CHAPTER 3
Project Description

3.1 Project Overview and Location

3.1.1 Introduction

3.1.1.1 The Refinery

The Valero Benicia Refinery (Refinery) presently receives its crude oil by pipeline and marine vessels. Crude oil produced within California (primarily from the San Joaquin Valley) is delivered by pipeline into the Refinery. Crude oils originating from the United States and from locations outside the United States, including Canada, are delivered by marine vessels to the Valero Marine Terminal at the Port of Benicia. The crude oils are unloaded and pumped via pipelines to crude oil storage tanks within the Refinery.

3.1.1.2 The Proposed Project

The Valero Crude by Rail project (Project) would enable the Refinery to receive up to 70,000 barrels per day of crude oil by tank car. The Project involves the installation of rail spur tracks, a tank car unloading rack, pumps, connecting pipelines, and infrastructure.

If the Project is approved, Valero will accept up to 100 tank cars of crude oil a day in two 50-car trains. The trains would enter the Refinery on an existing rail spur crossing Park Road. The crude oil unloaded from the tank cars would be pumped to the existing crude oil storage tanks in the Refinery via a new crude offloading pipeline, connected to existing piping located within the Refinery. The Project would require twenty additional employees or contractors. The trains would not be scheduled to arrive or depart between the hours of 6:00 AM – 9:00 AM or 4:00 PM – 6:00 PM weekdays. Valero would operate the Project components 24 hours per day, 7 days per week, and 365 days per year.

Based on Valero's plans, the crude oil delivered by rail would displace up to 70,000 barrels per day of the crude oil that is presently delivered by marine vessels. Crude oil delivered to the Refinery by tank car would not displace crude oil delivered to the Refinery by pipeline.

The crude oil to arrive by tank car would originate at sites in North America and be shipped by Union Pacific Railroad (UPRR). UPRR would transport tank cars on existing rail lines from sources in North America to Roseville, California, where the cars would be assembled into a train for shipment into the Refinery. Valero would own or lease the tank cars that would be used to transport crude oil. UPRR owns and operates the locomotive engines that would be used.

Implementing the proposed Project could reduce marine vessel delivery of crude oil by as much as 25,550,000 barrels in a 365 day year. Based on the three-year baseline period from December 10, 2009 to December 9, 2012 annual marine vessel deliveries could be reduced by as much as 82 percent.

The Project would not involve any changes to the existing Refinery operations or process equipment, other than the construction and operation of the Project components. The Project would not increase the amount of crude oil that can be processed at the refinery, or the amounts of petroleum products that can be produced. The Refinery's crude oil processing rate is limited to an annual average of 165,000 barrels per day (daily maximum of 180,000 barrels per day) by its Bay Area Air Quality Management District (BAAQMD) operating permit. The Project does not propose any change to this limit. The Project does not propose changes to the emissions limits in the current BAAQMD permits, although the Project does require approval of an Authority to Construct from the BAAQMD. In connection with this approval, the BAAQMD will consider locomotive emissions and tank car unloading emissions as may be caused by the Project.

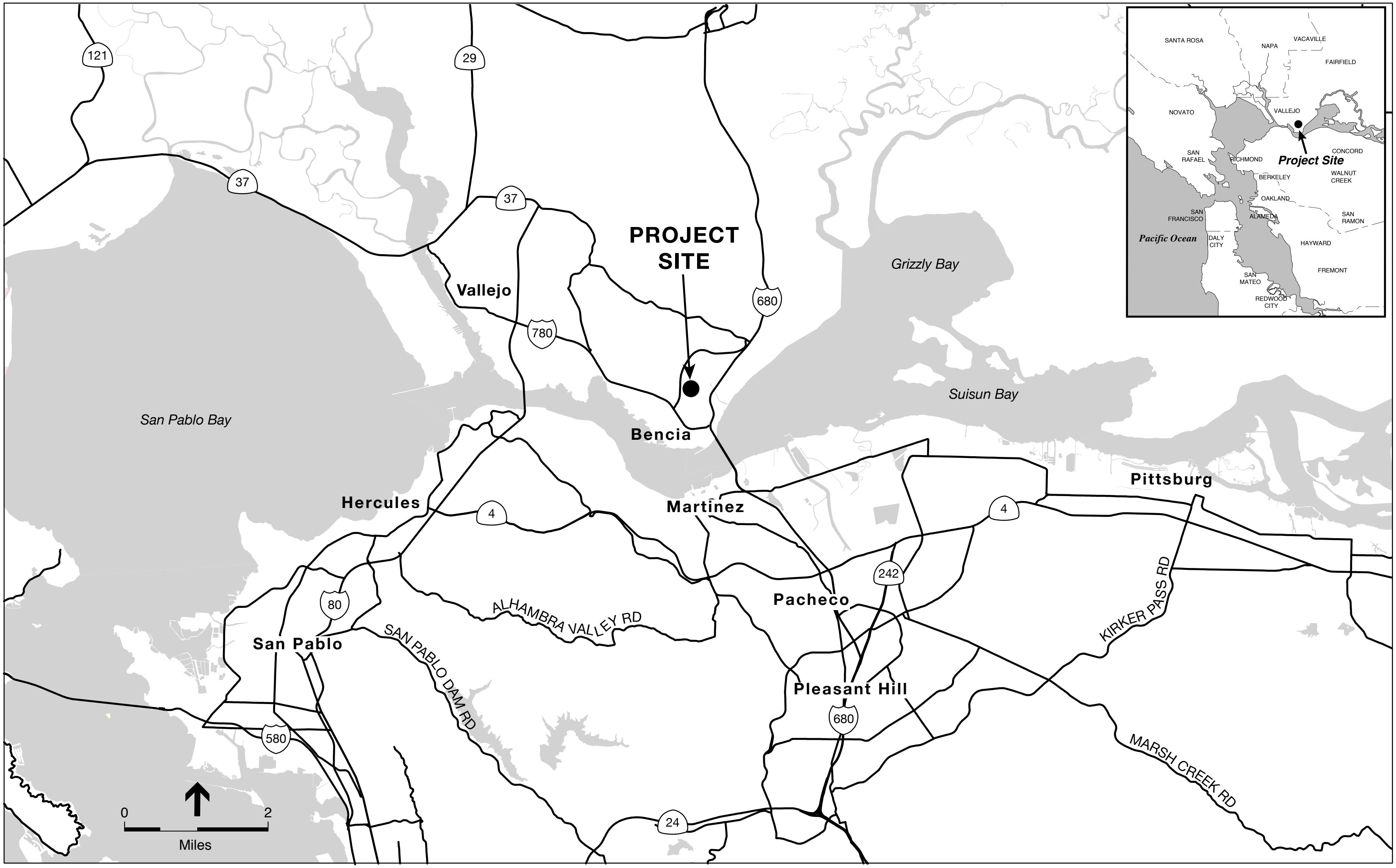
3.1.2 Location

The Refinery is located at 3400 East Second Street, an industrial area in the eastern portion of the City of Benicia, in Solano County. 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. To the west of East Second Street is open space, and the closest residential areas are approximately 3,000 feet to the south and west of the Refinery, and approximately 2,100 feet to the northwest of the proposed Project site. Figure 3-1 shows a location map of the region.

Refinery operations occupy approximately 330 acres of the 880 acre Valero property. The lands and facilities of the Refinery are depicted in Figure 3-2.

The Refinery dock is located on the Carquinez Strait between the Benicia-Martinez Bridge and the Port of Benicia wharf. The marine terminal for the Refinery and pipeline to the Refinery provide access for receiving and shipping bulk cargoes by marine vessel. The existing UPRR rail line provides rail access for the Refinery and for the Benicia Industrial Park. The Benicia Industrial Park is located east and north of the Refinery. Presently, the Refinery uses tank cars to receive chemicals used in refining and to ship refined products from the Refinery.

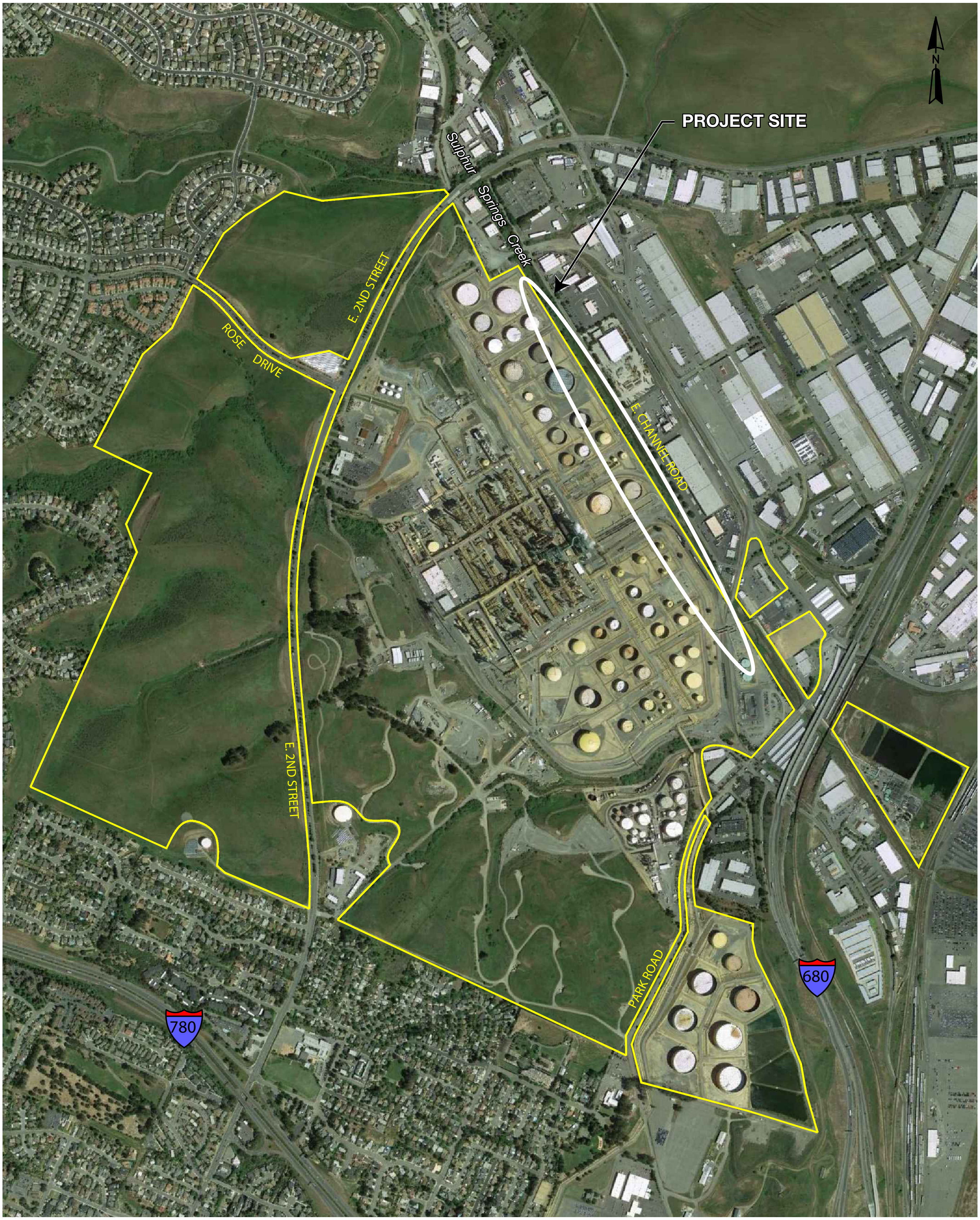
The Refinery and proposed Project site (within the Refinery) are zoned General Industrial. Present land use at the proposed Project site is petroleum refining and storage. Construction and operation of facilities associated with this proposed Project would be within the Refinery's property boundaries.



SOURCE: ESA

Benicia Valero CBR . 202115.01

Figure 3-1
Project Location



Aerial Photo Source: © 2012 Google Earth Pro Ver 6.2.2.6613

0 1/8 1/4 1/2
MILE

LEGEND

PROPERTY BOUNDARY

Benicia Valero CBR . 202115.01

SOURCE: ERM

Figure 3-2
Valero Refinery Boundary

3.2 Project Objectives and Components

3.2.1 Project Objectives

The Valero Benicia Refinery converts a range of crude oil and other feedstocks into gasoline and other petroleum products. The Project would provide an alternate means of delivering crude oil feedstock to the Refinery. The Project has the following objectives:

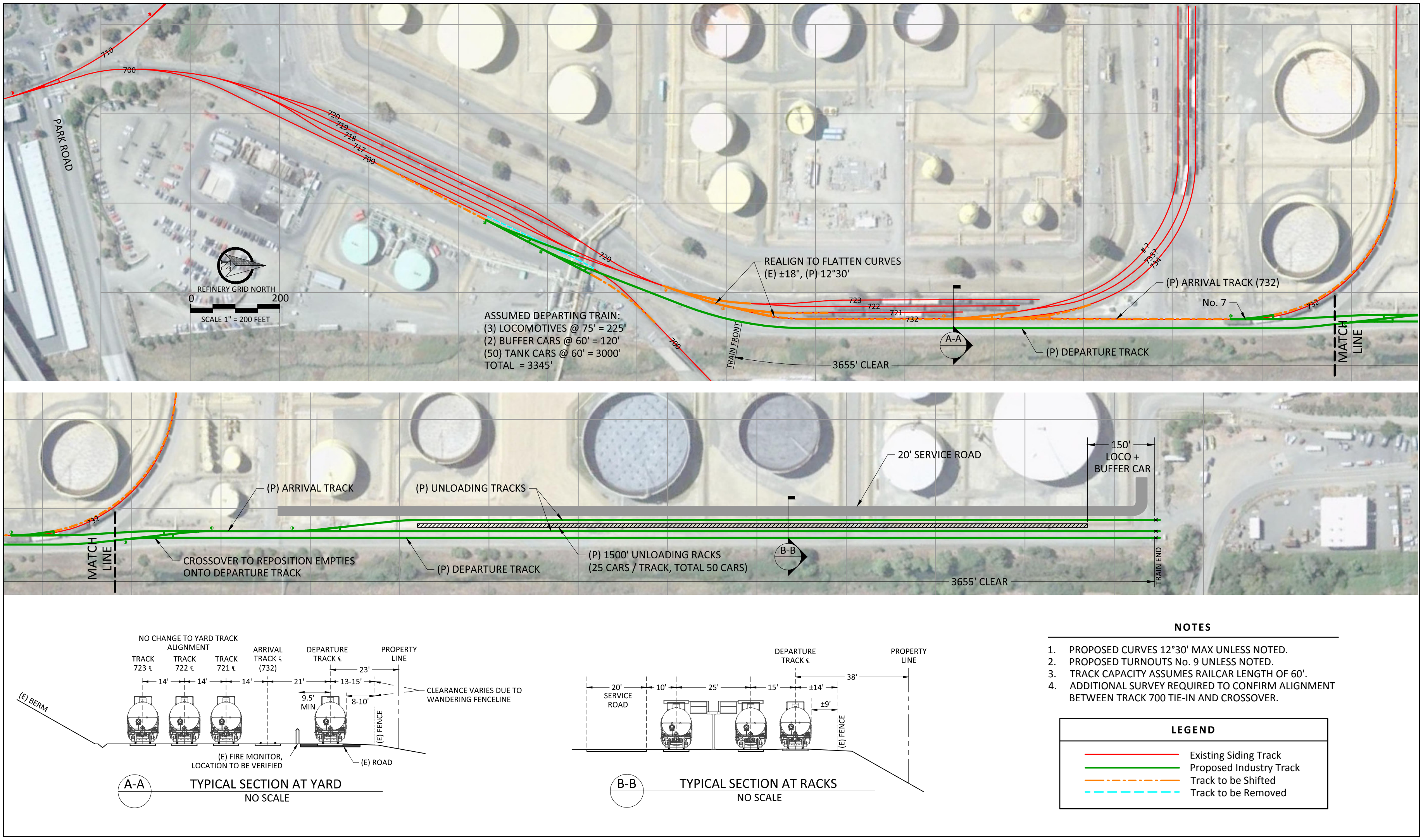
1. Allow for the delivery of up to 70,000 barrels per day of North American-sourced crude oil by rail.
2. Replace marine vessel delivery with rail delivery of up to 70,000 barrels per day of crude oil.
3. Mitigate project-related impacts.
4. Implement the proposed Project without changing existing Refinery process equipment or Refinery process operations, other than operation of the Project components.
5. Continue to meet requirements of existing rules and regulations pertaining to oil refining including the State of California Global Warming Solutions Act of 2006 (AB 32).

As a result of implementation of the proposed Project, the Refinery would be able to continue to efficiently produce fuels and other petroleum products for the California market and would remain economically competitive.

3.2.2 Project Component Summary

The proposed Project is shown in Figure 3-3, and would consist of the following primary components:

- Installation of a single tank car unloading rack capable of offloading two parallel rows of 25 crude oil tank cars.
- Construction of two parallel, offloading rail spurs to access the tank car unloading rack along with a parallel departure track to store tank cars in preparation for departure, for a total of 8,880 track-feet of new track on Refinery property.
- Installation of approximately 4,000 feet of 16-inch diameter crude oil pipeline and associated components and pump infrastructure between the offloading rack and the existing crude supply piping.
- Replacement and relocation of approximately 1,800 feet of existing tank farm dikes.
- Relocation of an existing firewater pipeline, compressor station, and underground infrastructure.
- Relocation of groundwater wells along Avenue “A.”
- Construction of a service road adjacent to the proposed unloading rack.



SOURCE: Valero

Figure 3-3
Site Plan

3.3 The Existing Refinery

3.3.1 Overview of Petroleum Refining

Refineries convert crude oil into marketable petroleum products such as gasoline, diesel fuel, jet fuel, kerosene, heating oil, coke, asphalt, and petroleum gases such as butane and propane. Refiners design and operate their refineries so as to maximize the value of the product slate produced from each type of crude oil. Often, for example, refiners seek to maximize the amount or "yield" of transportation fuels produced from a particular type of crude oil, because transportation fuels are the most valuable petroleum products.

3.3.1.1 Types of Crude Oil

Crude oils contain thousands of different chemical compounds. Most of these compounds are hydrocarbons, consisting solely of hydrogen and carbon atoms. Crude oils also have other compounds containing, for example, sulfur, nitrogen, oxygen, and metals.

Hydrocarbons range in “weight,” measured by the number of carbon atoms present in each molecule. The lightest hydrocarbons, for example, are petroleum gases such as methane, ethane, propane, and butane. Each molecule of these gases 1 to 4 carbon atoms. The hydrocarbons in gasoline are heavier, with anywhere from 5 to 12 carbon atoms in each molecule. The hydrocarbons in tar and asphalt are much heavier, with more than 70 carbon atoms in each molecule.

There are many different crude oils, with many different properties, produced all over the world. Crudes are commonly classified based on their relative weight and sulfur content. The weight of a crude oil is sometimes described as its “density” or “gravity.” The relative weight of a crude oil depends on the proportion of heavy to light hydrocarbons. The weight of different crudes is commonly measured according to a gravity scale developed by the American Petroleum Institute (API). API gravity is a measure of a crude oil’s weight as compared to water. Most API gravity values fall between 10 and 70 gravity degrees.

The sulfur content of crude oil generally ranges anywhere from 0.5% to 3%. Generally, crudes with a sulfur content of less than 1% are known as “sweet” crudes. Generally, crudes with a sulfur content greater than 1% are known as “sour” crudes. Crude oils are generally categorized as follows in Figure 3-4:

Crude Oil Class	Property Range	
	Gravity (°API)	Sulfur (wt.%)
Light Sweet	35-60	0-0.5
Light Sour	35-60	> 0.5
Medium Medium Sour	26-35	0-1.1
Medium Sour	26-35	> 1.1
Heavy Sweet	10-26	0-1.1
Heavy Sour	10-26	> 1.1

SOURCE: International Council on Clean Transportation (ICCT), 2011

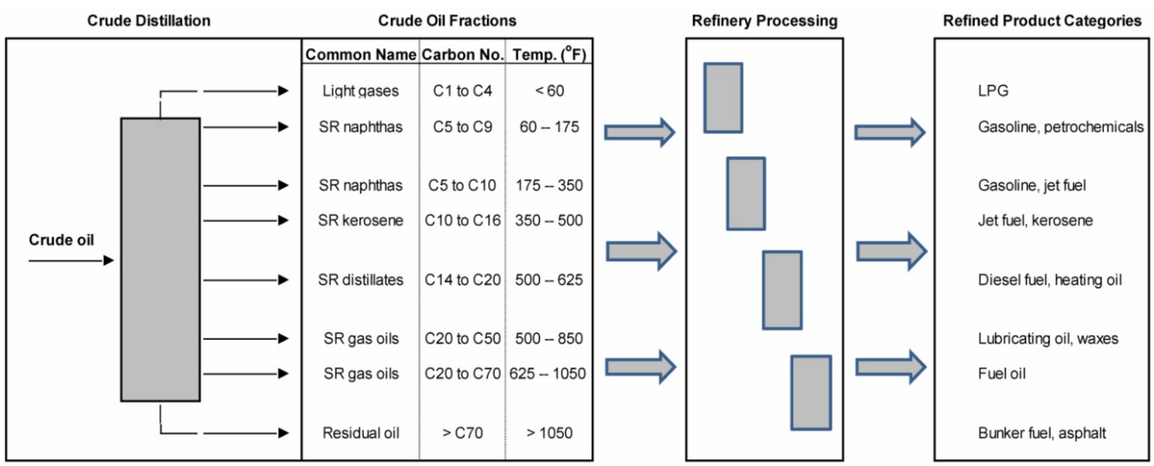
Figure 3-4
Crude Oil Classes

Refiners select particular crudes based on a number of factors, including the unique configuration of each refinery, the quality of available crudes, the price of each crude, the market demand for specific products, the market price of specific products, and the specifications of the products to be produced.

There is a wide variety of crudes available in the marketplace at any given time, with a wide range of API gravities and sulfur content. As a general rule, heavier crudes require more processing than light crudes, and sour crudes require more processing than sweet crudes. Thus, the "quality" of a crude oil is generally considered to be a function of its weight and sulfur content. Light, sweet crudes are considered the highest quality and are the most expensive. Examples include West Texas Intermediate, Louisiana Light Sweet, and Brent. Medium sour crudes are less expensive. Examples include Mars, Arab Light, Arab Medium, and Urals. Heavy sour crudes are the least expensive. Examples include Maya, Cerro Negro, Cold Lake, and Western Canadian Select (see Table 3-1).

3.3.1.2 The Refining Process

The first step in the refining process is to separate crude oil into components through distillation. The components are commonly referred to as "fractions." Lighter fractions have relatively lower boiling points, while heavier fractions have relatively higher boiling points. Common fractions include, from lightest to heaviest, petroleum gases, naphthas, kerosene, middle distillate, gas oil, and residue.

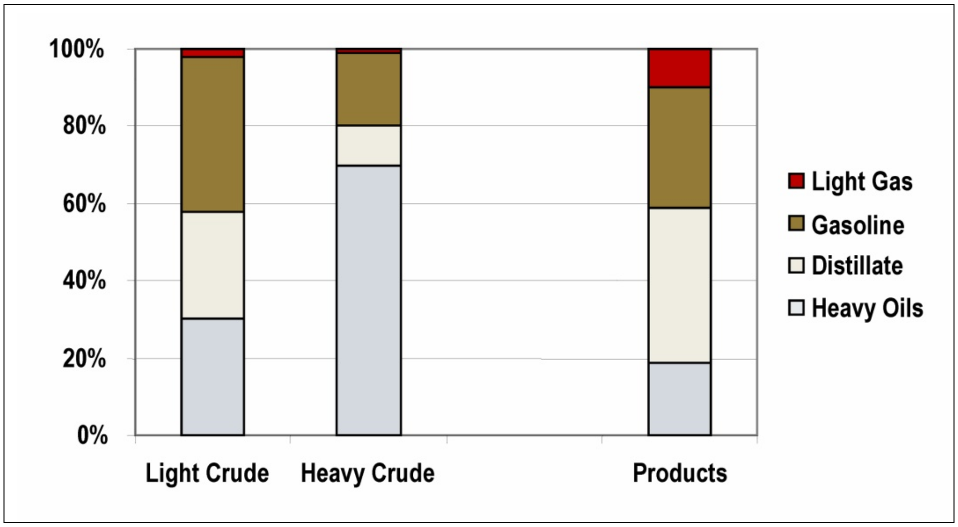


SOURCE: ICCT, 2011

Figure 3-5
Schematic View of Crude Oil Distillation and Downstream Processing

After a crude oil is separated into fractions through distillation, the resulting streams are treated in various "process units" and ultimately blended into marketable products. Some process units remove sulfur and other impurities from process streams. Other process units chemically alter process streams. Refiners use hydrocrackers, catalytic cracking units, and coker units, for example, to make some process streams lighter by breaking larger hydrocarbons into smaller ones. This is commonly known as "cracking." A refiner might, for example, take a stream in the gas oil range and break the hydrocarbons down into the gasoline range. This would allow the refiner to increase the amount of gasoline, and reduce the amount of heating oil, produced from a particular type of crude oil.

Figure 3-6 compares the fractions of a typical light crude (35° API) and a typical heavy crude (25° API) with the average demand profile for a product slate in developed countries. The figure illustrates how refiners often need to convert fractions into lighter streams in order to meet the typical demand for products.



SOURCE: ICCT, 2011

Figure 3-6
Typical Natural Yields of Light and Heavy Crude Oils

Refiners may chemically alter the shape of the hydrocarbons in naphtha streams through catalytic reforming, alkylation, isomerization, and etherification. These processes allow Refiners to increase octane in gasolines and increase the amount of gasoline produced from a type of crude oil.

Refiners use hydrotreaters, also known as hydrofiners, to remove sulfur and other impurities from refinery streams. Hydrotreaters remove sulfur in the form of hydrogen sulfide, which is then converted into elemental sulfur in sulfur recovery units. Impurities come out of the process as solids, or in the case of sulfur, as a hot liquid (or "molten sulfur").

3.3.1.3 Refinery Optimization

Refinery operations are extremely complex, and involve a great many individual decisions. Refiners must decide, for example, what crudes to purchase and what mix of products to produce. Refiners must also identify the best way to convert the selected crudes into the desired mix of products. Decisions must be made at each step of the process. During distillation, for example, a refiner must determine the particular range of hydrocarbon weights for each fraction produced. This is known as setting the "cut points" or boiling points of each range. Thereafter, each refiner must decide how each intermediate stream should be processed in different process units, and ultimately blended into finished products.

The schematic in Figure 3-7 reflects the operation of a typical refinery, and illustrates the complexity of the process.

Each refiner continually seeks to “optimize” the operation of its refinery by identifying and implementing the most profitable operating strategy. The optimum strategy is different for each refinery because no two refineries are the same. Each refinery has a unique “configuration,” consisting of the number and types of process units, the throughput capacity and technical characteristics of each unit, and the flow patterns connecting the various units. Based on its particular configuration, each refinery operates under a variety of constraints. Constraints include, for example, how much crude can be processed on any given day, the quality of the crude that can be processed, and the product slate that can be produced from a particular type of crude oil.

Refinery operations are so complex that virtually all refiners use the “linear programming” technique to plan refinery operations. Linear programming involves the use of a mathematical model to determine the most profitable operating strategy for a particular refinery. The model “inputs” include variables such as the configuration and constraints of the refinery in question, the crudes available, market demand, product prices, and product specifications. The model “outputs” include the crudes that should be purchased, the product slate that should be produced, the cut points, and the manner in which each intermediate process stream should be treated and blended.

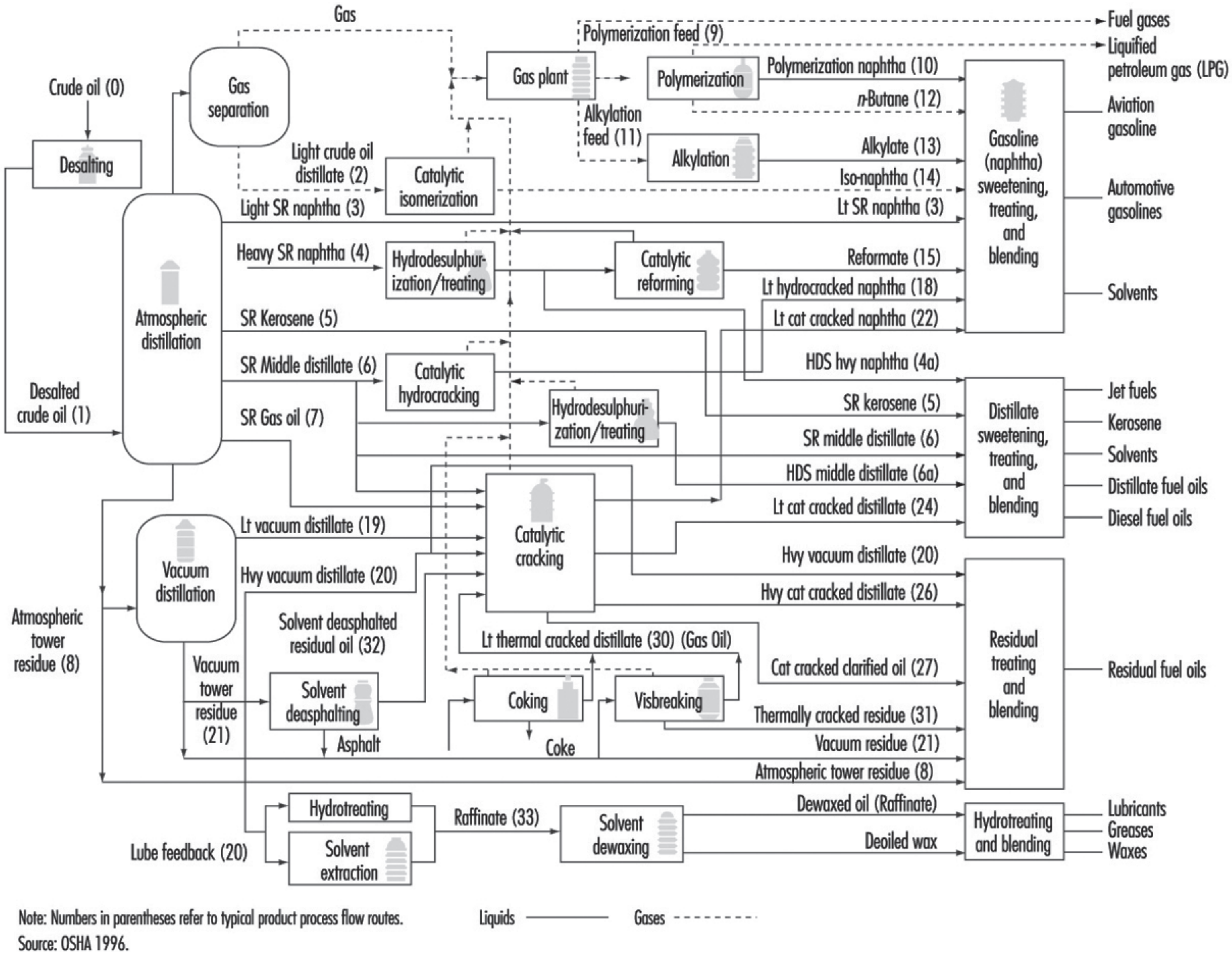
3.3.2 The Benicia Refinery

The Benicia Refinery converts crude oil into finished products, including gasoline, jet fuel, liquefied petroleum gas (LPG), heating oil, fuel oil, asphalt, petroleum coke, and sulfur. The Refinery produces 10 percent of the clean-burning California Air Resources Board (CARB) gasoline used in California, and 25 percent of the CARB gasoline used in the San Francisco Bay Area (Valero, 2014).

3.3.2.1 Crude Oil Processing

The Refinery contains a variety of equipment, including distillation columns, storage tanks, reactors, vessels, heaters, boilers, and other ancillary equipment. The Refinery also operates its own asphalt plant, wastewater treatment plant, and a marine terminal at the Port of Benicia. The marine terminal receives crude oil, refinery products, and feedstock deliveries and exports via marine vessels and barges. The Refinery uses rail transport to import chemicals used in refining and to export refinery products such as asphalt, petroleum coke, and LPG.

Crude oils delivered to the Refinery are transferred into storage tanks located in the crude oil tank farm north of the marine terminal. The crude oils are stored in external floating roof tanks which are configured and operated to comply with the stipulations of the BAAQMD Regulation 8-5. Valero combines crude oils from these storage tanks into blends that are then pumped to the Refinery process units located north of the tank farm.



SOURCE: OSHA, 1996

Figure 3-7
Schematic of Typical Petroleum Refinery

The Refinery contains a variety of different process units. The Pipestill Unit separates crude blends into fractions. The Fluid Catalytic Cracking Unit (FCCU) and the Hydrocracker Unit make heavier process streams lighter by breaking larger hydrocarbons into smaller ones. The Hydrofining Units and the Sulfur Recovery Unit remove sulfur from process streams and convert it into elemental sulfur. The Coker Unit converts residual oil into petroleum coke and lighter process streams. The Alkylation, Dimersol, and Reforming Units change the shape of hydrocarbons in gasoline-range process streams that will ultimately be blended into different grades of gasoline. Each process unit has a maximum capacity, and operates under a permit from the BAAQMD.

Overall, the Refinery's BAAQMD Title V permit limits Valero to processing a maximum of 180,000 barrels of crude oil on any given day, and an average of 165,000 barrels per day on an annual basis. (Title V permit, condition 20820, part 50.)

The Refinery currently exports petroleum coke and LPG from the Refinery to off-site customers. Once a day, during the daytime hours, up to 12 railcars loaded with petroleum coke leave the Refinery via Track 700, and cross Park Road towards the AMPORTS Benicia Terminal facility directly to the south. The product is then off-loaded into storage silos near the dock for eventual loading onto marine vessels for export. The empty coke railcars are brought back onto the Refinery for reloading for the next day's transfer operations.

Similar export operations take place with railcars transporting LPG destined for customers. The quantity of these export operations vary with season and production volume. On an annual basis it averages approximately two railcars per day. The Refinery also occasionally imports LPG.

Between 2004 and 2010, Valero made significant modifications to the Refinery's process units and other equipment. These modifications were collectively known as the "Valero Improvement Project" (VIP). The City certified the VIP project EIR and approved the VIP project in April of 2003, and later certified the VIP EIR addendum in July 2008. The VIP project enabled Valero to process crude blends that are heavier and more sour than previous blends, reduce the use of gas oil as a feedstock, and increase the maximum crude oil throughput. All elements of the VIP project were operational as of 2011, except for construction of a replacement hydrogen plant. Valero is currently considering whether to construct the replacement hydrogen plant, based on the fact that the Refinery currently has a sufficient supply of hydrogen to meet Valero's needs. Valero has obtained all approvals needed from the City and the BAAQMD to construct the hydrogen plant. The BAAQMD Permit-to-Construct expires in December of 2014.

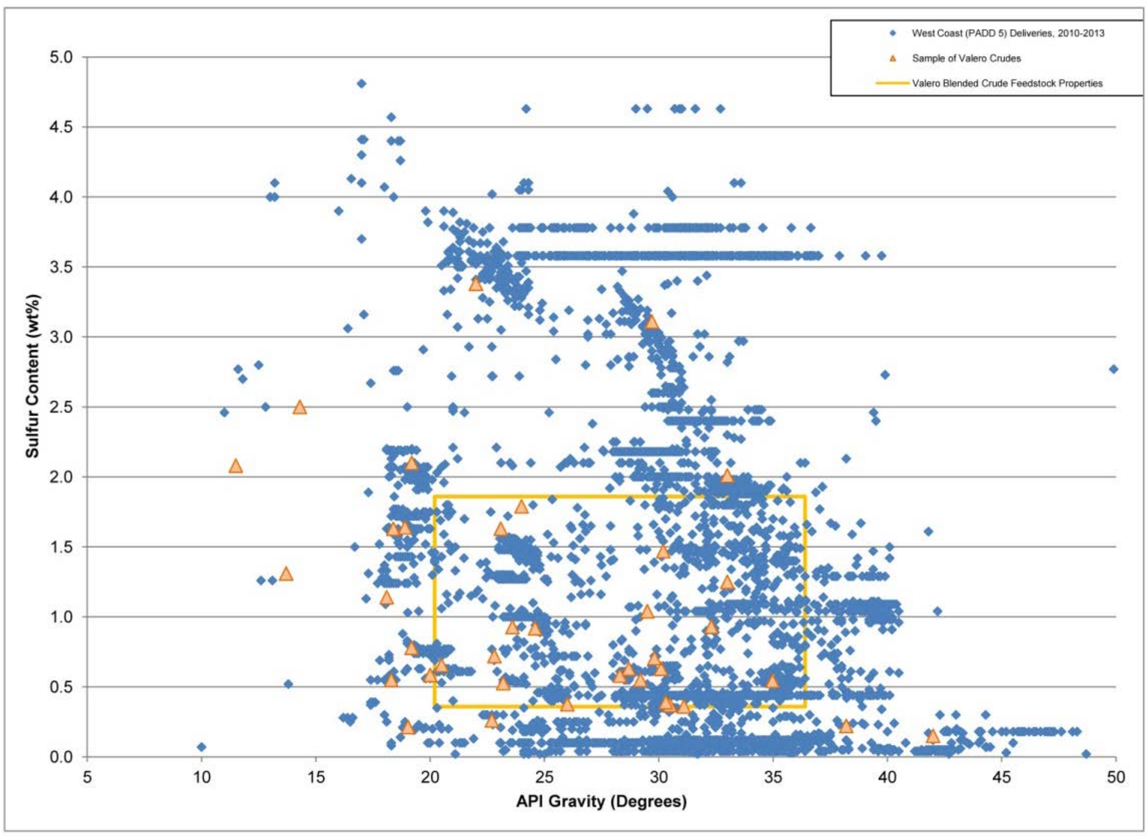
3.3.2.2 Crude Feedstocks

Valero can choose from a wide variety of crudes available in the marketplace at any given time. These crudes range from light sweet to heavy sour, with a range of options in between.

Like all petroleum refiners, Valero selects particular crudes based on linear programming. This analysis takes into account a number of factors, including the unique configuration of its refinery, the quality of available crudes, the price of each crude, the market demand for specific products, the market price of specific products, and the specifications of the products to be produced. Because many of these factors are constantly changing, Valero's crude feedstocks change based on new developments and conditions.

The VIP project enabled Valero to increase the average weight and sulfur content of its crude feedstocks while simultaneously reducing emissions of criteria pollutants by thousands of tons per year. Before the VIP project became operational, the Refinery was capable of processing crude blends that contained a maximum of 30% heavy, sour crudes. The VIP project gave Valero the flexibility to process crude blends that contain as much as 60% heavy, sour crudes.

In the last three years, Valero has purchased a variety of crudes ranging from light sweet to heavy sour. The yellow triangles in Figure 3-8 show the API Gravity and sulfur content of various specific crudes that Valero has purchased in the past three years. For comparison, the blue diamonds shown on Figure 3-8 display the API Gravity and sulfur content of all crudes delivered to west coast refineries during the same period – in other words, all crudes purchased by all refiners in the west coast region.



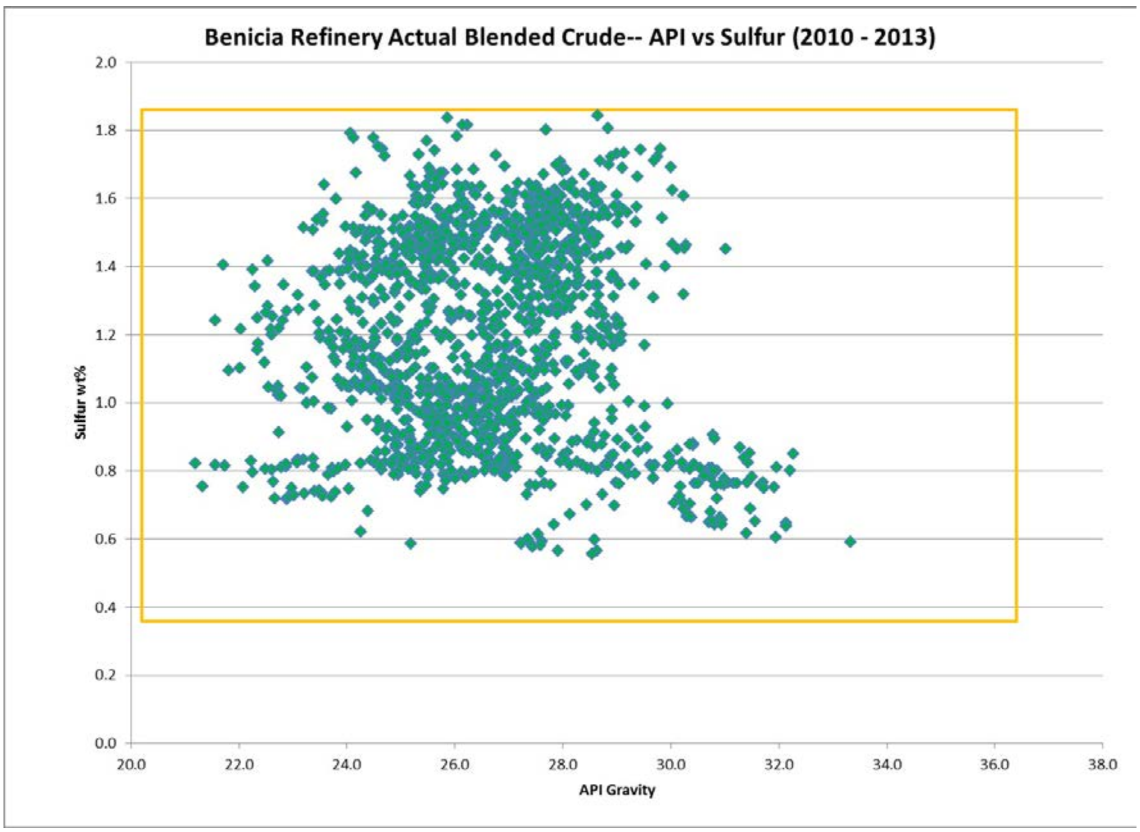
SOURCE: Valero, 2013

Figure 3-8
West Coast Crude Deliveries Compared to Valero's
Typical Crudes and Blended Crude Feedstock Capability

Valero does not process all crudes as they are delivered to the Refinery. Based on the Refinery's unique configuration, Valero must blend different crudes into a specific range of weight and sulfur content before they can be processed. This range, shown as the yellow box on Figure 3-8 is roughly between 20° and 36° API gravity, and between 0.4%-1.9% sulfur content.

If the Refinery attempted to process crudes outside of these ranges, a variety of problems could arise. If the sulfur content of a crude blend exceeds 1.9%, this could result in violation of Valero's BAAQMD permits and BAAQMD regulations. On the other hand, if sulfur content of a blend is less than 0.4%, the sulfur handling units would not operate properly. Processing a crude blend that is too heavy (lower than 20° API Gravity) could damage equipment, result in poor fuel quality, and/or reduce the amount of crude processed (based on balanced refinery operation).

Based on the Refinery's actual operation, moreover, it is clear that the optimum range of weight and sulfur for crude blends is much narrower than the yellow box in Figure 3-8. As Figure 3-9 shows, the substantial majority of the crude blends processed over a recent three year period at the Refinery ranged between 24° and 29° API gravity, and had a sulfur content ranging from 0.08%-1.6 %.



SOURCE: Valero, 2013

Figure 3-9
API vs Sulfur in Blended Crudes Processed at Valero Benicia Refinery, 2010 to 2013

3.3.2.3 Refinery Maintenance and Monitoring Activities

3.3.2.3.1 Maintenance Activities

Operation of a refinery requires substantive on-going maintenance activities. Maintenance is needed so that all refinery process units operate within their design parameters, especially for emissions, and to assure that products meet quality and quantity goals. Regular maintenance is essential to the overall safe operation of the refinery.

In addition to the on-going activities, scheduled maintenance actions, called turnarounds, are also necessary. The term "turnaround" refers to the period of time when refinery equipment is not available to process feedstocks, as opposed to refinery equipment's typical 24 hour a day, 365 day a year operation. There are a number of reasons to schedule a period when equipment would be out of operation. Some of these reasons are:

1. To inspect the internals of refinery vessels;
2. To clean pipe and vessel internals;
3. To upgrade existing refinery equipment and vessels;
4. To renew catalysts in vessels which do not use continuous regeneration;
5. To make connections for new equipment being installed at the Refinery;
6. To perform maintenance on critical equipment; and
7. To repair and renew piping and equipment before they fail.

Turnarounds are termed major when significant portions of the refinery are shut down; minor turnarounds may affect only certain units, or parts of the total Refinery.

Refinery turnarounds affect production. Therefore, Refinery staff plans carefully, so that work would be accomplished quickly in a turnaround and that process units can be started up again as soon as possible. The planning includes ensuring all necessary supplies and equipment are on-site and available when needed. Refinery maintenance and technical staff as well as additional contract maintenance staff work in shifts around the clock to minimize the duration of a turnaround.

Turnarounds may take place every year, but the Refinery usually plans major turnarounds to occur several years apart to maximize the overall production of the Refinery. At the Valero Benicia Refinery, major turnarounds occur at 5 to 6-year intervals and minor turnarounds typically occur at mid-points between major turnarounds. These turnarounds are part of the Refinery's normal, ongoing maintenance program and do not require City permits or environmental review.

A major turnaround offers the chance to change other equipment and processes in the Refinery during that scheduled downtime. Thus, the turnaround schedule becomes the controlling factor when planning and scheduling upgrades or other major changes to the process equipment at the Refinery.

3.3.2.3.2 Monitoring Activities

When processing a range of crude oils, there is a potential for adverse effects of contaminants on refinery equipment, so process conditions must be regularly monitored. At the Refinery, two particular programs are in place as part of the Refinery's safety systems to identify, track and manage these potential risks. The first is the Management of Change (MOC) process. The MOC program is an integral part of the Refinery's Process Safety Management (PSM) program. Management of Change procedures are in place to manage changes to process streams, 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 evaluation includes a review of, among other things, the acid content of the material (Total Acid Number (TAN)) and sulfur content.

Excess amounts of TAN and chlorides can corrode and crack certain metallurgy at unacceptable rates, reducing equipment life and affecting safe refinery operations. The refinery carefully monitors TAN and chloride content to ensure the equipment continues to operate safely. If the TAN or chloride content were to increase above the set parameters, the equipment would not last as long and the refinery would have to shut down more frequently to do preventative maintenance and equipment replacements resulting in much higher operating costs. Valero would not allow high levels of acid content and chloride content in the refining process as that would affect its safe operations.

Only after this extensive review are any new materials approved for processing. Monitoring of changes continues with routine sampling of the new blended crude stream as well as sampling other process streams for corrosion, dew point, and other parameters necessary to ensure safe operations.

The second program in place is the Mechanical Integrity (MI) program. The MI program is another 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 organize data to determine pipe and equipment metal thicknesses and corrosion rates. The positive material identification (PMI) element of the MI program is utilized to positively verify the actual materials of construction for equipment in the Refinery. As an example, Valero's PMI program includes a special procedure for identification of low-silicon carbon steel material which is known to be less resistant to corrosion under certain conditions when processing higher sulfur crudes. 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 in oil refining. These programs go beyond Cal/OSHA standards and provide the best feasible protection at the Refinery.

3.4 Components of the Proposed Project

3.4.1 New and Modified Facilities and Equipment

3.4.1.1 Tank car Unloading Rack

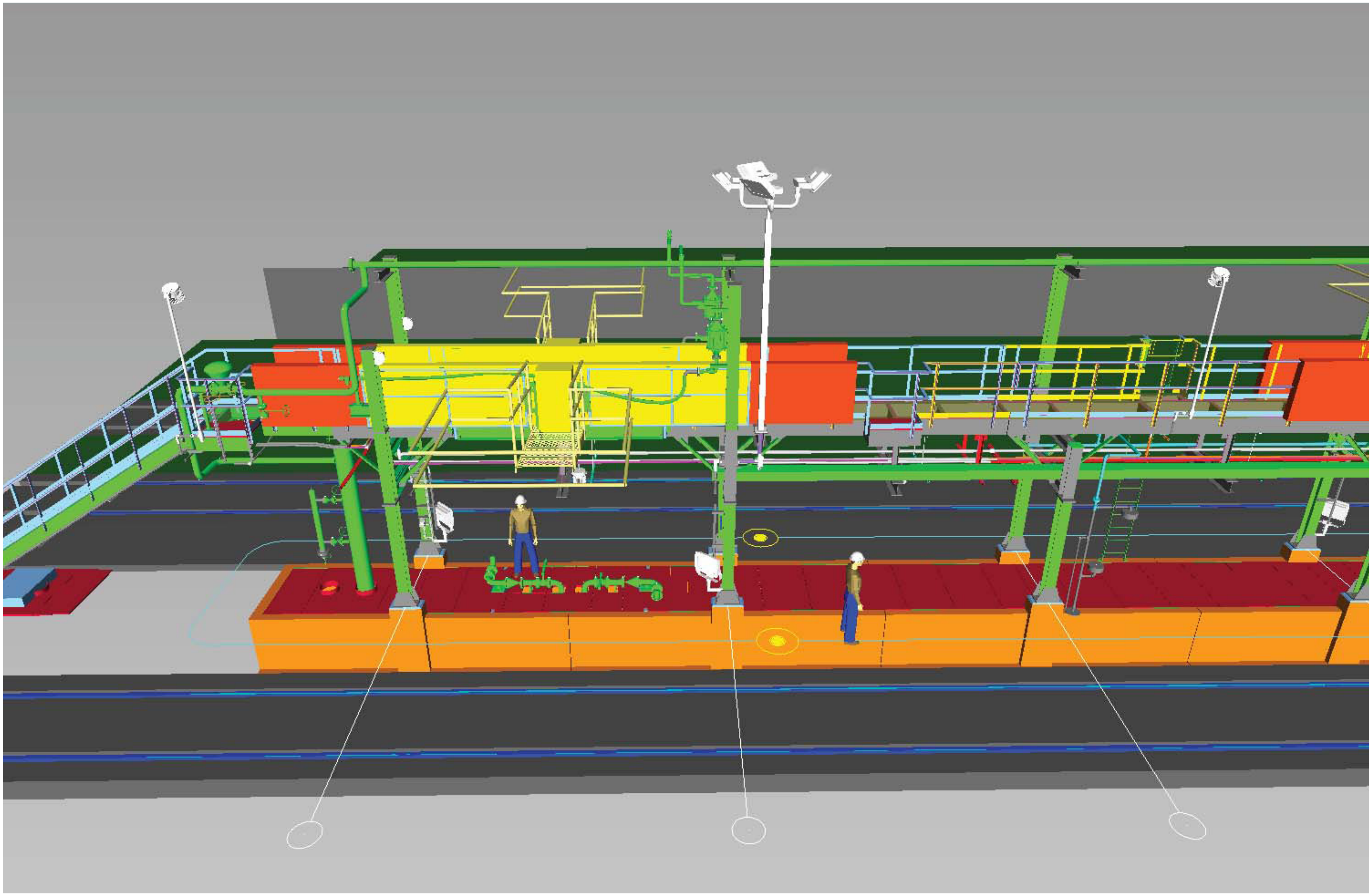
A new unloading rack (see Figure 3-10) capable of unloading two parallel rows of tank cars (one on each side) and transferring crude oil to the Refinery would be constructed for the Project. The 1,500-foot-long unloading rack would be used only for unloading crude oil; there would be no loading of crude oil or other materials at this rack. The rack would be installed in the northeastern portion of the main Refinery property, between the eastern side of the lower tank farm and the fence adjacent to Sulphur Springs Creek (see Figures 3-2 and 3-3). The fence would not be relocated to accommodate the new construction. The unloading rack platform walkway would be approximately 13 feet above grade. A majority of the lighting (primarily consisting of 25 new aluminum poles with lights mounted 12 feet above the platform) and tank car access walkways would be mounted to the unloading rack structure. A minimum of 23 feet vertical clearance is required by UPRR for facilities that bisect a railway track, and this would be the height of the proposed walkways. The tank car unloading rack would include directional lighting to illuminate tank car connecting points beneath the tank cars, walkways, access platforms, and a service road. The rack would use isolation valves specified to comply with BAAQMD best available control technology (BACT) requirements for fugitive air emissions.

The new tank car unloading facilities would include a liquid spill containment sump with the capacity to contain the contents of at least one tank car (shown in Figure 3-10 below the blue colored rails). The rack area would be sloped inward towards the centerline of the rack. A roadside curb would be provided east of the tracks near the fence line to further contain any minor spills and leaks. In addition, the existing liquid spill containment for tanks abutting the tank car unloading facilities would be modified to allow installation of the unloading facilities. Part of the existing containment berm for the tank field would be removed and a new concrete berm would be constructed approximately 12 feet west of the existing earthen berm.

3.4.1.2 Unloading Rail Spurs

Currently, the existing rail tracks at the Refinery serve the upper coke silo for petroleum coke loading and the intermediate tank farm for the LPG transfers. There are no unloading rail spurs for crude oil deliveries at the Refinery.

As a part of the proposed Project, existing tracks would be realigned and two unloading rail spurs and a parallel storage and departure spur would be constructed to allow for receipt of tank cars at the unloading rack (see Figure 3-3). The rail spurs and the parallel storage and departure spur



SOURCE: Valero

Benicia Valero CBR . 202115.01

Figure 3-10
Unloading Rack

would be constructed between the eastern side of the lower tank farm and the western side of the fence along Sulphur Springs Creek and would occupy a portion of Avenue "A." The distance between the existing fence and the centerline of the departure/storage track would be approximately 14 feet. The centerline of the adjacent rail spur would be 15 feet from the centerline of the departure/storage track, with another 25 feet between the centerline of this rail spur to the western spur.

The proposed Project would install approximately 8,880 track-feet of new track on Refinery property. This would primarily consist of tracks servicing the tank car unloading rack and the tank car departure spur. To allow the tank cars to migrate between spurs, three new track turnouts and one crossover would be installed. The proposed Project also proposes realigning approximately 3,560 track-feet located on Refinery property.

3.4.1.3 Tank Cars

All tank cars used to transport crude oil from Roseville to Benicia would be owned or leased by Valero. Each tank car is nominally 60 feet long, with a capacity of approximately 700 barrels and a maximum gross weight on rail of 286,000 pounds.

Under regulations adopted by the Pipeline and Hazardous Materials Safety Administration (PHMSA), crude oil shipped by rail must be shipped in tank cars 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)..

In 2011, the Association of American Railroads (AAR) voluntarily imposed more stringent standards on the design of DOT-111 tank cars. AAR issued the new standards through Casualty Prevention Circular 1232 (CPC-1232). CPC-1232 established the following requirements for DOT-111 cars:

- Thicker tank shell and tank heads;
- Higher tensile strength, normalized steel to improve the ability of tank cars to survive an accident;
- Protective 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.

Tank cars that meet these new standards are generally known by the number "1232," and are referred to herein as "1232 Tank cars." All DOT-111 tank cars ordered after October 1, 2011 must meet the standards for 1232 Tank cars. DOT-111 tank cars ordered before 2011 that do not meet the standards for 1232 Tank cars are commonly known as "legacy" DOT-111 tank cars.

Valero would comply with all legal requirements applicable to the transport of crude oil by rail, including all tank specification requirements. In one respect, however, Valero would exceed legal requirements. Valero has committed that, when the PHMSA regulations call for use of a DOT-111 car, Valero would use 1232 Tank cars rather than legacy DOT-111 cars.

3.4.1.4 Ancillary Facilities

Ancillary facilities affected by the proposed Project would include crude oil offloading pumps and pipeline and associated infrastructure, spill containment structures, a firewater pipeline, groundwater wells, and a service road.

The existing spill containment structure around the lower tank farm consists of a 5- to 10-foot-tall, earthen berm to provide secondary containment for tanks. The existing liquid secondary containment structure for the tanks abutting the tank car unloading facilities would be modified to allow installation of the unloading facilities. Approximately 1,800 feet of the existing earthen containment berm along the eastern edge of the tank farm would be removed and a new, 8-foot-tall concrete berm would be constructed approximately 12 feet west of the existing earthen berm. The resulting containment capacity of the shared containment system would continue to meet or exceed minimum regulatory containment requirements.

There is an existing firewater pipeline, several groundwater monitoring wells, a compressor station, and a carbon dioxide line in the vicinity of Avenue “A.” These facilities would be relocated to accommodate the new rail tracks.

Existing groundwater monitoring wells along Avenue “A” that interfere with the proposed facilities would be relocated or removed. The wells would be replaced in-kind or abandoned, as approved by the Regional Water Quality Control Board. Abandoned wells would be sealed and capped in accordance with Solano County and California Department of Water Resources procedures.

A new service road, approximately 20 feet wide, would be added along the western side of the new unloading rail spurs.

3.4.2 Project Operation

3.4.2.1 Tank car Transport and Unloading

The tank car unloading rack would accommodate up to 25 tank cars on each side at one time (up to two, 50 tank car “switches” per day would be transported to the rack by train). The tank cars would be emptied into a single pipeline located between the two rail spurs at slightly below ground level (see Figure 3-3). Each side of the rack would have 25 unloading stations, which would “bottom-unload” closed-dome tank cars using 4-inch-diameter hose, with dry disconnect couplings that would connect to a common header between the two sides of the rack (a check valve, connected to the top of each tank car via 2-inch-diameter hose would open to allow ambient air to enter during unloading and immediately close when unloading is finished). Three new pumps would be located on the western side of a new service road between Tanks 1720 and 1716. Two pumps operating in parallel would pump the crude oil from the unloading rack header via a new 16-inch pipeline. The third pump will be installed as a spare pump. This will facilitate periodic maintenance on the primary pumps. Once emptied, the 50 tank cars would be disconnected from the rack, moved to an on-site departure spur, and then replaced by another 50-rail-car switch.

A typical tank car handling scenario is described below:

1. Tank cars carrying crude oil destined for the Refinery arrive at the UPRR Roseville railyard.

2. UPRR-operated locomotives would move up to a 50 car unit train directly from the Roseville railyard via UPRR mainlines to Benicia and then onto the Refinery unloading tracks on Refinery property, traveling at up to 50 miles per hour (mph) on the Main line. When crossing Park Road at the Refinery property entrance, the trains would travel at approximately 5 mph.

3. Up to 25 tank cars would be positioned on the unloading tracks located on each side of the unloading rack. UPRR would leave its locomotives attached to each 25 tank car train.

4. UPRR would turn over operation of the trains to Valero for offloading.

5. A check valve would be installed onto each vent valve on the top of each tank car. The vent valve on the top of each tank car would be opened and the accompanying check valve would only allow fresh air into each tank car, and would prevent release of hydrocarbon fugitive emissions to the atmosphere. At each end car and on approximately every 8 tank cars in the 25 tank car string, a hose would be connected from the tank car's vent connection to a separate "equalization header." The equalization header would ensure the vapor spaces above the stored liquid crude in the tank cars is equalized between the tank cars. Individual drain hoses would be manually connected to the bottom of each tank car by on-site workers.

6. Valero would drain the contents of each tank car by gravity into a collection pipe (collection header) and then pump the contents directly into storage tankage located in the Refinery's crude oil storage tank field.

7. After the tank cars are emptied, the empty tank cars would be moved onto the departure spur on Refinery property adjacent to the unloading rack, where a train of up to 50 empty tank cars would be reassembled in preparation for transport off-site. Prior to departure, UPRR and Valero would conduct a safety inspection and ready the train for departure.

8. UPRR would transfer the empty 50 tank car train across Park Road and then east on the UPRR mainlines returning to UPRR's Roseville railyard. UPRR would assemble up to a 100 empty tank car train and transfer it to accept new loads from the North American crude source.

UPRR owns and maintains the main line between the Roseville railyard and the Bay Area. The line is part of the Martinez subdivision. UPRR operates freight trains on the line, and allows Capitol Corridor Joint Powers Authority (Capitol Corridor) passenger trains to operate on the line.

Freight trains on the line include unit, manifest, and local trains. Unit trains carry just one commodity, such as grain or crude oil. All of the cars in a unit train are shipped together from the same origin to the same destination. Manifest trains are express trains that carry a variety of different commodities in cars with different origins and different destinations. Local trains make multiple stops at terminals along the line. All of the trains carrying crude oil to the Refinery would be unit trains travelling from an oil producing region to the Refinery.

The passenger trains are scheduled to the minute. UPRR dispatches the passenger trains so as to meet these precise schedules. Freight trains do not typically run on regular schedules. In its normal course of operation, however, UPRR dispatches freight trains so as to avoid congestion that results in delayed deliveries.

If the Project were approved, Valero would ask UPRR to schedule Valero's unit trains 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. UPRR has agreed to make all reasonable effort to comply with this request and, therefore, it is expected that Valero's unit trains will avoid crossing Park Road during the commute hours. UPRR has demonstrated the ability to regularly meet passenger train schedules -- the Capitol Corridor trains dispatched by UPRR are on time 97% of the time. One can assume that UPRR will have little difficulty scheduling trains around a three hour window and a two hour window, given their success in meeting the much more precise one-minute schedules required by Capitol Corridor. Moreover, UPRR currently avoids dispatching freight trains during the commute hours in order to ensure that freight trains do not delay the Capitol Corridor passenger trains. Valero's requested schedule, therefore, is consistent with UPRR's existing practice for dispatching freight trains.

Valero would schedule delivery of one train between the nighttime hours 8:00 PM and 5:00 AM, and a second train in the daytime hours (except during the commute hours). It would take Valero approximately 12 hours to unload each train and prepare the empty train for the return trip to Roseville. Thus, two trains would cross Park Road during the evening hours, and two would cross Park Road during the daytime hours other than the hours of 6:00 AM to 9:00 AM and 4:00 PM to 6:00 PM.

Operations noted in Steps 1 through 8 could occur at any time of day/7 days per week/365 days per year. These operations would be dynamic and subject to change based on changing business conditions.

The proposed Project could result in the addition of approximately 20 new permanent refinery personnel (four crews of five), spread among different work shifts (two shifts per day) and on different days (four crews per week).

3.5 Future Crude Oil Feedstock

The Project would allow Valero to receive North American crudes at the Benicia Refinery that currently have limited accessibility. There are many North American crudes available in the market today, with a wide range of weight and sulfur content. Available North American crudes are listed on Table 3-1.

TABLE 3-1
AVAILABLE NORTH AMERICAN CRUDES

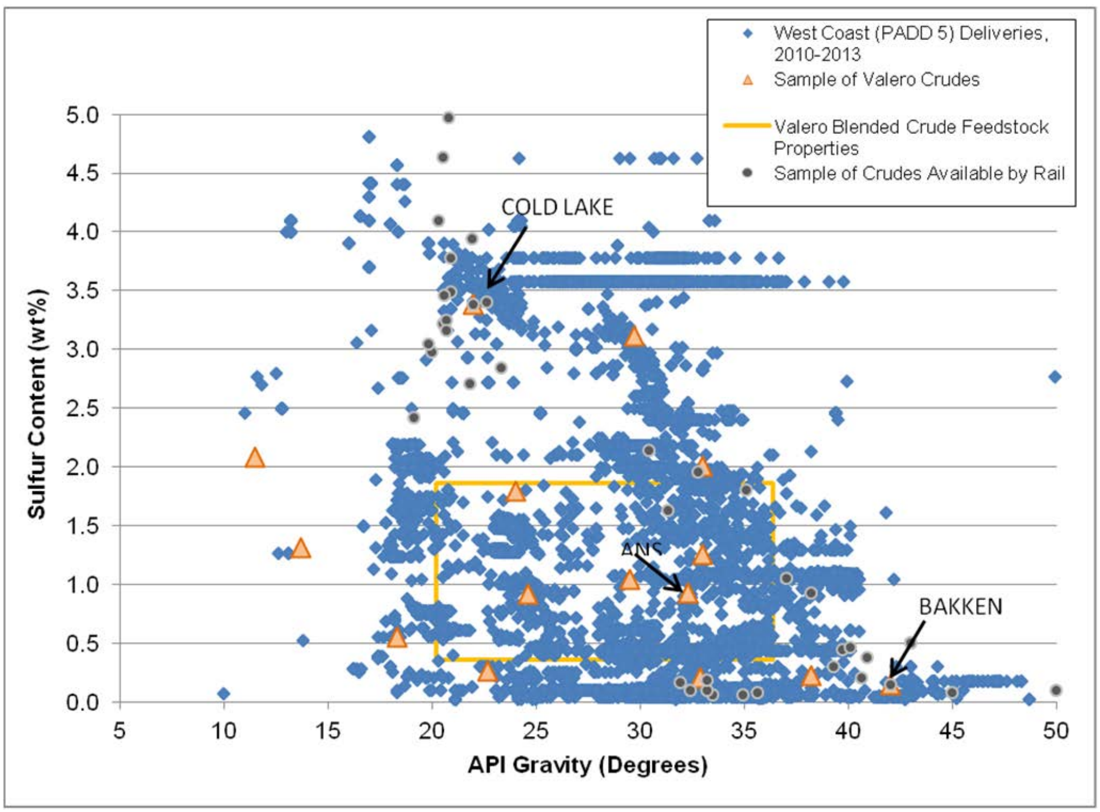
Type	Crude	Origin
Light Sweet	New Mexico Sweet	New Mexico
Light Sweet	Utah Sweet	Utah
Light Sweet	Bakken	North Dakota
Light Sweet	Canadian Manitoba Sweet	Canada
Light Sweet	Light Sweet Synthetic	Canada
Light Sweet	Husky Synthetic Blend	Canada
Light Sweet	Mixed Sweet Blend	Canada
Light Sweet	Niobar	Colorado
Light Sweet	Suncor Synthetic A	Canada
Light Sweet	Premium Albian Synthetic	Canada
Light Sweet	Long Lake Light Synthetic	Canada
Light Sweet	Sour Light Edmonton	Canada
Light Sweet	Shell Synthetic Light	Canada
Light Sweet	Syncrude Synthetic	Canada
Light Sweet	West Texas Intermediate	Texas
Light Sweet	Wyoming Sweet	Wyoming
Light Sour	Light Sour Blend	Canada
Light Sour	Peace River Sour	Canada
Medium Sour	Bow River South	Canada
Medium Sour	Sour High Edmonton	Canada
Medium Sour	Kearl Lake	Canada
Medium Sour	Midale	Canada
Medium Sour	Mixed Sour Blend	Canada
Heavy Sour	Albian Heavy Synthetic	Canada
Heavy Sour	Access Western Blend	Canada
Heavy Sour	Bow River North	Canada
Heavy Sour	Cold Lake	Canada
Heavy Sour	Cold Lake	Canada
Heavy Sour	Fosterton	Canada
Heavy Sour	Lloyd Blend	Canada
Heavy Sour	Lloyd Kerrobert	Canada
Heavy Sour	Suncor Synthetic H	Canada
Heavy Sour	Peace River Heavy	Canada
Heavy Sour	Smiley-Coleville	Canada
Heavy Sour	SHE	Canada
Heavy Sour	Western Canadian Blend	Canada
Heavy Sour	Western Canadian Select	Canada
Heavy Sour	Wabasca Heavy	Canada

SOURCE: McGovern, 2014 (See Appendix K)

Once the Project is complete, Valero plans to obtain North American crudes that are, on average, lighter and sweeter than Valero's current feedstocks. According to Valero, the North American crudes will be "Alaskan North Slope (ANS) look-alikes or sweeter" (Valero, 2013). As explained above, however, Valero selects crudes based on a range of variables that can change over time. Thus, the project could foreseeably result in Valero's purchase of any of the crudes listed above as well as others that might become available.

Moreover, Valero must blend its crude feedstocks to a narrow range of weight and sulfur content before processing. This constraint in turn limits the range of crude feedstocks that Valero can purchase. Although Valero can acquire individual crudes ranging from light sweet to heavy sour, the *average* weight and sulfur content of Valero's crude feedstocks over any given period of time must remain relatively constant.

Figure 3-11 displays the API Gravity and sulfur content of (1) all crudes delivered to west coast refineries over a three year period; (2) a sample of crudes purchased by Valero over that same period; and (3) a sample of North American crudes that would be available by rail if the Project were approved and constructed. As the Figure shows, North American crudes span a similar range of weight and sulfur content as crudes recently purchased by Valero, as well as all crudes recently purchased by west coast refineries. In any case, the average weight and sulfur content of all crudes purchased by Valero must remain with the yellow box.



SOURCE: Valero, 2013

Figure 3-11
West Coast Crude Deliveries and Sample of Crudes Available by Rail

3.6 Project Construction

The following sections provide information on the construction phase of the proposed Project.

3.6.1 Schedule

The Refinery is scheduled to begin construction in 2014 and commence operations in late-2014 or early 2015. Construction is expected to take approximately 25 weeks. Construction work would be conducted in two 10-hours shifts per day, seven days per week for most activities.

3.6.2 Site Preparation

Construction activities would take place mostly near the lower tank farm area, along Avenue "A" within the Refinery. Pipeline construction would take place in this area, which includes Avenue ”A”, Avenue "D", 9th Street, and 14th Street.

Construction activities would include excavation and grading, demolition of the existing spill containment berm, realignment of existing track, and construction of a new containment wall, unloading rack, new rail tracks, and piping and associated equipment. All new track construction / operation would comply with the California Building Codes and CPUC General Orders 26-D, 72-B, and 75-D.

Most of the area that would be disturbed by the Project lies between the tank farm containment berm and the property fence, and is already graded. A part of this affected area that is graded and paved with asphalt forms Avenue "A." New tracks would result in a cut volume of approximately 16,000 cubic yards and fill volume of 2,000 cubic yards. Containment berm work would result in a cut volume of 3,000 cubic yards. The new rail unloading rack would also result in a cut volume of 1,500 cubic yards. The net cut volume is approximately 18,500 cubic yards.

Material deliveries would include, but would not be limited to, pumps, pipes, valves, fittings, structural steel, plates, concrete, rebar, formwork, machinery and equipment, electrical equipment, electrical conduit and cable, instrumentation, insulation, gaskets, bolts, nuts, rail tracks, and fill material from off-site. Deliveries would also be required for additional services equipment (e.g., portable toilets and temporary office trailers for construction contractors).

3.6.3 Construction Labor Force

The construction workforce would include workers conducting activities inside the Refinery in and around the Project site. The total workforce is estimated to include 121 construction workers per day over the construction period.

3.6.4 Construction Materials and Services

Laydown areas located off-site north and east of the Refinery at 251 West Channel Road and 443 Industrial Way, respectively, would host proposed Project equipment, and may also contain temporary office trailers, security lighting, and other incidental features.

3.6.5 Construction Traffic

The proposed Project would generate additional construction and personal vehicle trips during the construction period. Vehicle traffic would include employees, administrative personnel, management, materials, bus drivers, and soil deliveries.

Prior to commencing construction, Valero would be required to submit a traffic control plan to the City and other agencies as may be appropriate. Public safety measures approved by the City Engineer would be maintained at key intersections or other driveways that may be affected by construction vehicle ingress and egress. No physical entrance, roadway, or intersection improvements would be needed to accommodate construction traffic volume.

Parking and on-site services would be provided for construction workers. Parking for the construction contractors would be in the two existing lots on the southern side of the main Refinery area. All temporary administrative, sanitary, and comfort services would be provided in the areas designated for these purposes on Refinery property. There would be no parking or other services off-site.

3.7 Federal Preemption of Railroad Regulation

Under the Commerce Clause of the United States Constitution, no state or local government may impose laws or regulations that unduly burden interstate commerce. Because railroads are a key component of the system of interstate commerce, most aspects of railroad operations are governed exclusively by federal law.

With respect to land use requirements, the Interstate Commerce Commission Termination Act (ICCTA) affords railroads flexibility in making necessary improvements and modifications to rail infrastructure, subject to requirements of the federal Surface Transportation Board. Congress afforded railroads this flexibility because of the integrated national nature of the American rail system and the need for uniform and consistent standards across the country. As a general matter, ICCTA broadly preempts state and local regulation of railroads. This preemption extends to “the construction, acquisition, operation, abandonment, or discontinuance of spur, industrial, team, switching, or side tracks, or facilities . . . . [T]he remedies provided under this part with respect to regulation of rail transportation are exclusive and preempt the remedies provided under Federal or State law.

The courts have repeatedly held that the ICCTA preempts state and local regulation, i.e., “those state laws that may reasonably be said to have the effect of ‘managing’ or ‘governing’ rail transportation.” *Norfolk Southern Railway Company v. City of Alexandria*, 608 F.3d 150, 157-158

(4th Cir. 2010) (city ordinance and permit regulating the transportation of bulk materials, including ethanol, was preempted by the ICCTA). The ICCTA also preempts state and local regulation of the construction and operation of rail lines. *Emerson v. Kansas City S. Ry. Co.*, 503 F.3d 1126 (10th Cir. 2007); *Friberg v. Kansas City S. Ry. Co.*, 267 F.3d 439 (5th Cir. 2001); *Green Mountain R.R. Corp. v. Vermont*, 404 F.3d 638 (2d Cir. 2005) (preconstruction permitting of a transload facility); *City of Auburn v. United States*, 154 F.3d 1025 (9th Cir. 1998) (environmental and land use permitting). As one court noted, "[i]t is difficult to imagine a broader statement of Congress' intent to preempt state regulatory authority over railroad operations." *CSX Transp. v. Georgia Public Service Comm'n*, 944 F. Supp. 1573, 1581 (N.D. Ga. 1996).[1]

UPRR has taken the position that, among other types of regulation, any limitation on the volume of product shipped or the frequency, route, or configuration of such shipments is clearly preempted under federal law. UPRR has summarized its position in a statement set forth in Appendix L.

1 While it is clear that UPRR does not require local land use permits in order to make improvements or modifications to its operations or rail lines, as noted above, UPRR states that they are committed to operating their business safely and working with the communities they serve to address concerns about those operations.

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