400 East Second Street, within an industrial area (Benicia Industrial Park) in the eastern portion of the City of Benicia. The Refinery lies in a general north-south orientation near and west of Interstate 680. The Refinery is located along the northern edge of the Suisun Bay below a low range of coastal hills. Figure 3-1 in Chapter 3, *Project Description* shows the map of the region.

The Refinery occupies approximately 330 acres of the 880-acre Valero property; the remaining portion of which is undeveloped. The Refinery consists of four primary areas: the main Refinery area, which includes the process block and tank farm where raw materials are converted into gasoline and other products and where intermediate and finished products are stored; a crude tank farm, located south and east of the process block area, where raw materials are stored; an administrative area, including the Refinery's main entry and parking lot along East Second Street; and the Refinery's wastewater treatment plant, separated from the main Refinery area by I-680. Additionally, the Refinery's wastewater effluent outfall discharges approximately 1,100 feet offshore into Suisun Bay. The Project site is adjacent to the northeastern boundary of the Valero property, between the lower tank farm and Sulphur Springs Creek.

The Union Pacific Railroad Company (UPRR) line serves the Refinery as well as other businesses within the Benicia Industrial Park east of the Refinery, via Track 700. The Refinery

dock, located on the Carquinez Strait between the Benicia-Martinez Bridge and the Port of Benicia wharf, provides Refinery access to bulk transport by ship. Coke shipments from Valero are loaded from Berth 3 at the Port of Benicia. The lands and facilities of the existing Refinery are shown in Figure 3-2 in Chapter 3, *Project Description*.

Surrounding Land Uses

The Refinery is immediately bordered by approximately 550 acres of mostly undeveloped Valero property to the south and west, and general industrial uses to the north and east. Industrial uses in the Benicia Industrial Park are located east of the Project site. This area consists largely of single-level warehouse and manufacturing buildings interspersed with parking areas and materials storage yards. As noted above, a spur of the UPRR rail line serves the Benicia Industrial Park. This line branches off from the line serving Valero and passes through Valero's property.

Residential uses are located approximately 3,000 feet to the south and west of the Refinery, and approximately 2,100 feet to the northwest. The nearest residential area to the Project site is located approximately 0.4-mile to the northwest of the terminus of the proposed unloading rack and rail spurs. This neighborhood is separated from the Project site by undeveloped hills, including areas owned by Valero.

4.9.2.3 Regulatory Setting

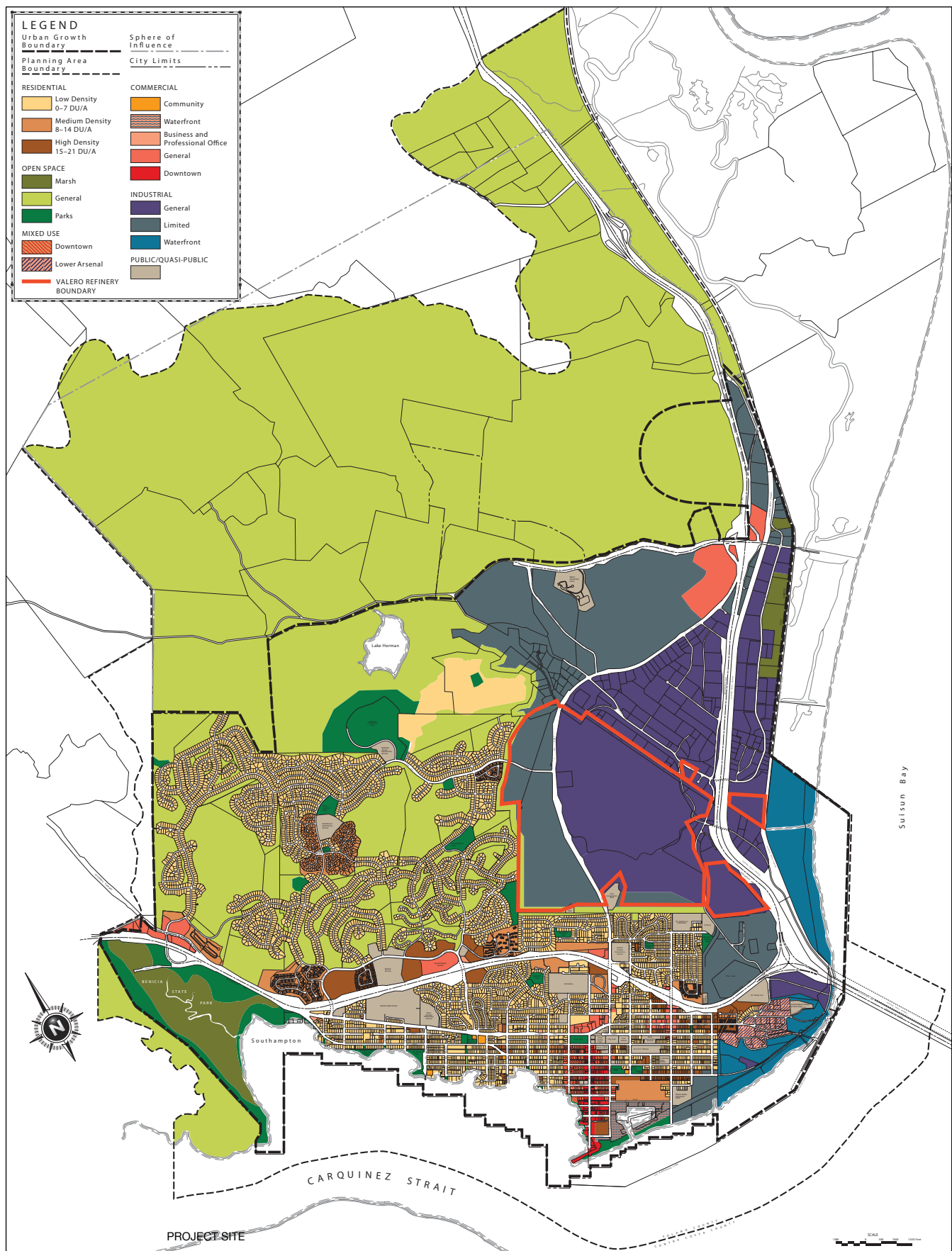
City of Benicia

Land Use Designation

The project site exists within the geographic area named in the *City of Benicia General Plan* as the Benicia Industrial Park, which is the major industrial area in the City. Benicia's industrial land is divided into three General Plan Land Use categories: General Industrial, Limited Industrial, and Water-related Industrial. The land use designation for the project site is General Industrial, which is the least restrictive of the three categories, and is intended to allow flexibility for industrial development. Over half of the Benicia Industrial Park is designated General Industrial. This includes nearly all of the area north of I-780 and east of East Second Street (City of Benicia, 1999 and 2003). Existing General Plan land use designations are shown on Figure 4.9-1.

General Plan

To meet the requirements of state law, all cities and counties in California are required to prepare and adopt a general plan. Pursuant to state law, the general plan is a comprehensive, long-term plan for the physical development of the City, and any land outside its boundaries that bears relation to its planning. The *City of Benicia General Plan*, adopted in 1999, includes specific policies to preserve and enhance existing development and to provide for orderly and appropriate new development of the City of Benicia until approximately the year 2020. Actions and approvals required by the City of Benicia Community Development Department must be consistent with the General Plan.



SOURCE: City of Benicia

Benicia Valero CBR . 202115.01

Figure 4.9-1
Existing Land Use Designations

The General Plan contains the Community Development and Sustainability chapter (Chapter 2), which includes a discussion of the various types of land uses in Benicia. It also features goals and policies addressing growth management, economic development, circulation (i.e., transportation and traffic), community/public services, and public facilities. The General Plan's Community Identity chapter (Chapter 3) covers historic and cultural resources, visual character, and open space and conservation of resources. The Community Health and Safety chapter (Chapter 4) addresses options for developing a more healthy community, hazards to the community, emergency response plans and community safety measures, and community noise sources and related effects.

General Plan goals and policies applicable to the Project are included below. Policies pertaining to other environmental topic areas, such as traffic and circulation, hazards and public safety, and hydrology, are included in their respective sections of this EIR.

Growth Management

Policy 2.1.1: Ensure that new development is compatible with adjacent existing development and does not detract from Benicia's small town qualities and historic heritage, (and to the extent possible, contributes to the applicable quality of life factors noted above).

Policy 2.1.4: Strive to preserve significant areas of vegetation and open space when approving development projects.

Economic Development

Goal 2.5: Facilitate and encourage new uses and development which provide substantial and sustainable fiscal and economic benefits to the City and the community while maintaining health, safety, and quality of life.

Policy 2.6.1: Preserve industrial land for industrial purposes and certain compatible "service commercial" and ancillary on-site retail uses.

Policy 2.6.4: Link any expansion of industrial use to the provision of infrastructure and public services that are to be developed and in place prior to the expansion.

Policy 2.6.5: Establish and maintain a land buffer between industrial/commercial uses and existing and future residential uses for reasons of health, safety and quality of life.

Goal 2.7: Attract and retain industrial facilities that provide fiscal and economic benefits to—and meet the present and future needs of—Benicia.

Open Space and Conservation of Resources

Goal 3.15: Provide buffers throughout the community.

Policy 3.15.4: Use open space as a buffer against natural and man-made hazards.

Program 3.15.F: Require open space buffers around known hazardous areas such as the Exxon (Valero) Refinery and the Interpretive Trail Site.

(City of Benicia, 1999)

Zoning Ordinance

The City of Benicia Zoning Ordinance is the primary tool for achieving the objectives of the General Plan. The zoning ordinance provides detailed specifications for allowable development within areas designated by the General Plan. The Refinery process unit, and the Project site, are designated General Industrial (IG) by the zoning ordinance. Other areas within the Benicia Industrial Park, east of the Refinery, are also zoned IG. General Industrial uses are permitted by right under the zoning ordinance, except that a use permit is required for all oil and gas refining. Valero's undeveloped land, which serves as a buffer between the Refinery and adjacent land uses to the north, south, and west, is zoned Limited Industrial (IL) (City of Benicia, 2012 and 2013). Existing zoning is shown on Figure 4.9-2.

San Francisco Bay Conservation and Development Commission

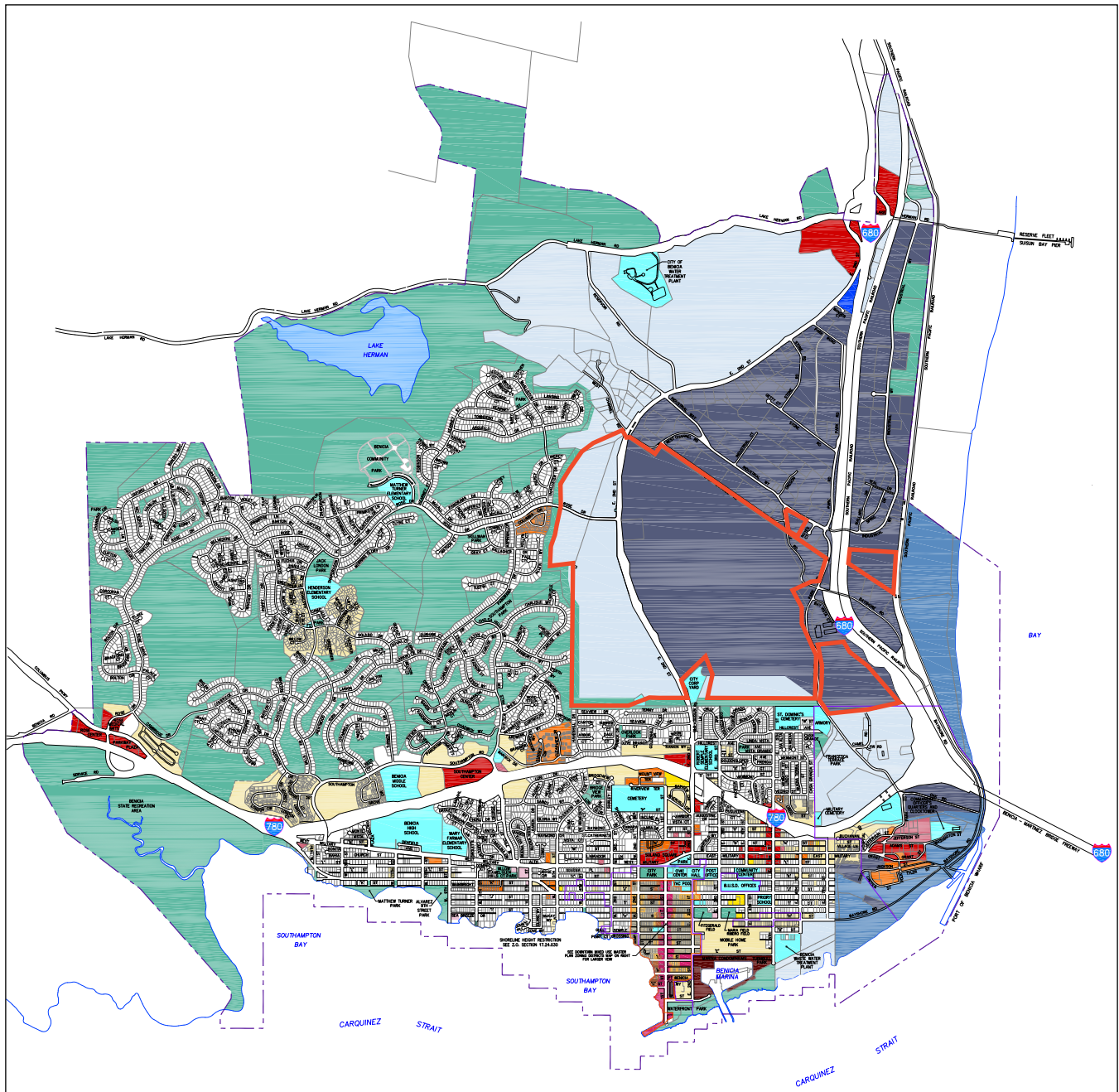
The San Francisco Bay Conservation and Development Commission (BCDC) is a state agency with permit authority over the Bay and its shoreline. Created by the McAteer-Petris Act in 1965, BCDC regulates filling, dredging, and changes in use in San Francisco Bay. BCDC also regulates new development within the 100 feet of the shoreline to ensure that maximum feasible public access to and along the Bay is provided. BCDC is also charged with ensuring that the limited amount of shoreline property suitable for regional high priority water-oriented uses is reserved for these purposes. Land-side uses and structural changes are governed by policies regarding public access. BCDC planning documents applicable to the Refinery and the Project site include the *San Francisco Bay Plan*, *Bay Area Seaport Plan*, *Benicia Waterfront Special Area Plan*, and *Suisun Marsh Protection Plan*.

San Francisco Bay Plan (Bay Plan)

The Bay Plan specifies goals, objectives, and policies for existing and proposed waterfront land use and other BCDC jurisdictional areas. The Bay Plan identifies high-priority uses of the Bay and shoreline for which shoreline areas should be reserved. These “priority uses” include ports, water-related industry, airports, wildlife refuges, and water-related recreation areas. Plan Map 2 of the Bay Plan designates the Refinery, including the Project site and UPRR tracks in the vicinity of the Refinery, as water-related industry. Water-related industry is defined as an industry that requires “a waterfront location on navigable, deep water to receive raw materials and distribute finished products by ship, thereby gaining a significant transportation cost advantage.” Certain segments of the UPRR tracks outside the city limits of Benicia pass through, or are adjacent to, units of the Grizzly Island Wildlife Area in the Suisun Marsh. The primary purposes of wildlife refuges according to the Bay Plan are: “(1) the protection of threatened or endangered native plants, wildlife, and aquatic organisms; (2) the preservation and enhancement of unique habitat types or highly significant wildlife habitat; or (3) the propagation and feeding of aquatic life and wildlife.” (BCDC, 2006)

Benicia Waterfront Special Area Plan

The *Benicia Waterfront Special Area Plan* (Waterfront Plan) was adopted by the San Francisco Bay Conservation and Development Commission (BCDC) and the City of Benicia to provide



ZONING MAP LEGEND:

OS	OPEN SPACE
PS	PUBLIC & SEMI-PUBLIC
RS	SINGLE FAMILY RESIDENTIAL • 0 - 7 DU/ACRE
RM	MEDIUM DENSITY RESIDENTIAL • 8 - 14 DU/ACRE
RH	HIGH DENSITY RESIDENTIAL • 15 - 21 DU/ACRE
PD	PLANNED DEVELOPMENT
CC	COMMUNITY COMMERCIAL
CO	OFFICE COMMERCIAL
CG	GENERAL COMMERCIAL
CW	WATERFRONT COMMERCIAL
IL	LIMITED INDUSTRIAL
IG	GENERAL INDUSTRIAL
IW	WATER RELATED INDUSTRIAL
IP	INDUSTRIAL PARK

DMUMP MAP LEGEND:

TOWN CORE
TOWN CORE-OPEN
NEIGHBORHOOD GENERAL
NEIGHBORHOOD GENERAL-OPEN

VALERO REFINERY BOUNDARY

GENERAL LEGEND:

BENICIA CITY LIMITS BOUNDARY
HISTORIC OVERLAY DISTRICT
LOT / PROPERTY LINE
STREET / ROAD / HIGHWAY RIGHT-OF-WAY LINE
SHORE LINE / EDGE OF WATER BODY
DMUMP BOUNDARY



0 400 800 1200 1800 2400
Graphic Scale in Feet

SOURCE: City of Benicia

Benicia Valero CBR . 202115.01

Figure 4.9-2
Existing Zoning

detailed planning and regulatory guidelines for the Benicia shoreline between West Second Street and the Benicia-Martinez Bridge. The Refinery dock, which provides access to bulk transport by ship, and the Port of Benicia, where coke shipments from Valero are loaded for marine transport, are both located within the boundaries of the Waterfront Plan. The Waterfront Plan area is divided into three geographic sections: Historical Business District, Marina District, and the Port District. The Refinery dock and the Port of Benicia are both located within the Port District. Permitted uses within the Port District include ports, water-related industry, and limited public access (BCDC, 1977).

Bay Area Seaport Plan

The San Francisco *Bay Area Seaport Plan* (Seaport Plan) was prepared in conjunction with the Metropolitan Transportation Commission (MTC) and serves as BCDC's overall policy for long-term growth and development of the Bay Area's six seaports, which includes the Port of Benicia. Areas determined to be necessary for future port development are designated as "port priority use areas" by the Seaport Plan. These areas are reserved for port-related and other uses that will not impede development of the sites for port purposes. The Port of Benicia, including the Refinery dock, is located within the port priority use area (BCDC, 1996).

Suisun Marsh Protection Plan

The *Suisun Marsh Protection Plan*, prepared by BCDC, contains policies which regulate the marsh's Primary Management Area of 89,000 acres of tidal marsh, managed wetlands, adjacent grasslands, and waterways, as well as a Secondary Management Area of approximately 22,500 acres of significant buffer lands. Solano County was required to prepare and adopt a component of the local protection program required under the Suisun Marsh Preservation Act to implement the *Suisun Marsh Protection Plan* within the Suisun Marsh Management Area. The Suisun Marsh Local Protection Program (SMLPP) was subsequently adopted by Solano County (as well as the cities of Fairfield and Suisun City) in the 1980s. Neither the Refinery nor the Project site is located within the boundaries of the SMLPP, although the UPRR tracks cross the Primary Management Area of the SMLPP. This area consists of tidal marshes, seasonal marshes, managed wetlands, and lowland grasslands. It is the intent for this area to remain in its existing marsh and related uses (BCDC, 1976; Solano County, 2012).

Conservation Plans

Bay Delta Conservation Plan

The Bay Delta Conservation Plan (BDCP) is a proposed 50-year habitat conservation plan (HCP) and natural community conservation plan (NCCP) that would help secure California's water supply by building new water infrastructure and investing in habitat restoration to improve the ecological health of the Sacramento-San Joaquin River Delta, while minimizing impacts to local communities and farms. The BDCP includes a series of conservation measures to enhance ecosystem processes and function, such as increased seasonal floodplain habitat, intertidal and associated subtidal habitat, improved hydrologic conditions, and improved salinity within the Delta estuary, as well as reduced direct losses of fish and other aquatic organisms. The Public

Draft of the BDCP and the Draft Environmental Impact Statement (EIS)/EIR were published in December 2013. The UPRR tracks that would be used to deliver crude oil to the Refinery cross the Suisun Marsh, which is included in the BDCP area (DNR, 2013).

Suisun Marsh Habitat Management, Preservation, and Restoration Plan

The Suisun Marsh Habitat Management, Preservation, and Restoration Plan (Suisun Marsh Plan [SMP]) has management oversight by a group of agencies with primary responsibility for Suisun Marsh management, and is intended to balance the benefits of tidal wetland restoration with other habitat uses in the Suisun Marsh. The principal agencies with primary responsibility for management of the Suisun Marsh are the U.S. Fish and Wildlife Service, U.S. Bureau of Reclamation, California Department of Fish and Wildlife, California Department of Water Resources, National Marine Fisheries Service, Suisun Resource Conservation District, and CALFED Bay-Delta Program. The Final Environmental Impact Statement (EIS) / EIR was published in November 2011. The UPRR tracks that would be used to deliver crude oil to the Refinery cross the Suisun Marsh (USBR, 2011).

Solano County Habitat Conservation Plan

The U.S. Bureau of Reclamation (USBR), the Solano County Water Agency (SCWA), and other participating governments and agencies within Solano County have agreed to implement conservation measures to ensure the protection of threatened and endangered species and their habitat within the SCWA contract service area by implementation of conservation measures outlined in the Solano Project Water Service Contract Renewal Biological Opinion (Solano Project Biological Opinion). To support those measures, the SCWA and participating governments and agencies have developed a HCP for the Solano Project contract service area. The Solano HCP is intended to support the issuance of an “incidental take permit” under the Federal Endangered Species Act (FESA) for activities associated with future water use in the SCWA service area. Entities participating in the HCP also intend to secure incidental take authorization from the California Department of Fish and Wildlife for State-listed species. The City of Benicia and the unincorporated areas of Solano County outside the SCWA service area have elected not to participate in the HCP. However, the UPRR tracks that would be used to deliver crude oil to the Refinery cross portions of the HCP area. In addition, as of publication of this EIR, the HCP has not been formally adopted by the plan participants (SCWA, 2012).

Yolo County Natural Community Conservation Plan/Habitat Conservation Plan

The Yolo Natural Heritage Program (NHP) is a comprehensive, county-wide plan designed to provide for the conservation and management of sensitive species and the natural communities upon which those species depend, while accommodating other important uses of the land. The NHP will further replace the existing project-by-project approach to mitigation and conservation, thereby providing greater benefits to species covered by the NHP and a more streamlined mitigation process for activities covered by the NHP. The NHP serves as a HCP pursuant to FESA and a NCCP under the California Natural Community Conservation Planning Act. The UPRR tracks that would be used to deliver crude oil to the Refinery cross Yolo County near

Sacramento. The Yolo County NCCP/HCP has not been formally adopted by the plan participants; the First Administrative Draft was published in July 2013 (YNHP, 2013).

4.9.2.4 Project Baseline

Baseline (existing) conditions reflect the ongoing operation of the Refinery as it existed at the time of the issuance of the NOP (August 2013), as an oil refinery, including ongoing operations and maintenance activities as described in detail in Section 3.3.

4.9.3 Significance Criteria

Based on California Environmental Quality Act (CEQA) Guidelines Appendix G, a project would cause adverse land use impacts if it would:

- a) Physically divide an established community;
- b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect; or
- c) Conflict with any applicable habitat conservation plan or natural community conservation plan.

4.9.3.1 Approach to Analysis

Section 15125(d) of the CEQA Guidelines states that “the EIR shall discuss any inconsistencies between the Project and applicable general plans and regional plans” as a part of the discussion of the existing setting of the project. However, inconsistency with an adopted plan does not necessarily indicate a significant impact. This section considers adopted plans and the policies that are applicable to the Project, and determines whether the Project conforms to those plans and policies. While potential policy inconsistencies resulting from the project would not qualify as significant environmental impacts, physical environmental impacts were identified elsewhere in this document.

4.9.4 Discussion of No Land Use or Planning Impacts

Review and comparison of the setting circumstances and Project characteristics with the significance criteria stated above, clearly show that no impact would result for the third land use criterion. The following discusses the reasoning supporting this conclusion:

c) Conflict with an adopted habitat conservation plan or natural community conservation plan.

The Refinery is located outside the boundaries of the *Bay Delta Conservation Plan*, the *Solano County Habitat Conservation Plan* and the *Yolo County Natural Community Conservation Plan/Habitat Conservation Plan*, none of which has been formally adopted by their respective

plan participants. Although the UPRR tracks that would be used to deliver crude oil to the Refinery crosses portions of these areas, no physical changes would occur to the existing railroad tracks as a result of the Project. Therefore, the Project would not conflict with any adopted conservation plan and no impact would result. Furthermore, the Project would not conflict with the current draft plans, and no impact would result.

4.9.5 Discussion of Impacts and Mitigation Measures

The Project was evaluated for consistency with the *City of Benicia General Plan* and other relevant local and regional plans and policies, which are described above in the Regulatory Setting. Although they would not be considered land use impacts, construction-related activities that could affect adjacent land uses are discussed in Sections 4.1, *Air Quality*; 4.6, *Greenhouse Gas Emissions*; and 4.10, *Noise*. Construction activities are scheduled to begin in 2014 and are expected to take approximately 25 weeks. Construction-related impacts would be relatively short-term in duration and would not continue after the Project begins operating. In general, the physical construction-related effects on adjacent land uses would be less-than-significant impacts. Certain physical construction-related effects would require the mitigation measures identified in the relevant sections of this document to reduce those impacts to less than significant. For analyses and discussions of these construction-related impacts, please refer to the above-identified sections.

a) Physically divide an established community.

Impact 4.9-1: The Project would not physically divide an established community. (*Less than Significant*)

Land uses in the vicinity of the Project include general industrial uses in the Benicia Industrial Park east of the Refinery. This area consists largely of single-level warehouse and manufacturing buildings interspersed with parking areas and materials storage yards. The nearest residential area is located approximately 0.4-mile to the northwest of the terminus of the proposed unloading rack and rail spurs. This neighborhood is separated from the Project site by undeveloped hills, including areas owned by Valero. The Project is surrounded by other areas of the Refinery to the west and south. The Project would be constructed within the existing footprint of already-developed portions of the Refinery, in physically discrete areas occupied by existing Refinery and tank storage operations. Although the Project would increase the frequency of 8-minute crossings of Park Road by trains delivering crude oil to the Refinery, the increased crossing frequency is within the current range of crossing variability (see Section 4.11, *Transportation and Traffic*). The blockage of Park Road would be temporary and would not physically divide Benicia. Development on the Refinery property would be contained within the footprint of the existing Refinery and tank farm, and would not physically divide Benicia. The impact would be less than significant.

- b) **Conflict with any applicable land use plan, policy, or the regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect.**

Impact 4.9-2: The Project would be in conformance with applicable regional or local plans and policies adopted for the purpose of avoiding or mitigating environmental effects. (*Less than Significant*)

The Project site is designated General Industrial by the *City of Benicia General Plan* and General Industrial (IG) by the Benicia Zoning Ordinance. General Industrial uses are permitted by right under Benicia's Zoning Ordinance, except that a use permit is required for all oil and gas refining. The Project would be consistent with the uses designated for the site by the General Plan and would not conflict with any applicable policies contained in the General Plan.

The entire Refinery is located in an area designated by the *San Francisco Bay Plan* for water-related industry. The Project would be consistent with this use. The Project site is not located within the boundaries of the *Benicia Waterfront Special Area Plan* or the *Bay Area Seaport Plan (Benicia Port Plan)*; no conflict would result from implementation of the Project.

The Refinery is located outside the Marsh Protection Area identified in the Suisun Marsh Local Protection Program (SMLPP) of the *Suisun Marsh Protection Plan*. Although the UPRR tracks cross the Primary Management Area of the SMLPP, no physical changes would occur to the railroad tracks as a result of the Project. The Project would not conflict with the SMLPP and no impact would result.

Therefore, the Project would not conflict with any applicable land use plan or policy adopted for the purpose of avoiding or mitigating an environmental effect. The impact would be less than significant.

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4.10 Noise

4.10.1 Introduction

This section addresses noise impacts associated with the Project. It analyzes both potential noise impacts caused by construction and operation of the Project on the ambient noise environment. Background information on environmental acoustics, including definitions of terms commonly used in noise analysis, is provided below.

4.10.2 Setting

4.10.2.1 Noise Background

Sound is mechanical energy transmitted by pressure waves through a medium such as air. Noise can be defined as unwanted sound. Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). In particular, the sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound level. Sound pressure level is measured in decibels (dB), with zero dB corresponding roughly to the threshold of human hearing and 120 to 140 dB corresponding to the threshold of pain.

Sound pressure fluctuations can be measured in units of hertz (Hz), which correspond to the frequency of a particular sound. Typically, sound does not consist of a single frequency, but rather a broad band of frequencies varying in levels of magnitude (sound power). When all the audible frequencies of a sound are measured, a sound spectrum is plotted consisting of a range of frequency spanning 20 to 20,000 Hz. The sound pressure level, therefore, constitutes the additive force exerted by a sound corresponding to the sound frequency/sound power level spectrum.

The typical human ear is not equally sensitive to all frequencies of the audible sound spectrum. As a consequence, when assessing potential noise impacts, sound is measured using an electronic filter that de-emphasizes the frequencies below 1,000 Hz and above 5,000 Hz in a manner corresponding to the human ear's decreased sensitivity to low and extremely high frequencies instead of the frequency mid-range. This method of frequency weighting is referred to as A-weighting and is expressed in units of A-weighted decibels (dBA). Some typical A-weighted sound levels are presented in Figure 4.10-1.

Noise Exposure and Community Noise

An individual's noise exposure is a measure of the noise experienced by the individual over a period of time. A noise level is a measure of noise at a given instant in time. However, noise levels rarely persist consistently over a long period of time. In fact, community noise varies continuously with time with respect to the contributing sound sources of the community noise environment. Community noise is primarily the product of many distant noise sources, which constitute a relatively stable background noise exposure, with the individual contributors unidentifiable. Background noise levels change throughout a typical day, but do so gradually,

NOISE LEVEL		
COMMON OUTDOOR ACTIVITIES	(dBA)	COMMON INDOOR ACTIVITIES
	110	Rock band
Jet flyover at 1,000 feet	100	
Gas lawnmower at 3 feet	90	
Diesel truck at 50 feet at 50 mph	80	Food blender at 3 feet Garbage disposal at 3 feet
Noisy urban area, daytime	70	Vacuum Cleaner at 10 feet
Gas lawnmower at 100 feet	60	Normal speech at 3 feet
Commercial area	50	Large business office
Heavy traffic at 300 feet	40	Dishwasher in next room
Quiet urban daytime	30	Theater, large conference room (background)
Quiet urban nighttime	20	Library
Quiet suburban nighttime	10	Bedroom at night, concert hall (background)
Quiet rural nighttime	0	Broadcast/recording studio

corresponding with the addition and subtraction of distant noise sources and atmospheric conditions. The addition of short duration single event noise sources (e.g., aircraft flyovers, horns, sirens) makes community noise constantly variable throughout a day.

These successive additions of sound to the community noise environment vary the community noise level from instant to instant requiring the measurement of noise exposure over a period of time to legitimately characterize a community noise environment and evaluate cumulative noise impacts. This time-varying characteristic of environmental noise is described using statistical noise descriptors. Noise descriptors discussed in this analysis are summarized below:

- L_{eq}:** The equivalent sound level is used to describe noise over a specified period of time, in terms of a single numerical value. The L_{eq} is the constant sound level which would contain the same acoustic energy as the varying sound level, during the same time period (i.e., the average noise exposure level for the given time period).
- DNL:** The day-night noise level (DNL; also referred to as L_{dn}) or the energy average of the A-weighted sound levels occurring during a 24-hour period and which accounts for the greater sensitivity of most people to nighttime noise by weighting noise levels at night (“penalizing” nighttime noises). Noise between 10:00 p.m. and 7:00 a.m. is weighted (penalized) by adding 10 dBA to take into account the greater annoyance of nighttime noises.

Effects of Noise on People

The effects of noise on people can be placed into three categories:

- **Interference with activities such as speech and sleep.** The thresholds for speech interference indoors are about 45 dBA if the noise is steady and above 55 dBA if the noise is fluctuating. Outdoors, the thresholds are about 15 dBA higher. Interior residential standards for multi-family dwellings are set by the State of California at 45 DNL. The standard is designed for sleep and speech protection and most jurisdictions apply the same criterion for all residential uses.
- **Subjective effects of annoyance, nuisance, and dissatisfaction.** Based on attitude surveys used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas, the main causes for annoyance are interference with speech, radio and television, house vibrations, and interference with sleep and rest. The DNL as a measure has been found to provide a valid correlation of noise level and the percentage of people annoyed. Three aspects of community noise are most important in determining subjective response – the level of sound, the frequency composition or spectrum of the sound, and the variation of sound level with time.
- **Physiological effects such as hearing loss or sudden startling.** While physical damage to the ear from an intense noise impulse is rare, a degradation of auditory acuity can occur even within a community noise environment. Hearing loss occurs mainly due to chronic exposure to excessive noise, but may be due to a single event such as an explosion. Natural hearing loss associated with aging may also be accelerated from chronic exposure to loud noise.

Environmental noise typically produces effects in the first two categories. Workers at industrial plants often experience effects described in the last category. There is no completely satisfactory

way to measure the subjective effects of noise, or the corresponding reactions of annoyance and dissatisfaction. A wide variation exists in the individual thresholds of annoyance and different tolerances to noise tend to develop based on an individual's past experiences with noise.

Thus, an important way of predicting a human reaction to a new noise environment is the way the new noise compares to the existing noise levels to which one has adapted: the so called "ambient noise" level. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise would be judged by those hearing it. With regard to increases in A-weighted noise level, the following relationships occur:

- Except in carefully controlled laboratory experiments, a change of 1-dBA cannot be perceived;
- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference when the change in noise is perceived but does not cause a human response;
- A change in level of at least 5-dBA is required before any noticeable change in human response would be expected; and
- A 10-dBA change is subjectively heard as approximately a doubling in loudness and can cause an adverse response.

These relationships occur in part because of the logarithmic nature of sound and the decibel system. A ruler is a linear scale: it has marks on it corresponding to equal quantities of distance. One way of expressing this is to say that the ratio of successive intervals is equal to one. A logarithmic scale is different in that the ratio of successive intervals is not equal to one. Each interval on a logarithmic scale is some common factor larger than the previous interval. A typical ratio is 10, so that the marks on the scale read: 1, 10, 100, 1,000, 10,000, etc., doubling the variable plotted on the x-axis. The human ear perceives sound in a non-linear fashion; hence the decibel scale was developed. Because the decibel scale is based on logarithms, two noise sources do not combine in a simple additive fashion, rather they combine logarithmically. For example, if two identical noise sources produce noise levels of 50 dBA, the combined sound level would be 53 dBA, not 100 dBA.

Noise Attenuation

Sound level naturally decreases with more distance from the source. This basic attenuation rate is referred to as the *geometric spreading loss*. The basic rate of geometric spreading loss depends on whether a given noise source can be characterized as a point source or a line source. Point sources of noise, including stationary mobile sources such as idling vehicles or on-site construction equipment, attenuate (lessen) at a rate of 6.0 dBA per doubling of distance from the source. In many cases, noise attenuation from a point source increases by 1.5 dBA from 6.0 dBA to 7.5 dBA for each doubling of distance due to ground absorption and reflective wave canceling. These factors are collectively referred to as *excess ground attenuation*. The basic geometric spreading loss rate is used where the ground surface between a noise source and a receiver is reflective, such as parking lots or a smooth body of water. The excess ground attenuation rate (7.5 dBA per doubling of distance) is used where the ground surface is absorptive, such as soft dirt, grass, or scattered bushes and trees.

Widely distributed noises such as a street with moving vehicles (a “line” source) would typically attenuate at a lower rate of approximately 3.0 dBA for each doubling of distance between the source and the receiver. If the ground surface between source and receiver is absorptive rather than reflective, the nominal rate increases by 1.5 dBA to 4.5 dBA for each doubling of distance. Atmospheric effects, such as wind and temperature gradients, can also influence noise attenuation rates from both line and point sources of noise. However, unlike ground attenuation, atmospheric effects are constantly changing and difficult to predict.

Vibration

Vibration is an oscillatory motion through a solid medium in which the motion’s amplitude can be described in terms of displacement, velocity, or acceleration. There are several different methods that are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe vibration impacts to buildings. The root mean square (RMS) amplitude is most frequently used to describe the effect of vibration on the human body. The RMS amplitude is the average of the squared amplitude of the signal. Typically, ground-borne vibration generated by man-made activities attenuates rapidly with distance from the source of the vibration (FTA, 2006).

4.10.2.2 Environmental Setting

Sensitive Receptors

The Project would be constructed within the Refinery in an area designated for General Industrial uses by the City of Benicia General Plan. Construction noise could impact residences in the vicinity of the Refinery, and this potential impact is considered below.

The Project would also result in four additional daily train trips along the Union Pacific main line from Roseville to the Refinery. The incremental increase in train noise caused by four additional trains is an indirect impact of the Project. Train noise could potentially impact sensitive receptors along the route from Roseville to the Refinery. The analysis of indirect noise impacts from trains herein considers impacts in the City of Benicia in detail. Indirect impacts outside the City are considered in general terms. Potential impacts on biological resources are considered in Section 4.2.

Noise-sensitive uses do not immediately adjoin the developed part of the Refinery. In general, the Refinery complex is bordered by approximately 470 acres of mostly undeveloped Valero property to the south and west, and general industrial uses to the north and east. Residential uses are located to the south (Hillcrest neighborhood) and west (Southampton neighborhood) of the Valero buffer land boundaries. The closest sensitive receptors to the Project site are residences off Lansing Circle, approximately 2,100 feet northwest of the proposed northern extent of the new unloading tracks, and approximately 2,250 feet northwest of the proposed northern extent of the unloading racks. The buffer lands separating the neighborhoods from the Refinery are designated for non-noise sensitive uses by the Benicia General Plan - designated as General Industrial, Limited Industrial, and General Open Space (City of Benicia, 1999). Areas to the northeast and southeast of the Refinery are also non-noise sensitive land uses, consisting of Interstate 680 and the Benicia Industrial Park.

Noise Sources and Ambient Noise Levels

Transportation sources, such as automobiles, trucks, trains, and aircraft, are the principal sources of noise in the urban environment. Along major transportation corridors, noise levels can reach 80 DNL, while along arterial streets, noise levels typically range from 65 to 70 DNL. Industrial and commercial equipment and operations also contribute to the ambient noise environment in their vicinities. The ambient noise environment at the project site is dominated by existing operations at the Refinery, and vehicular traffic on Interstate 680 and Interstate 780.

Existing rail noise in the City of Benicia is generated along the Union Pacific rail line, which extends along the eastern City boundary near the Suisun Bay shoreline. Existing operations along the Union Pacific rail line total approximately 42 daily headways with 35 of those occurring during daytime hours and seven during nighttime hours. The City of Benicia General Plan Noise Element indicates that the 60 dBA, L_{dn} noise contour extends approximately 100 feet from either side of the right of way (City of Benicia, 1999).

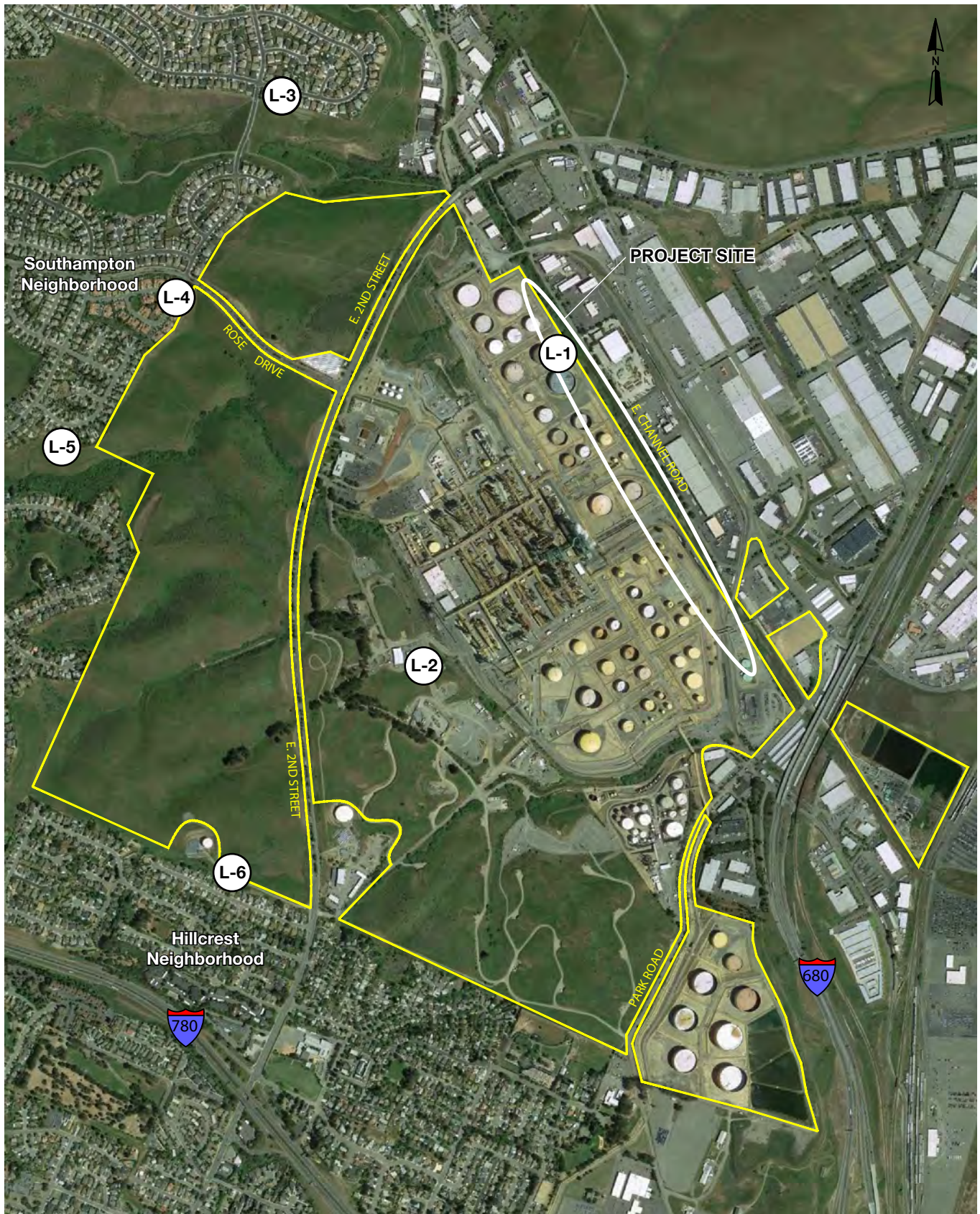
To provide the basis for evaluating potential impacts of the Project on the nearest noise-sensitive uses, long-term noise measurements were conducted between Wednesday, February 20, and Monday, February 25, 2013. Precision, calibrated, Type 1 logging sound level meters measured noise pressure levels and logged hourly statistical noise data continually over the entire measurement period. Measurements were taken at six locations, four of which represent noise-sensitive residential receivers in the area and the other two characterize existing noise levels near and inside the Refinery. Table 4.10-1, below, lists the six noise monitoring locations and summarizes the range of average daytime, evening, and nighttime ambient noise levels measured at each of these locations. For the purpose of estimating average noise levels, the daytime period is from 7:00 a.m. to 7:00 p.m., the evening period is from 7:00 p.m. to 10:00 p.m., and the nighttime period is from 10:00 p.m. to 7:00 a.m. Noise monitoring location L-1 is at the Project site, L-2 is within the Refinery, but outside the Project site, and monitoring locations L-3, L-4, and L-5 at Lansing Circle, Columbia Circle, and Allen Way, respectively, are located within the Southampton neighborhood to the west of the Refinery. L-6, a utility pole in the buffer zone, is just north of residences in the Hillcrest neighborhood, south of the Refinery. These noise-monitoring locations are illustrated in Figure 4.10-2.

**TABLE 4.10-1
AVERAGE EXISTING L_{eq} IN THE PROJECT AREA FOR
DAYTIME, EVENING, AND NIGHTTIME PERIODS (dBA)**

Location		L-1	L-2	L-3	L-4	L-5	L-6
Description		Project Site	Pole near Repeater Tower	Lansing Circle	Columbia Circle	Allen Way	Utility Pole in Buffer
L_{eq}	Daytime	60	72	54	56	54	53
	Evening	59	72	55	53	51	51
	Nighttime	59	72	52	53	53	54

NOTE: Locations correspond to those illustrated in Figure 4.10-2.

SOURCE: Wilson, Ihrig & Associates, 2013.



Aerial Photo Source: © 2012 Google Earth Pro Ver 6.2.2.6613

LEGEND

PROPERTY BOUNDARY



SOURCE: ERM

Benicia Valero CBR . 202115.01

Figure 4.10-2
Noise Monitor Location and Sensitive Receptors

4.10.2.3 Regulatory Setting

Federal, State, and local agencies regulate different aspects of environmental noise. Federal and State agencies generally set noise standards for mobile sources such as aircraft and motor vehicles, while regulation of stationary sources is left to local agencies. Local regulation of noise involves implementation of general plan policies and noise ordinance standards. Local general plans tend to identify general principles intended to guide and influence development plans; local noise ordinances and codes establish standards and procedures for addressing specific noise sources and activities.

Federal

Federal regulations establish noise limits for medium and heavy trucks (i.e., more than 4.5 tons, gross vehicle weight rating) under the Code of Federal Regulations, Title 40, Part 205, Subpart B. The federal truck pass-by noise standard is 80 dBA at 15 meters (approximately 50 feet) from the vehicle pathway centerline. These standards are implemented through regulatory controls on truck manufacturers.

The Noise Control Act required the U.S. Environmental Protection Agency (USEPA) to establish noise control standards for trains and railway stations engaged in interstate commerce, and it authorized the Federal Railroad Administration (FRA) to enforce them. Federal laws and regulations addressing rail operations include:

- Surface Transportation Board environmental regulations at 49 Code of Federal Regulations (CFR) 1105.7;
- USEPA Railroad Noise Emission Standards (40 CFR 201);
- FRA Railroad Noise Emission Compliance Regulations (49 CFR 210); and
- FRA Final Rule on the Use of Locomotive Horns at Highway-Rail Grade Crossings (49 CFR Parts 222 and 229)

There are separate standards for locomotives, railway cars, and railway station activities such as car coupling. For locomotives built before 1980, the level of noise is limited to 73 dBA in stationary operation and at idle speeds, and is limited to 96 dBA at cruising speeds. The standards for locomotives built after 1979 are more stringent and limit noise in stationary operation and at idle speeds to 70 dBA and at cruising speeds to 90 dBA. Noise from railway cars must not exceed 88 dBA at speeds of 45 miles per hour (mph) or less and must not surpass 93 dBA at speeds greater than 45 mph. Noise from car coupling activities at railway stations is limited to 92 dBA (Bearden, 2000).

State of California

The State of California establishes noise limits for vehicles licensed to operate on public roads. For heavy trucks, the State pass-by standard is consistent with the federal limit of 80 dBA. The State pass-by standard for light trucks and passenger cars (i.e., less than 4.5 tons, gross vehicle rating) is also 80 dBA at 15 meters from the vehicle pathway centerline. These standards are

implemented through controls on vehicle manufacturers and by legal sanction of vehicle operators by State and local law enforcement officials.

City of Benicia

The Community Health and Safety Element of the *City of Benicia General Plan* regulates noise in the city limits with noise performance standards, which are directly applicable to the Project. These performance standards are used for determining the compatibility of proposed noise sensitive land uses with stationary noise sources. The standards also apply to new projects that include stationary noise sources, which may affect an existing noise sensitive development. The intent of these performance standards is both to prevent new noise sources from encroaching on existing noise sensitive developments and to prevent new noise sensitive development from encroaching on existing uses. The noise limits set by these performance standards are shown in Table 4.10-2. Noise sources evaluated relative to these performance standards should be considered with respect to their standard daily or weekly operating conditions. Noise sources may produce unusual noise levels due to temporary equipment malfunction, or unusual atmospheric conditions. Noise levels associated with these infrequent conditions are exempt from the performance standards contained in Table 4.10-2. In addition, the performance standards are not applicable to safety signals or warning devices.

**TABLE 4.10-2
NOISE LEVEL PERFORMANCE STANDARDS FOR NOISE-SENSITIVE LAND USES**

Noise Level Performance Standards, dBA Land Use	Exterior Hourly L_{eq}		Interior Hourly L_{eq}	
	Daytime 7 a.m. to 10 p.m.	Nighttime 10 p.m. to 7 a.m.	Daytime 7 a.m. to 10 p.m.	Nighttime 10 p.m. to 7 a.m.
Residential	55	50	40	35
Transient Lodging	55	50	40	35
Hospitals	--	--	40	35
Nursing Homes	55	50	40	35
Theaters, Auditoriums	--	--	35	35
Churches	55	50	40	40
Schools	55	50	45	45
Libraries	55	50	45	45

NOTES:

- Stationary noise sources include industrial operations, outdoor recreation facilities, HVAC units, loading docks, etc.
- The above standards may be adjusted upwards to allow for an increase in the existing ambient hourly L_{eq} caused by a project. An increase of less than 3 dB is permitted, even if the standards in Table 4.10-2 are exceeded; an increase of 3 dB or greater constitutes a significant environmental impact, unless the increase does not cause the standards in Table 4.10-2 to be exceeded.
- The noise level standards contained above shall be applied to a typical hour of operation. When a peak hour of operation is expected to occur consistently during daily or weekly operations, the standards shall also be applied to those operations.
- Each of the noise standards specified above shall be lowered by 5 dB for tonal noises (humming, high pitched tones, speech music, or recurring impulsive noises). This lowering of the standard does not apply to residential units established in conjunction with industrial or commercial caretaker dwellings.
- The City may choose to apply the noise level performance standards at designated outdoor activity areas, in lieu of the property line.
- The above standards do not apply to safety signals or warning devices.
- For noise sources that occur on an infrequent basis and are considered to be safety equipment (such as flaring or pressure relief valves), a maximum noise level of 75 dB is acceptable, as measured from the receiver's property line. Noise levels that are projected to exceed this maximum are considered a significant environmental impact.
- Where outdoor activity areas do not exist and/or are not expected to be affected, the City may choose to only apply the interior noise level criteria.

SOURCE: City of Benicia, 1999.

Title 8, Chapter 8.20 of the Benicia Municipal Code contains noise regulations that apply to the Project. Section 8.20.140 addresses noise from the operation of machinery, equipment, fans, and air conditioning units. This section limits noise increases from such mechanical devices to a maximum of 5 dBA over ambient base noise levels at the property line of any property generating the noise. Section 8.20.150 prohibits construction activities within any residential zone, or within a radius of 500 feet from a residential zone between the nighttime hours of 10:00 p.m. of any one day and 7:00 a.m. of the following day in such a manner that a reasonable person of normal sensitivity residing in the area would feel discomfort or annoyance unless a permit has been obtained from the City Manager or his/her designee (City of Benicia, 2013). This Municipal Code section would not apply to the Project as construction activities would take place more than 2,000 feet from the nearest residential zones. Therefore, there are no standards established in the local general plan or noise ordinance that would be applicable to construction noise that would be associated with the Project.

4.10.2.4 Project Baseline

Baseline conditions for this noise analysis reflect pre-Project conditions at the existing Refinery in February 2013, when ambient noise levels represented by the long-term noise measurements were collected. The baseline conditions include residences that would be as close as 2,100 feet to the north of the new unloading tracks on the Project site.

4.10.3 Significance Criteria

Based on California Environmental Quality Act (CEQA) Guidelines Appendix G, a project would cause adverse noise impacts if it would result in:

- a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- b) Exposure of persons to or generation of, excessive ground borne vibration or ground borne noise levels;
- c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;
- d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;
- e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels; or
- f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels.

4.10.3.1 Approach to Analysis

The significance of Project-related noise impacts were determined based on the following specific significance thresholds.

Short-Term Construction Noise Impacts

Short-term maximum construction-related noise levels have been estimated for the Project based on the types of equipment that would be required to construct the Project. It is assumed that Project-related construction activities would occur at all hours. Although the City's noise level performance standards are technically not applicable to short-term construction activities, for a conservative analysis, Project-related construction noise levels that would exceed the City's outdoor nighttime noise level performance standard of 50 dBA at the closest residences would be considered substantial, and would result in a significant impact (see Table 4.10-2). If nighttime noise levels already exceed the City performance standard, an increase of 3 dBA or more at a sensitive receptor location would be considered significant.

Long-Term Operational Noise Impacts

A noise assessment was conducted for Valero by Wilson, Ihrig & Associates to evaluate noise level increases at noise sensitive uses in the vicinity of the Refinery due to the train trips and operations of pumps that would be associated with the Project (Wilson, Ihrig & Associates, 2013). This assessment was reviewed by the City's environmental consultant, Environmental Science Associates (ESA), and was found to be technically accurate with the exception of the distance used to estimate unloading rack pump and train trip noise levels at the closest residences along Lansing Circle. The noise assessment utilized preliminary Project siting information. The noise assessment estimated a distance of 2,700 feet to the closest residence. Utilizing Google Maps and a review of aerial photos with respect to the proposed site plan (see Figure 3-3) ESA estimates that the closest residence on Lansing Circle would be approximately 2,100 feet from the closest portion of the proposed unloading tracks and approximately 2,250 feet from the closest portion of the proposed unloading racks. Therefore, using the same methods as the noise assessment, ESA made adjustments to the pump and train trip noise values to reflect the actual distances from the closest Project component locations to the residences on Lansing Circle. In addition, to address concerns expressed by one commenter during the Initial Study comment period, ESA conducted an additional analysis to assess worst case Project-related horn noise impacts at the nearest residences to the Park Road railroad crossing.

To assess changes in the ambient noise environment due to the Project, the following significance criteria take into account both the absolute change in noise levels due to the Project and the relationship between the resultant noise level and the City's noise level performance standards. Operational noise generated by the Project would cause a significant impact if it would cause ambient noise levels that already exceed the City's noise performance standards summarized in Table 4.10-2 to increase by 3 dBA or more at a sensitive receptor location; or if it would generate an increase in ambient noise 5 dBA or greater at a sensitive receptor location where the resulting noise level would remain below the City's performance standards.

Vibration Impacts

Maximum construction-related vibration levels have been estimated for the Project based on the types of equipment that would be required to construct the Project. A numerical threshold to identify the point at which a vibration impact occurs has not been identified by City standards or codes. Thus, the Project would be considered to result in a significant construction vibration impact if buildings or sensitive individuals would be exposed vibration levels equivalent to or higher than the California Department of Transportation (Caltrans) PPV vibration threshold level of 0.2 inches per second (in/sec) (Caltrans, 2004). This PPV level has been found to be annoying to people in buildings and can pose a risk of architectural damage to buildings.

For operational train-related vibration, a qualitative analysis was conducted using the Federal Transit Authority (FTA) screening assessment for residential locations. The vibration screening assessment indicates that residences within 200 feet of a conventional commuter railroad or a rapid transit railroad could experience adverse vibration impacts (FTA, 2006). For the Project, locomotive and railcar speeds in the Project area would be substantially less than those that would be associated with conventional commuter and rapid transit trains; therefore, although crude tank cars may be heavier than transit railcars, this screening distance is appropriate to assess the significance of potential tank car vibration impacts.

4.10.4 Discussion of No Noise Impacts

Review and comparison of the setting circumstances and Project characteristics with the significance criteria stated above, clearly show that no impact would result related to criterion a), associated with construction noise, and related to the criteria e) and f) for both construction and operations, including operation of the new equipment at the Refinery and the incremental increase in train noise from four additional train trips. The following discusses the reasoning to support this conclusion:

- a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.**

Construction

The City of Benicia General Plan does not contain standards or policies that are applicable to construction noise. However, as discussed above, Section 8.20.150 of the Benicia Municipal Code prohibits construction activities within any residential zone, or within a radius of 500 feet from a residential zone between the nighttime hours of 10:00 p.m. of any one day and 7:00 a.m. of the following day (City of Benicia, 2013). This Municipal Code section would not apply to the Project because construction activities would take place more than 2,000 feet from the nearest residential zones. As a result, there are no standards established by the City of Benicia related to construction noise that would be applicable to construction of the Project; and therefore, construction activities would result in no impact associated with exceeding local general plan or municipal code standards.

- e) **For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels.**

The Project is not located within 2 miles of a public airport. Therefore, there would be no impact associated with this criterion.

- f) **For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels.**

The Project is not located within the vicinity of a private airstrip. Therefore, there would be no impact associated with this criterion.

4.10.5 Discussion of Impacts and Mitigation Measures

- a) **Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.**

Impact 4.10-1: Operation and maintenance of the Project could result in exposure of persons to noise levels in excess of standards established by the City of Benicia. (*Less than Significant*)

The Project would result in four additional daily train trips along the Union Pacific main line from Roseville to the Refinery. The incremental increase in train noise caused by four additional trains is an indirect impact of the Project. Train noise could potentially impact sensitive receptors along the route from Roseville to the Refinery. The analysis of indirect noise impacts from trains herein considers impacts in the City of Benicia in detail. Indirect impacts outside the City are considered in general terms.

The noise performance standards established by the *City of Benicia General Plan* listed in Table 4.10-2 are directly applicable to operation of the Project. Noise associated with operation of the Project would primarily be related to movement of tank cars and operation of the unloading rack pumps. Based on the noise assessment conducted for the Project and adjustments made by ESA to account for the corrected distances of the proposed unloading tracks and racks to the nearest residence (i.e., 2,100 feet and 2,250 feet, respectively), the unloading rack pumps and the tank car movements would generate worst-case maximum noise levels of up to 23 dBA and 60 dBA, respectively, at the nearest residence at Lansing Circle. These noise levels equate to hourly average L_{eq} levels of 3 dBA for unloading rack pump noise and 33 dBA for train movement noise (Wilson, Ihrig & Associates, 2013; and ESA, 2014), which would not exceed the City's nighttime hourly L_{eq} limit of 50 dBA.

An additional source of Project-related noise would be locomotive horn noise associated with trains that would approach the Park Road railroad crossing. Assuming a reference horn noise level of 110 dBA at 100 feet (USGPO, 2014), the maximum instantaneous horn noise that would be associated with trains approaching Park Road at the nearest residences approximately

3,400 feet to the southwest would be approximately 62 dBA. Given that train horns would only sound for up to 25 seconds as the locomotive would approach the road crossing (FRA, 2014), the hourly L_{eq} would be approximately 40 dBA, and would not exceed the City's nighttime hourly L_{eq} limit of 50 dBA.

The existing average hourly L_{eq} noise levels for day, evening, and nighttime hours at the nearest residences to the Project site range between 51 dBA and 56 dBA. Therefore, although tank car movements at the Refinery and train horn soundings would be audible at the nearest residence locations, the associated noise levels would not exceed City standards and would be less than ambient hourly average noise levels measured in the Project area (see Table 4.10-1). The associated impact would be less than significant. It should be noted that east of Park Road the mainline railroad tracks within the City of Benicia are in an industrial area with no noise-sensitive receptors in the vicinity. Therefore, Project-related train noise outside of the Refinery along the mainline railroad tracks within the City of Benicia would result in less than significant impacts.

The project-generated four additional daily train trips along the Union Pacific main line would also have indirect noise impacts in other communities outside of Benicia. These communities would include Fairfield, Dixon, Davis, West Sacramento, and Sacramento. Receptors within the City of Fairfield are as close as 50 feet from the rail line. These additional rail trips would represent an increase of less than 10% of existing rail operations and would therefore be less than a doubling of sound energy associated with a 3 dBA increase in noise levels. Consequently, cumulative rail noise increases at other communities would also be less than significant.

b) Exposure of persons to or generation of, excessive ground borne vibration or ground borne noise levels.

Impact 4.10-2: The Project would result in the generation of ground borne vibration. (*Less than Significant*)

Construction

Some types of construction equipment can produce vibration levels that can cause architectural damage to structures and be annoying to nearby sensitive receptors. Vibration levels generated during construction of the Project would vary during the construction period, depending upon the construction activity and the types of construction equipment used. Typical PPV vibration levels at various distances for the construction equipment type that would generally result in the highest vibration levels (i.e., large bulldozers) are presented in Table 4.10-3.

Given that the nearest residences to any Project-related construction equipment would be at distances of over 2,000 feet, construction equipment PPV levels would be substantially less than the 0.20 in/sec significance threshold. Therefore, short-term construction-related vibration impacts would be less than significant.

**TABLE 4.10-3
VIBRATION SOURCE LEVELS FROM CONSTRUCTION EQUIPMENT**

Distance (feet)	Peak Particle Velocity (in/sec)
	Large Bulldozer
15	0.191
25	0.089
50	0.031
75	0.017
100	0.011
150	0.006

SOURCE: FTA, 2006.

Operations and Maintenance

Operation and maintenance of the Project would increase the daily number of trains accessing the Project site, which would produce groundborne vibration in the immediate area of the railroad. However, given that the nearest residences to any portion of the proposed new unloading track would be at distances that would easily exceed the FTA's railroad vibration screening distance of 200 feet for residences (FTA, 2006), vibration impacts from the proposed new unloading rails would be less than significant. The proposed addition of two trains per day along the mainline tracks would increase the frequency of trains, but would not increase the peak vibration levels along the railroad because freight trains already pass along the mainline track. Therefore, impacts from vibration on the mainline track would be less than significant.

c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.

Impact 4.10-3: Operation of the Project could result in exposure of persons to a permanent increase in ambient noise levels. (*Less than Significant*)

As described above in Impact 4.10-1, although tank car movements and train horn soundings would be audible at the nearest residences, the associated noise levels would be less than the ambient hourly average noise levels measured in the Project area during both daytime and nighttime hours (Wilson, Ihrig & Associates, 2013). Therefore, the Project would not result in a substantial permanent increase in ambient noise levels above levels existing without the Project. The associated impact would be less than significant.

d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

Impact 4.10-4: Construction of the Project would not result in a substantial temporary or periodic increase in ambient noise levels. (*Less than Significant*)

Project-related construction activities would result in temporary increases in noise levels in the Project area. Construction of the Project would begin in 2014 and last approximately 25 weeks. It would include installation of a new tank car unloading rack within the Refinery, modifications to the existing Refinery rail infrastructure, and construction of a new aboveground pipeline within the Refinery. It is estimated that construction of these Project components would require the use of the types of construction equipment presented in Table 4.10-4. As indicated in the table, the maximum average noise levels of the individual pieces of construction equipment would be as high as 88 dBA at 50 feet (FTA, 2006). Assuming that two of the loudest pieces of construction equipment would operate at the same location simultaneously, the combined maximum construction noise level would be up to 91 dBA at 50 feet.

**TABLE 4.10-4
TYPICAL MAXIMUM NOISE LEVELS FROM CONSTRUCTION EQUIPMENT**

Construction Equipment	Noise Level (dBA, L_{eq} at 50 feet)
Backhoe	80
Flatbed Truck	88
Air Compressor	81
Dozer	85
Air Compressor	85
Grader	85
Front End Loader	85
Water Trucks	88
Cranes	83
Concrete Trucks	88

SOURCE: FTA, 2006.

As discussed above, the closest sensitive receptors to the Project would be residences off Lansing Circle, approximately 2,100 feet northwest of the northern extent of the new unloading tracks on the Project site. At this distance, it is estimated that the combined maximum construction noise level would be attenuated to approximately 45 dBA (ESA, 2014), which would not exceed the City's nighttime hourly L_{eq} limit of 50 dBA, and would be less than the hourly average nighttime ambient noise levels measured in the Project area (see Table 4.10-1). As a result, this impact would be less than significant.

4.11 Transportation and Traffic

4.11.1 Introduction

This Section considers whether any traffic delays caused by the Project, as compared to existing conditions, would amount to a significant impact. Under existing conditions, freight trains cross Park Road each day. Each train crossing impedes the flow of traffic across Park Road to some degree. In addition, long train crossings create extended vehicle queues that can impede traffic at the five nearby study intersections, the I-680 freeway Bayshore Road off-ramp, and the I-680 freeway itself. Train crossings can also impede emergency vehicles such as ambulances, fire trucks, and police cars. Lastly, the Project could have indirect effects on other at-grade crossings along the rail line between the Refinery and Roseville.

The Project would add four train crossings per day -- two “loaded” trains inbound to the Refinery and two “empty” trains outbound from the Refinery. Each crossing would last approximately eight minutes. The crossings will be scheduled to avoid the hours of 6:00 AM to 9:00 AM and 4:00 PM to 6:00 PM. Thus, up to four times per day, the Project could increase the time that it takes drivers to cross Park Road, pass through one of the 5 study intersections, and/or travel on the I-680 freeway and its off-ramp near the Bayshore Road exit. The train crossings could also potentially delay emergency vehicles such as ambulances, fire trucks, and police cars.

While the Project would add approximately 20 new permanent employees (four crews of five employees), spread among different work shifts and on different days, these new employees would add very few vehicle trips during peak traffic hours. Truck traffic associated with the Refinery operations would not change as a result of the Project. Thus, the analysis herein focuses on the impacts of train crossings rather than the small amount of new vehicle trips.

The analysis considers the existing conditions, existing-plus-project conditions, and cumulative conditions (without and with the project) in 2035. The analysis is based on 2013 traffic counts, and a projected growth rate of 1.5 percent per year. This growth rate is similar to that used in the *Benicia Business Park EIR* to derive cumulative 2035 traffic volumes.

The analysis is based on the Transportation Impact Analysis Report prepared by Fehr and Peers in October 2013 (“Traffic Study”), and additional analysis by City staff, the EIR consultant, and Fehr and Peers. The analysis applies the relevant policies and objectives of the *City of Benicia General Plan* Circulation Element and the Congestion Management Program (CMP) of the Solano Transportation Authority (STA).

4.11.2 Setting

4.11.2.1 Current Conditions

Existing Roadway Network

Regional access to the Project site is provided primarily from Interstate 680 (I-680), while local access is provided via Park Road, Bayshore Road, and Industrial Way.

Interstate 680

I-680 is a four-lane, north-south freeway in the Project vicinity. From the Benicia-Martinez Bridge, I-680 extends north to Interstate 80 (I-80) in Cordelia. Limited access interchanges are located at Bayshore Road (northbound off-ramp and southbound on-ramp only) and Industrial Way (northbound on-ramp and southbound off-ramp only).

Bayshore Road

Bayshore Road is a two-lane road that connects the Refinery to the industrial port area along the southeastern edge of the City of Benicia, following the Suisun Bay shoreline; a partial interchange with I-680 provides access to and from the south.

Park Road

Park Road is a two-lane road that connects the industrial port area along the southeastern edge of the City of Benicia to the industrial areas to the northeast. Park Road serves as the connection between the split interchange ramps at Industrial Way (southbound off-ramp and northbound on-ramp) and Bayshore Road (southbound on-ramp and northbound off-ramp). It intersects the existing Union Pacific Railroad (UPRR) track at an at-grade railroad crossing located just east of Bayshore Road.

Industrial Way

Industrial Way is a two-lane road that loops through the industrial area where the Refinery is situated, providing access to numerous industrial parcels either directly or via connections with local streets; a partial interchange with I-680 provides access to and from the north.

Existing Alternative Transportation

Pedestrian and Bicycle Facilities

The study area lacks substantial pedestrian facilities (sidewalks are not provided along any of the roads), which is typical of industrial areas.¹ No designated bicycle facilities are currently provided within the study area, although the *City of Benicia General Plan* includes a planned Class III bike route along Park Road southwest of Industrial Way.²

Public Transit

Fairfield and Suisun Transit (FAST) operates an express intercity route—Route 40—that connects the City of Vacaville to the Bay Area Rapid Transit (BART) station in the City of Walnut Creek. Route 40 has one stop in each direction at the intersection of Park Road and Industrial Way. From here, the northbound route continues via I-680 to the City of Fairfield, and the southbound route continues via I-680 to the Pleasant Hill BART Station; both utilize the I-680 interchanges at Industrial Way and Bayshore Road. The City of Benicia proposes to build the Benicia Industrial Park Bus Hub at the intersection of Park Road and Industrial Way (City of Benicia, 2013). The facility would accommodate up to 50 parking spaces and other transit-related

¹ Although new sidewalks would not extend to Bayshore Road, the City of Benicia has plans to install sidewalks on Park Road adjacent to a Bus Hub facility proposed at the Park Road / Industrial Way intersection.

² Class III bike routes are signed routes where bicycle share the roadways with vehicular traffic; no separate right-of-way is provided for bicyclists.

amenities (e.g., bicycle storage area, and space for “kiss and ride”); the existing on-street bus stops for Route 40 would be improved with designated bus pull-out areas, new sidewalks and covered benches.

4.11.2.2 Regulatory Setting

Solano County

The Solano Transportation Authority (STA) operates as the Congestion Management Agency (CMA) for Solano County. One of the CMA’s responsibilities is to analyze the impacts of local land use decisions on the regional transportation system (the Congestion Management Program [CMP] system). The Solano County CMA comments on environmental impact reports prepared for proposed land use development projects, and requires that analysis of CMP system facilities be performed with the STA travel demand model. If a proposed project is projected to cause a segment of the CMP system to deteriorate below the adopted LOS standard, a deficiency plan must be prepared to provide mitigation for that impact. The CMA’s adopted LOS standard is LOS E for roadways and freeways in the CMP system.

There are no CMP local roads (i.e., non-freeways) in the immediate vicinity of the Project site; the only CMP local roads are Military East and Military West, which are southwest of I-780.

City of Benicia

The *City of Benicia General Plan* contains goals, policies, and programs intended to facilitate the movement of people and goods throughout the city. The following General Plan goals and are relevant to the Project.

Goal 2.20: Provide a balanced street system to serve automobiles, pedestrians, bicycles, and transit, balancing vehicle-flow improvements with multi-modal considerations.

Policy 2.20.1: Maintain at least Level of Service D on all city roads, street segments, and intersections.

Goal 2.24: Continue to provide safe and direct access to the Industrial Park.

Policy 2.24.1: Continue to ensure public access to private roads in the industrial and Port areas.

4.11.2.3 Project Baseline

For purposes of analyzing the Project’s impacts on traffic congestion, this analysis uses a baseline of August 13, 2013, the day that the City issued the Notice of Preparation. The baseline conditions presumed to exist as of that date are described in detail in Section 2.0 of the Traffic Study. Under existing conditions, sporadic rail crossings degrade the level of service from A to D or F at the five study intersections.

4.11.3 Significance Criteria

California Environmental Quality Act (CEQA) Guidelines Appendix G, states that a project would have a significant impact on transportation conditions if it would:

- 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;
- c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks;
- d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment);
- e) Result in inadequate emergency access; or
- f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities.

4.11.3.1 Approach to Analysis

Most traffic analyses prepared by the City involve projects that add new vehicle trips to the existing roadway system. The Project here, however, involves a different scenario: the Project would add new freight train crossings rather than any significant new vehicle trips to the system. The train crossing scenario here is different from the standard scenario in two key respects.

First, in the standard scenario, the peak traffic volumes occur regularly, once or perhaps twice a day, at the same time or times of day – usually in the morning and/or late afternoon/early evening when commuters travel to and from work. In contrast, freight train crossings at Park Road are sporadic. The same freight trains do not cross Park Road every day. In fact, during seven days of videotaping in April 2013, the total number of daily train crossings varied widely, from four to 18 each day. In addition, trains do not cross at the same time of day. The videotaped crossings occurred at various times between 9:30 AM and 7:15 PM, but did not reveal any pattern, other than there were no crossings observed during the AM peak traffic period. The duration of each crossing varied widely, from 40 seconds to 16 minutes, 17 seconds.

Second, unlike the standard scenario, the Project is in an industrial area. Any driver that crosses Park Road or travels through one of the study intersections is traveling to or from some industrial use – either the Refinery or some other business in the adjacent Benicia Industrial Park. These industrial uses rely on the railroad to transport both raw materials and finished products to and from their facilities. Thus, unlike commuters traveling to and from work in commercial and residential areas, drivers that travel in the industrial area have an expectation that train crossings

will, occasionally, result in delays that can be, in some cases, somewhat lengthy. This analysis takes into account the industrial character of the area because, under CEQA, the significance of an impact varies with the setting. An impact that might be significant in one setting may not be considered significant in another setting.

Because of the differences between the standard scenario and the situation here, the approach used herein is, necessarily, a modified form of the standard approach. Pursuant to General Plan Policy 2.20.1, the analysis assumes that a Project impact on traffic would be significant if it would cause an intersection to degrade below LOS D. As in the standard approach, the analysis compares the peak traffic volume under baseline conditions with the peak traffic volume under baseline-plus-project conditions. Unlike the standard approach, however, neither the baseline peak nor the baseline-plus-project peak occurs at a particular time of day. Rather, the analysis compares the longest train crossing under baseline conditions with the longest train crossing under baseline-plus-project conditions. Other things being equal, the longest train crossing creates the longest queues and therefore the longest delays at nearby intersections and on the freeway off-ramp (and possibly on the freeway mainline). Therefore, the “peak” is not a time of day, but rather the longest train that crosses, regardless of the time of day.

If the Project were approved, Valero would ask Union Pacific to schedule Valero’s unit trains so that none of them cross Park Road during the weekday commute hours of 6:00 AM to 9:00 AM and 4:00 PM to 6:00 PM. Thus, the analysis focuses on baseline conditions and baseline-plus-project conditions outside of those time periods. The analysis uses conditions measured and projected during the 2:45 to 3:45 PM hour, (as representative of conditions from 9:00 AM to 4:00 PM and 6:00 to 7:00 PM) and the 9:00 to 10:00 PM hour (as representative of conditions from 7:00 PM to 6:00 AM).

In light of the forgoing, this analysis assumes that the Project would have a significant impact if the Project’s additional train crossings during the designated study hours would:

- Cause any intersection’s operations to degrade from LOS D or better to LOS E or F;
- Substantially increase delays at an intersection that currently operates at LOS E or F; or
- Increase the average vehicle delay by one second or more at a train crossing that currently operates at LOS F (or by two seconds or more at a train crossing that currently operates at LOS E).

4.11.4 Discussion of No Transportation and Traffic Impacts

c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks.

The Project would not involve aircraft, would not be near an airport, nor would the Project construct anything that would intrude into aircraft flight paths or air traffic spaces. Therefore, the Project would have no impact on air traffic patterns.

4.11.5 Discussion of Impacts and Mitigation Measures

- 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.**

Impact 4.11-1: The Project would not cause intersection operations to degrade to worse than LOS D, would not cause a substantial increase in traffic volumes at intersections already operating at LOS F with the Project, would not cause a substantial increase in average vehicle delay at train crossings, and would not cause an increase in the queue length caused by trains crossing Park Road that substantially impedes other traffic (such as traffic on the I-680 mainline, or at an adjacent upstream intersection wherein traffic not destined over the Park Road crossing is unable to continue along the travel way). (*Less than Significant*)

Existing Train Crossings

The City of Benicia serves as the terminus for what is commonly referred to as the Overland Route for UPRR. The Refinery is served by a spur off the Overland Route mainline that runs between the industrial port area along the southeastern edge of the City of Benicia and the Refinery itself, terminating north of Park Road. This spur features an at-grade crossing at Park Road, east of Bayshore Road. The spur also serves the industrial areas northeast of the Refinery. Switching activity between tracks typically occurs just south of the Park Road at-grade railroad crossing. The Park Road crossing is controlled by two gates and mast-mounted flashing lights.

Train crossing counts (using video cameras placed adjacent to the at-grade crossings) were collected at the Park Road at-grade crossing in addition to the at-grade crossing at the Iron Workers Union Driveway 700 feet southeast of Park Road, for the week of Monday, April 15 through Sunday, April 21, 2013 (see results of the counts Table 4.11-1). The reason for there being a higher number of train crossings at Park Road than at the Iron Workers Union driveway is because the majority of switching activity between tracks serving the Refinery and tracks serving other industrial areas northeast of the Refinery occur on the segment just south of Park Road and north of the Iron Workers Union Driveway. It is common for UPRR trains to access the Refinery, then exit the Refinery, cross Park Road, perform the track switching, and cross Park Road again to access the other industrial areas northeast of the Refinery, and vice versa.

The back and forth seen with current daytime switching operations is required for UPRR to “cut” the train into the various segments needed within the Refinery and then over on the Industrial Way siding. UPRR pulls out onto Park Road to get the tail end of the train ahead of the switch needed to redirect the train to the Industrial way siding.³

³ Such a switching operation would not occur for Project trains because the first half of 50 railcars would be led by a locomotive, and the last half would be pushed by one (called “buried power”). The train would be “cut” in the middle all within the Refinery as the two 25-car segments are aligned at the rack. No back and forth across Park Road would be required for this operation.

**TABLE 4.11-1
EXISTING AT-GRADE RAIL OPERATIONS**

Attribute	Park Road At-Grade Crossing	Iron Workers Union Driveway At-Grade Crossing
Range of Crossings Per Day	4 - 18	4 - 6
Weekdays		
Average Crossings Per Day	10	5
Average Crossing Duration	02:50	03:15
Average Number of Railcars Per Day	95	69
Average Number of Railcars Per Crossing	10	15
Range of Number of Railcars Per Crossing	2 - 35	2 - 43
Maximum Observed Crossing Duration	16:17	24:50
Percent of Crossings With Duration Under 5 Minutes	86%	87%
Weekends		
Average Crossings Per Day	7	5
Average Crossing Duration	01:42	00:18
Average Number of Railcars Per Day	45	40
Average Number of Railcars Per Crossing	7	8
Range of Number of Railcars Per Crossing	2 - 18	2 - 18
Maximum Observed Crossing Duration	05:56	03:21
Percent of Crossings With Duration Under 5 Minutes	92%	100%

SOURCE: Fehr & Peers, 2013.

The week-long videotaped train crossings at both at-grade intersections occurred at various times between 9:00 AM and 7:30 PM on weekdays, and between 12:00 Noon and 6:30 PM on weekends, not revealing any pattern, other than there were no crossings observed during the AM peak traffic period. An average of 10 train crossings totaling 95 railcars during the weekdays were observed on Park Road, with the average crossing duration estimated at 2 minutes and 50 seconds. About 86 percent of all crossings on Park Road had a duration of less than 5 minutes. The majority of train crossings on Park Road had a duration of typically less than 2 minutes, though a maximum crossing duration was observed at 16 minutes and 17 seconds on Wednesday, April 17, 2013 around 2:00 PM, and the shortest crossing duration was observed at 40 seconds on Friday, April 19, 2013 around 10:45 AM.

Similarly, the majority of train crossings on the Iron Workers Union Driveway had a duration of less than 2 minutes, though a maximum crossing duration was observed at 24 minutes and 50 seconds on Wednesday, April 17, 2013 around 2:00 PM, and a shortest crossing duration of less than 15 seconds multiple times. The average number of train crossings and duration of each crossing is generally lower on weekends compared to weekdays.

Existing Intersection Level of Service Operations

The highest traffic volumes at area intersections generally occur during the weekday AM peak hour (7:15 to 8:15 AM) and the PM peak hour (4:15 to 5:15 PM). The evaluation of intersection level of service conditions without and with existing train crossings at Park Road focused on weekday off-peak hours at the intersections of Park Road / Bayshore Road and Bayshore Road / I-680 Northbound Off-Ramp, specifically the 2:45 PM to 3:45 PM hour (representative of conditions from 9:00 AM to 4:00 PM and 6:00 PM to 7:00 PM) and the 9:00 PM to 10:00 PM hour (representative of conditions from 7:00 PM to 6:00 AM). Detailed LOS calculations were completed only for the 2:45 PM to 3:45 PM hour, however, because hourly volumes between 9:00 PM and 10:00 PM are about 90 percent lower than the AM peak hour (i.e., too low to require detailed evaluation in order to draw conclusions about acceptable operating LOS).

As shown in Table 4.11-2, the study intersections currently operate at acceptable service levels (LOS A) during off-peak hours when no train crossing occurs at Park Road. However, if a train crossing with a duration of about 12 minutes occurs, then the intersection service levels degrade to LOS F, and vehicle queues extend upstream on Park Road to Industrial Way, and on Park Road – Bayshore Road to (and onto) the I-680 Northbound Off-Ramp (but do not extend onto the I-680 mainline). If a train crossing occurs during the AM or PM peak traffic hours, then drivers experience LOS F conditions as well. Nighttime traffic volumes are low enough to avoid unacceptable LOS conditions if a train crossing occurs.

**TABLE 4.11-2
EXISTING OFF-PEAK HOUR INTERSECTION LEVEL OF SERVICE (LOS)**

Intersection	Traffic Control	Without Train Crossing		With Train Crossing	
		Delay	LOS ^a	Delay	LOS ^a
Park Road / Bayshore Road	All-Way stop	6 sec.	A	236 sec.	F
Bayshore Road / I-680 Northbound Off-Ramp	Side-Street stop	10 sec.	A	212 sec.	F

^a Level of service at all-way stop-controlled intersections represent overall intersection conditions; level of service at side-street stop-control intersections represent the turning movement with the worst condition.

SOURCE: Fehr and Peers, 2013.

Existing-Plus-Project Conditions

If the Project were approved and became operational, four additional trains would cross Park Road each day. As explained in Section 3.4.3.1, the trains would be scheduled so that none of them cross Park Road during the commute hours of 6:00 AM to 9:00 AM and 4:00 PM to 6:00 PM. Each train would carry 50 railcars, and each railcar would be about 60 feet long. Each locomotive would be about 60-70 feet long with the typical length of all the locomotives about 200 feet long. The trains would cross Park Road at an average speed of 5 mph. A minimum headway (interval) of 12 hours would occur between Project train deliveries. All switching activity between tracks would occur within the Refinery site north of Park Road.

A train with 200 feet of locomotives and 50 railcars in length would take about 7.3 minutes to cross Park Road at a speed of 5 mph. The at-grade crossing traffic controls provide a 30-second buffer time before and after each train crossing on Park Road. Therefore, each 50-railcar train delivery would block traffic on Park Road for approximately 8.3 minutes. The estimated blockage time on Park Road due to the Project is less than some other existing observed train crossings. The April 2013 maximum observed train crossing duration was 16 minutes and 17 seconds, which is nearly double the blockage time of the train crossings due to the Project.

The off-peak hours of 2:45 – 3:45 PM and 9:00 – 10:00 PM were evaluated assuming a 50-railcar train crossing at Park Road. During the hour of 2:45 – 3:45 PM (representing 9:00 AM – 4:00 PM and 6:00 PM - 7:00 PM), a Project-related train would generate queues on the west side of the tracks that could extend back onto Bayshore Road and affect the operations of the I-680 ramp-terminal intersections, but would not extend back onto the I-680 mainline. Queues on the east side of the tracks would be contained within the Park Road segment between the tracks and Industrial Way, affecting access to and from Refinery driveways and the U-Store-It driveway. The segment of Park Road between the at-grade railroad crossing and Industrial Way provides a two-way left-turn lane (TWLTL), and because the great majority of westbound traffic approaching Bayshore Road on Park Road turns left, those drivers would be expected to use the TWLTL as a queue storage lane, and other westbound drivers would use the through lane as a means to turn right into the Refinery (or as a queue storage lane if they intend to go straight on Park Road or to turn right onto Bayshore Road).

Traffic volumes from 9:00 PM – 10:00 PM hour (representing 7:00 PM to 6:00 AM), are much lower within the study area compared to the peak traffic periods. A Project-related train crossing would not create any queues longer than four vehicles. These queues would be contained within the provided intersection storage capacity at Park Road / Bayshore Road.

The change in average vehicle delay at the Park Road crossing associated with the 8.3-minute duration when the Project's trains would block traffic at that crossing was evaluated by dividing the total vehicle delay caused by the project trains passing over Park Road by the number of vehicles on Park Road passing over the crossing in an hour. The 8.3-minute train crossing (i.e., 500 seconds) divided by the approximate 640 vehicles on Park Road during the AM peak hour equates to an average vehicle delay of about 0.8 second per vehicle.

Cumulative Conditions

A 1.5 percent per year growth rate was applied to existing traffic volumes, which is similar to the 1.6 percent per year rate used in the *Benicia Business Park EIR* for the period between 2006 and 2030. It is noted that according to 2006 and 2013 count data collected at the intersection of Park Road / Bayshore Road, traffic volumes have not increased during the seven-year period, potentially due to the recent economic downturn.

Under cumulative volume conditions, vehicle queues associated with the 50-railcar crossing again would extend back onto the northbound I-680 off-ramp, but not onto the I-680 mainline. Queues also would extend back to the Park Road / Refinery Driveway, but would not reach Industrial Way. Traffic volumes in the evenings and late nights are much lower within the study area compared to the

peak traffic periods. During the 9:00 – 10:00 PM hour, the resulting queues during a train crossing would be no longer than five vehicles. Although the proposed 50-railcar train crossing would block Park Road for over 8 minutes, the resulting queues would be contained within the provided intersection storage capacity at Park Road / Bayshore Road during the 9:00 – 10:00 PM hour.

Project train crossings occurring during the 9:00 AM – 7:00 PM period would generate queues on the west side of the tracks that would extend back onto Bayshore Road and affect the operations of the I-680 ramp-terminal intersections, but would not extend back onto the I-680 mainline. Queues on the east side of the tracks would be contained within the Park Road segment between the tracks and Industrial Way, affecting access to and from Refinery driveways and the U-Store-It driveway. As described above, the segment of Park Road between the at-grade railroad crossing and Industrial Way provides a TWLTL, and because the great majority of westbound traffic approaching Bayshore Road on Park Road turns left, those drivers would be expected to use the TWLTL as a queue storage lane, and other westbound drivers would use the through lane as a means to turn right into the Refinery (or as a queue storage lane if they intend to go straight on Park Road or to turn right onto Bayshore Road).

As described above, an 8.3-minute delay (road blockage) would increase the average vehicle delay in an hour by less than one second per vehicle.

If the proposed train crossings occur during the 7:00 PM – 6:00 AM period, resulting queues on the west side and east side of the tracks would not exceed the provided storage capacity, and would not extend back and affect the operations of other study intersections.

Project Impacts

The Project's freight train crossings would not degrade any intersection currently operating at LOS D or better to a level worse than LOS D. Under existing baseline conditions, the longest daily train degrades the level of service at each study intersection from LOS A to LOS F, and vehicle queues extend upstream on Park Road to Industrial Way, and on Park Road – Bayshore Road to (and onto) the I-680 Northbound Off-Ramp. Under baseline-plus-project conditions, the longest train would have the same effect. Therefore, there would be no change to the peak daily episode of delay.

The Project's freight train crossings would not increase the length of delay at any intersection that currently operates at LOS E or F. Under existing baseline conditions, the longest daily train is longer than Valero's unit trains. Therefore, the delay caused by each Valero unit train at each intersection would be less than the delay caused by the longest daily train under current conditions.

In addition, the 8.3-minute Project train crossing would increase the average vehicle delay in an hour by about 0.8 second, which is less than the one-second threshold of significance when the train crossing currently operates at LOS F. This is considered a less-than-significant impact.

In addition to impacts caused by Project-generated crossings of Park Road, there would be indirect Project impacts at the at-grade crossings elsewhere along the rail line between the Refinery and the Roseville Yard. Using Google Earth aeriels, other than Park Road, there are 24 at-grade crossings of

public roadways (6 of which are in urban areas), plus 9 at-grade crossings of private roads (all in rural areas). Although Project trains would increase the frequency of trains crossing these roads by four crossings per day, the number generally would fall within the range of crossings per day under existing conditions, and therefore, for the following reasons, the Project's impact on the 33 above-noted at-grade crossings would be less than significant: (1) traffic volumes at all but the 6 crossings of public roads in urban areas most-likely are low, and (2) the duration of the crossing would be short because Project trains would be travelling at a speeds faster than the 5 mph at Park Road (and generally would fall within the range of durations of crossings by other trains under existing conditions).

-
- 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.**

Impact 4.11-2: The Project would not conflict with the Solano County 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. (*Less than Significant*)

As described above, the Project would generate very few new vehicle trips on area roadways during peak traffic hours (except for the potential for temporary and intermittent traffic generated during Project construction), as the new permanent employees (four crews of five employees) would be spread among different work shifts and on different days. In addition, the increase in peak-hour traffic would be minimal on any one road, being spread over different roads and highways that provide access to and from the Project site. Lastly, vehicle queues caused by train crossings on Park Road (current and future) would not affect any roads or highways on the Solano County Congestion Management Program (CMP) network.

-
- d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).**

Impact 4.11-3: The Project would not substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment), or due to the proposed increased frequency/length of train crossings. (*Less than Significant*)

The Federal Railroad Administration (FRA) provided collision history data for the Park Road at-grade crossing. According to the FRA, the last reported collision at the Park Road at-grade crossing was in April 1995 when a train collided with a truck.

Neither Project construction nor Project operations would alter the physical configuration of the existing roadway network serving the area (or outside the Project area), and would not introduce unsafe design features. The Project also would not introduce uses that are incompatible with existing uses already served by the road system that serves the Project area (or outside the Project

area). As described under Impact 4.11-1, the Project would have a less-than-significant impact on traffic LOS and on impedance to traffic flow caused by backups during train crossings. Therefore, in sum, the Project would have a less-than-significant traffic hazard impact.

e) Result in inadequate emergency access.

Impact 4.11-4: The Project would not result in inadequate emergency access. (*Less than Significant with Mitigation*)

The Benicia Fire Department has a response time goal of 7 minutes for all emergency calls, 90 percent of the time, and they routinely achieve that goal. According to the 2012 data, the average response time within the entire City was about 5.2 minutes (2,099 total incidents), and the average response time to the Park Road / Bayshore Road area was about 6.6 minutes (27 total incidents). The City of Benicia Fire Department also has a contract with the Solano County Emergency Medical Service Authority to provide an advance life support staffed engine to all emergency medical calls within 7 minutes from the time the station is received in Benicia Dispatch.

Although the Project would increase the train frequency within the study area by four train crossings per day (two trips into the Refinery and two trips out of the Refinery), the proposed crossing duration of each Project train trip would be lower than train crossing durations that already exist today without the Project. The proposed increased crossing frequency is within the current range of crossing variability. According to the 2012 emergency response data provided by the Fire Department, an average of about two emergency incidents a month occurred along the industrial areas of Park Road and Bayshore Road. The probability of an emergency incident occurring at the same time as a Project train crossing is low. It is unlikely that the Project would cause the average emergency vehicle response time to increase to over 7 minutes for the Park Road and Bayshore Road industrial areas. However, the following measures would minimize potential Project impacts in regards to emergency vehicle access:

Mitigation Measure 4.11-4:

- Coordinate with the City of Benicia Fire Department to finalize the City of Benicia Fire Department/Valero Benicia Refinery Fire Department Operation Aid Agreement (“Agreement”) to be implemented in the event an emergency occurs during a Project train crossing. The “Agreement” shall provide methods of adequately informing the Fire Department of the expected train crossing schedule and alternate routes to access the Park Road and Bayshore Road industrial areas during the event that a train crosses Park Road. In order to inform Benicia Dispatch of a train crossing during an emergency, Valero shall provide, install, and maintain camera(s) at specified location(s) determined by the City, with coordination from Valero. The camera shall meet the City’s standards and have a real-time connection to Benicia Dispatch. The camera connection will signal to Benicia Dispatch that emergency responders shall use East 2nd Street as the identified alternative route to the Park Road and Bayshore Road industrial areas. East 2nd Street was identified for its direct access to area and the Opticom system in place at all signalized intersections. The camera must be installed and operational prior to commencement of the Project or certificate of

occupancy. In order to minimize potential impacts associated with utilizing the alternative route, Valero shall provide the necessary devices for the City's emergency response vehicles that are not equipped for the Opticom system. The emergency response vehicles identified to receive a device shall be those without the necessary device as of the date the "Agreement" is executed. Valero shall be responsible for the maintenance of the camera during the life of the Project.

- Utilize the Refinery's existing onsite emergency response team to assist with responding to off-site emergencies within the Park Road and Bayshore Road industrial areas as requested by the City of Benicia Fire Department under the existing mutual aid agreement, if an emergency occurs during the event of a train crossing on Park Road. The procedures for the occurrence of this support by the Valero Refinery Fire personnel are outlined in the proposed Benicia Fire-Valero Fire Operational Aid Agreement.

Significance after Mitigation: Less than significant.

f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities.

Impact 4.11-5: The Project would not conflict with adopted policies, plans or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities. (*Less than Significant*)

Implementation of the Project would neither directly nor indirectly eliminate existing or planned alternative transportation corridors or facilities, include changes in policies or programs that support alternative transportation, nor construct facilities in locations in which future alternative transportation facilities are planned. The Project would not conflict with adopted policies, plans, and programs supporting alternative transportation.

As described above, FAST operates one weekday transit route (Route 40) on Park Road within the study area; the nearest bus stops are located at the intersection of Park Road / Industrial Way. Route 40 provides four buses in each direction during the AM commute period between 5:30 and 9:00 AM, and five buses in each direction during the PM commute period between 3:30 and 8:00 PM. Valero would not schedule Project train crossings during the AM or PM peak traffic period. It is anticipated that Project train crossings could occur during the 6:00 to 8:00 PM period, and on average, about one bus travels along Park Road in each direction during that period. The chances of buses attempting to cross Park Road in the event of a Project train crossing are small, but possible. Although the Project would increase the frequency of trains crossing Park Road by four crossings a day, the number of crossings per day under Project conditions generally would fall within the range of crossings per day under existing conditions. In addition, the proposed crossing duration of each Project train trip would be shorter than the longer train crossings that already occur today without the Project. The potential increase in transit delay incurred by the Project is within the delay variability already experienced by Route 40 during the PM peak commute period. The Project impacts would be less than significant.

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