VALERO IMPROVEMENT PROJECT

Addendum to VIP EIR

Prepared for
City of Benicia

June 2008

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SECTION 1
Addendum Statement

1.1 Introduction

The City of Benicia (City) certified an Environmental Impact Report (EIR) (State Clearinghouse #002042122) for the Valero Improvement Project (VIP) in 2003 and granted Valero a Use Permit (PLN 2002-00022) for the VIP the same year. The Bay Area Air Quality Management District (BAAQMD) also granted an Authority to Construct (No. 5846) permit for VIP in 2003. Valero now proposes revisions to the VIP that would reduce emissions and improve efficiency while keeping to the VIP's original scope and purpose (see Section 3.2.1 of the Draft EIR). These revisions, known as the VIP Amendments, would shut down some older, more polluting equipment, add new, less polluting equipment that is also more energy efficient, and change some of the equipment proposed in the EIR. The VIP amendments would also allow Valero to comply with an EPA Consent Order that requires construction of a scrubber[1].

1.2 Statement of Purpose

Valero has submitted an Environmental Analysis (EA) to the City that concludes that an Addendum to the EIR is the appropriate CEQA documentation for the VIP Amendments. The City has performed a peer review of the EA to determine whether it provides an adequate analysis under CEQA of the environmental effects of the VIP Amendments and whether an Addendum to the EIR is the appropriate type of CEQA document. This document provides the City's peer review of Valero's EA and provides the documentation to support the City's conclusions regarding the VIP Amendments.

[1] After the date of certification for the EIR, the United States Environmental Protection Agency (USEPA) initiated a nationwide, broad-based compliance and enforcement initiative involving the petroleum refining industry. In the interest of settlement, like many other refining companies, Valero entered into a Consent Decree with the USEPA (United States, et al, v. Valero Refining Company, et al (W.D. Tex. entered November 23, 2005)). As part of the Consent Decree, Valero agreed to install additional air pollution control equipment and implement other enhancements to air pollution management practices at its refineries to reduce air emissions. Specifically for the Benicia Refinery, Valero agreed to implement a SO_2 adsorbing catalyst additive for the FCCU (referred to as flue gas desulfurization (DeSOx) catalyst). In addition, Valero agreed to install a regenerative scrubber to control SO_2 emissions from the CKR. In lieu of using DeSOx catalyst for the FCCU, Valero has elected, with EPA's approval, to install a regenerative scrubber to control SO_2 emissions from the FCCU, in addition to the CKR.

1.3 Conclusion

The City has determined that Valero's EA of its proposed VIP Amendments together with the City's peer review of the EA, provide an adequate level of analysis to support an Addendum to the EIR. This Addendum is appropriate under CEQA to address the environmental effects of the VIP Amendments because none of the conditions described under CEQA Guidelines Section 15162 calling for the preparation of an subsequent EIR or Negative Declaration have occurred (CEQA Guideline Section 15164).

This document, incorporating Valero's EA and the City's peer review of the EA constitutes an Addendum to the EIR.

1.4 Organization of this Document

This document is organized as follows:

Section 1 provides a statement of the Addendum as well as a brief summary of the City's overall conclusion.

Section 2 presents Valero's EA of the proposed VIP Amendments.

Section 3 presents the City's peer review of Valero's EA.

Appendices are provided as appropriate to support this Addendum.

SECTION 2
Valero's Environmental Analysis

Prepared for:
Valero Refining Company – California
Benicia Refinery

Environmental Analysis
Valero Improvement Project Amendments

ENSR Corporation
February 2008
Rev. May 2008
Document No.: 06993-023-300

Prepared for:
Valero Refining Company – California
Benicia Refinery

Environmental Analysis
Valero Improvement Project Amendments

Prepared By

Prepared By

Reviewed By

ENSR Corporation
February 2008
Rev. May 2008
Document No.: 06993-023-300

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List of Abbreviations

$\mu g/m^3$	micrograms per cubic meter
AAQS	Ambient Air Quality Standards
AB	Assembly Bill
ABAG	Association of Bay Area Governments
ACM	asbestos containing material
AERMOD	AMS/EPA Regulatory Model, a dispersion model recommended by the USEPA
AF/Yr	acre-feet per year
Air Liquide	Air Liquide Large Industries, U.S. LP
AMS	American Meteorological Society
API	American Petroleum Institute
ATSDR	Agency for Toxic Substances & Disease Registry
BAAQMD	Bay Area Air Quality Management District
BACT	Best Available Control Technology
Benicia Refinery	Valero Benicia Refinery
BMP	Best Management Practices
BPIPPRM	Building Profile Input Program-PRIME
Btu/hr	British thermal units per hour
BUSD	Benicia Unified School District
Cal/EPA	California Environmental Protection Agency
CalARP	California Accidental Release Prevention Program
Caltrans	California Department of Transportation
CAP	Clean Air Plan
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CCAA	California Clean Air Act
CCAR	California Climate Action Registry
CCR	California Code of Regulations
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
CFHU	Catalytic Feed Hydrotreater Unit
City	City of Benicia
CKR	Fluid Coker
CMP	Congestion Management Program
CO	carbon monoxide
CO_2	carbon dioxide
CWA	Clean Water Act
dBA	decibels above reference noise
DEM	Digital Elevation Model
DNL	Day/night noise level (adds 10 decibels to night time noise)
DPM	diesel particulate matter
Dscfm	dry standard cubic feet per minute
EA	Environmental Analysis
E.O.	Executive Order

List of Abbreviations

EIR	Environmental Impact Report
EMFAC	California Air Resources Board EMission FACtors model for vehicle emissions
ESP	Electrostatic precipitator
^oF	Degrees Fahrenheit
FCCU	Fluid Catalytic Cracking Unit
FEMA	Federal Emergency Management Agency
GAQM	Guidelines on Air Quality Models (USEPA)
GEP	Good Engineering Practice
gpd	Gallons per day
gpm	Gallons per minute
H_2O	Water
H2U	Hydrogen Unit
H_2SO_4	Sulfuric Acid
HARP	Hot Spots Analysis and Reporting Program
HHV	higher heating value
HI	Hazard Indices
HP	Horsepower
HPU	Hydrogen Purification Unit
HRA	Health Risk Assessment
IG	General Industrial
ISC	Industrial Source Complex
ISCST3	Industrial Source Complex – Short Term 3
km	Kilometer
L_{eq}	Equivalent Noise Level
Lbs/Hr	Pounds per Hour
LOS	level of service
m	Meter
MGD	million gallons per day
MMBtu/hr	million British thermal units per hour
MMscfd	million standard cubic feet per day
MTBE	methyl tertiary butyl ether
MTC	Metropolitan Transportation Commission
MW	Megawatt
NAD27	North American Datum 1927
NO_2	Nitrogen Dioxide
NO_X	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NRU	Naphtha Reformer Unit
NSR	New Source Review
O_2	oxygen
OEHHA	Office of Environmental Health Hazard Assessment
PG&E	Pacific Gas and Electric
PM10	fine particulate matter less than 10 microns in diameter

List of Abbreviations

PMI	point of maximum impact
POCs	precursor organic compounds
ppmv	parts per million by volume
ppmvd	parts per million by volume, dry basis
PS	Pipe Still
PSA	Pressure Swing Adsorption
psi	Pounds per Square Inch
REL	reference exposure level
RFG	Refinery fuel gas
RH	relative humidity
RMP	Risk Management Plan
RWQCB	Regional Water Quality Control Board
SAM	Sulfuric Acid Mist
SCFD	standard cubic feet per day
SCR	Selective Catalytic Reduction
SNCR	Selective Non-Catalytic Reduction
SO_2	sulfur dioxide
SO_3	Sulfur Trioxide
SRU	Sulfur Recovery Unit
STA	Solano Transportation Authority
TAC	toxic air contaminants
TBACT	Best Available Control Technology For Toxics
TGU	Tail Gas Hydrogenation Unit
TMDL	Total maximum daily load
Tonnes	Metric Tons
TSCA	Toxic Substances Control Act
ULSD	ultra low sulfur diesel
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
UWMP	Urban Water Management Plan
Valero	Valero Refining Company – California
VIP	Valero Improvement Project
WWTP	Wastewater Treatment Plant

Executive Summary

This Environmental Analysis (EA) outlines proposed changes (VIP Amendments) to the Valero Improvement Project (VIP) which is currently being implemented at the Valero Refining Company – California's (Valero) refinery in Benicia. A Certified Environmental Impact Report (EIR) (State Clearinghouse #002042122) was prepared for the original VIP in 2003. A City of Benicia (City) Use Permit (PLN 2002-00022) and Bay Area Air Quality Management District (BAAQMD) Authority to Construct (No. 5846) were also obtained for the project in 2003. This document supersedes the Environmental Assessment submitted to the City of Benicia in October 2007 as it includes updated information related to the project elements currently being considered.

The proposed VIP Amendments analyzed in this document have been primarily designed to further reduce environmental impacts of the original project through implementation of additional energy efficiency, air pollution control, and flare minimization measures. The overall scope and purpose of VIP remains unchanged by the VIP Amendments. Since the time VIP was approved in 2003, Valero has continued to perform detailed engineering and design work for later phases of VIP. In addition to new energy efficiency, air pollution control, and flare minimization elements, VIP Amendments also include some minor clarification of technical details such as the location of construction areas, updated utilization of utilities (natural gas, electricity, water, etc.), and adding a new desalter at the Pipe Still (PS) to wash salts and solids from crude oil feedstock.

In the original VIP, a new Main Stack Scrubber was proposed to treat sulfur dioxide (SO_2) emissions from only the Fluid Coker (CKR) Unit. Now, the new scrubber is modified by the VIP Amendments to treat SO_2 from both the CKR and Fluid Catalytic Cracking Unit (FCCU). This will be accomplished by placing carbon monoxide laden gases (CO gas) from the CKR and FCCU into two new, more efficient PS furnaces, replacing the existing PS Furnaces and the PS Helper furnace proposed in the Certified EIR. The new scrubber will exhaust through a new, dedicated stack rather than the existing Main Stack, and will be designated the FCCU/CKR Scrubber. The new furnace and scrubber configuration will further reduce emissions of SO_2, nitrogen oxides (NO_X), sulfur trioxide (SO_3), and greenhouse gases (GHG).

The original VIP proposed significant modifications to the existing Hydrogen Unit (H2U) for the purpose of meeting the hydrogen demand of VIP. To meet the same hydrogen demand, the VIP Amendments propose to replace one of the two existing H2U trains with a new, more efficient H2U. The new configuration significantly reduces criteria pollutant and GHG emissions. Additionally, since the new H2U will use refinery fuel gas as a primary feed stock, there will be fewer instances of flaring when the refinery has an over supply of refinery fuel gas. Startup and shutdown of the new H2U will not result in flaring, and there will be no new flare installed as a result of the VIP Amendments.

In addition to reducing emissions, the environmental impacts of the VIP Amendments are expected to be minimal and do not result in new significant impacts nor substantially increase the severity of previously disclosed significant impacts beyond those already identified in the Certified EIR. For example, the VIP Amendments and cumulative projects will not result in an increase in water consumption over the Certified EIR, and there will be negligible impacts to public health/safety, noise, and aesthetics. The VIP Amendments addressed by this environmental analysis will also have the following net reductions when compared to the currently permitted VIP:

- SO_2 emission reduction of more than 2,300 tons per year;
- NO_X emission reductions of more than 270 tons per year;
- GHG emission reductions of more than 11,000 Tonnes per year carbon dioxide (CO_2) equivalent; and
- Flaring reductions (not included in the above reductions).

The supporting EA can be used by the City to assess the appropriate approach to satisfying the City's obligations under the California Environmental Quality Act (CEQA). The preliminary analysis of this document suggests that an Addendum to the Certified EIR may be appropriate.

1.0 Introduction

The Valero Refining Company – California (Valero) has prepared this environmental document to amend its current Use Permit application, submitted to the City of Benicia (City) for amendments to Use Permit (PLN 2002-00022) for the Valero Improvement Project (VIP) at the Valero Benicia Refinery (Benicia Refinery). Use Permit PLN 2002-00022 was previously issued in April 2003, and is being amended to reflect certain changes in VIP that result in environmental and technological enhancements. The VIP proposed to implement a series of modifications and additions to the Benicia Refinery to update refinery equipment and to better align it to current market demands.

These amendments include the following changes to the VIP project scope:

(1) Further reductions to air emissions;

(2) Improved energy efficiency and reductions in emissions of greenhouse gases (GHGs);

(3) Measures to minimize flaring; and

(4) Minor clarifications to certain technical details of the VIP scope.

For the purposes of this environmental analysis, the collective amendments to the project, as outlined above, will be referred to as the "VIP Amendments". The VIP Amendments allow Valero to implement project refinements that will better achieve operational efficiency, air emissions reductions, and minimizations of flaring. The VIP Amendments will not increase the permitted capacities of the Benicia Refinery's process units beyond the levels identified in the Certified EIR and included in current Bay Area Air Quality Management District (BAAQMD) air quality permits and the City of Benicia Land Use Permit.

1.1 CEQA

This environmental analysis document has been prepared as supplemental information to assist the City of Benicia's Planning Department in its role as the California Environmental Quality Act (CEQA) lead agency for VIP Amendments.

As required by CEQA (California Public Resources Code 21000 et seq.) and in compliance with the State CEQA Guidelines (Title 14 California Code of Regulations [CCR] 15000 et seq.), this analysis addresses the environmental impact of the installation, construction, and operation of certain modifications to various project components previously approved and certified under the VIP Environmental Impact Report (Certified EIR) (State Clearinghouse #002042122), completed in March 2003 and certified in April 2003. In addition, this analysis considers whether new or substantially more severe impacts would result from refinements to the project, changed circumstances, or new information associated with the proposed project amendments, which were not known and could not have been known with the exercise of due diligence at the time the EIR was certified as complete.

CEQA requires state and local government agencies to consider the environmental consequences of projects over which they retain discretionary authority even after an EIR has been certified. Under certain circumstances, additional CEQA documentation is required. However, Section 21166 of the California Public Resources Code provides that when an EIR has been prepared for a project, no subsequent or supplemental EIR is required unless major revisions to the prior EIR are necessary due to (i) substantial changes proposed in the project, (ii) substantial changes in the surrounding circumstances, or (iii) the availability of new information that was not known when the prior EIR was certified. To implement this provision, Section 15162(a) of the CEQA Guidelines (CCR Title 14) provides that a subsequent EIR be prepared for a project after an EIR has been certified if substantial evidence in light of the whole record supports any of the following conclusions.

15162. Subsequent EIRs and Negative Declarations

(a) When an EIR has been certified or a negative declaration adopted for a project, no subsequent EIR shall be prepared for that project unless the lead agency determines, on the basis of substantial evidence in the light of the whole record, one or more of the following:

(1) Substantial changes are proposed in the project which will require major revisions of the previous EIR or negative declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects;

(2) Substantial changes occur with respect to the circumstances under which the project is undertaken which will require major revisions of the previous EIR or negative declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects; or

(3) New information of substantial importance, which was not known and could not have been known with the exercise of reasonable diligence at the time the previous EIR was certified as complete or the negative declaration was adopted, shows any of the following:

(A) The project will have one or more significant effects not discussed in the previous EIR or negative declaration;

(B) Significant effects previously examined will be substantially more severe than shown in the previous EIR;

(C) Mitigation measures or alternatives previously found not to be feasible would in fact be feasible, and would substantially reduce one or more significant effects of the project, but the project proponents decline to adopt the mitigation measure or alternative; or

(D) Mitigation measures or alternatives which are considerably different from those analyzed in the previous EIR would substantially reduce one or more significant effects on the environment, but the project proponents decline to adopt the mitigation measure or alternative.

(b) If changes to a project or its circumstances occur or new information becomes available after adoption of a negative declaration, the lead agency shall prepare a subsequent EIR if required under subsection (a). Otherwise the lead agency shall determine whether to prepare a subsequent negative declaration, an addendum, or no further documentation.

(c) Once a project has been approved, the lead agency's role in project approval is completed, unless further discretionary approval on that project is required. Information appearing after an approval does not require reopening of that approval. If after the project is approved, any of the conditions described in subsection (a) occurs, a subsequent EIR or negative declaration shall only be prepared by the public agency which grants the next discretionary approval for the project, if any. In this situation no other responsible agency shall grant an approval for the project until the subsequent EIR has been certified or subsequent negative declaration adopted.

(d) A subsequent EIR or subsequent negative declaration shall be given the same notice and public review as required under Section 15087 or Section 15072. A subsequent EIR or negative declaration shall state where the previous document is available and can be reviewed.

If the criteria under Section 15162 would require a subsequent EIR, CEQA Guidelines Section 15164 indicates that an agency may choose to prepare an Addendum, rather than a subsequent EIR, if only minor additions or changes would be necessary to make the previous EIR adequately apply to the project in the changed situation. As described in **Section 3.0** of this document, none of the conditions described in CEQA Guidelines Sections 15162 or 15163[1] has occurred. Under such circumstances, CEQA Guidelines Section 15164 allows for the preparation of an Addendum as described below:

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1. CEQA Guidelines Section 15163 (a) provides that the lead or responsible agency may choose to prepare a supplement to an EIR rather than a subsequent EIR if:

15164. Addendum to an EIR or Negative Declaration

(a) The lead agency or responsible agency shall prepare an addendum to a previously certified EIR if some changes or additions are necessary, but none of the conditions described in Section 15162 calling for preparation of a subsequent EIR have occurred.

(b) An addendum to an adopted negative declaration may be prepared if only minor technical changes or additions are necessary or none of the conditions described in Section 15162 calling for the preparation of a subsequent EIR or negative declaration have occurred.

(c) An addendum need not be circulated for public review, but can be included in or attached to the final EIR or adopted negative declaration.

(d) The decision making body shall consider the addendum with the final EIR or adopted negative declaration prior to making a decision on the project.

(e) A brief explanation of the decision not to prepare a subsequent EIR pursuant to Section 15162 should be included in an addendum to an EIR, the lead agency's findings on the project, or elsewhere in the record. The explanation must be supported by substantial evidence.

As the lead agency under CEQA, the City will consider the potential environmental impacts of the proposed VIP Amendments when it decides whether or not to approve these changes as part of VIP and will select the appropriate method to revise the Certified EIR. The environmental analysis presented in **Section 3** and **Section 4** of this document is intended to assist the City's planning and decision-making process.

The preliminary conclusion of the environmental analysis in this document is that the proposed VIP Amendments, described in detail in **Section 2.0**, neither result in new significant impacts nor substantially increase the severity of previously disclosed significant impacts beyond those already identified in the Certified EIR. Thus, only minor additions or changes to the Certified EIR are necessary, and an addendum to the Certified EIR is appropriate as outlined in CEQA Guidelines Sections 15162 and 15164. An addendum would augment the previously Certified EIR to the extent necessary to address the conditions described in CEQA Guidelines Section 15164.

1.2 Scope of This Document

This document describes the proposed VIP Amendments under consideration and describes the potential incremental environmental impacts of implementing the changes proposed by the VIP Amendments. The following resource topics are addressed in this updated analysis for the VIP Amendments:

- Aesthetics, Visual Quality, Light and Glare
- Air Quality
- Greenhouse Gases (GHGs)
- Biological Resources
- Cultural Resources
- Energy
- Geology, Soils, And Seismicity
- Public Health
- Public Safety
- Hydrology and Water Quality
- Land Use, Plans, and Policies
- Noise
- Public Services
- Transportation and Traffic
- Utilities and Service Systems
- Agricultural Resources
- Mineral Resources
- Population and Housing

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(1) Any of the conditions described in Section 15162 would require the preparation of a subsequent EIR, and

(2) Only minor additions or changes would be necessary to make the previous EIR adequately apply to the project in the changed situation.

For ease of comparison to the original document, the above resource topic areas correspond to those analyzed in the Certified EIR. As a result, this list does not exactly match the current CEQA Guidelines Appendix G outline of suggested resource impact areas to be analyzed for a project. However, with the exception of GHGs, agricultural resources, mineral resources, and population and housing, the other Appendix G resource impact areas were addressed in the Certified EIR under other sections. (For example, the public health and public safety sections include analyses of hazards and hazardous materials impacts, and the public services section includes an analysis of recreation impacts. For completeness, agricultural resources, mineral resources, and population and housing have been added to the analyses of VIP Amendments, even though they were not within the scope of the Certified EIR because the City found that there were no impacts to these resources resulting from VIP.)

Due to increasing attention to the issue of GHG emissions following the passage of AB 32 and other regulatory developments, it is appropriate to include this analysis here. As documented in **Section 3.1.3**, the VIP Amendments will not result in a net increase in GHG emissions. Therefore, this analysis does not reveal a new significant impact related to GHG emissions.

1.2.1 Impact Terminology

The following terminology is used in this environmental analysis to describe the levels of significance of the incremental impacts that could potentially result from the proposed VIP Amendments:

- The Project is considered to have *no impact* on a particular resource topic if the analysis concludes that it will not affect that particular resource.
- An impact is considered *less than significant* if the analysis concludes that the impact will cause no substantial adverse change to the environment and that it will not require mitigation.
- An impact is considered *less than significant with mitigation incorporated* if the analysis concludes that, with the inclusion of mitigation measures to which the applicant has agreed, the impact will cause no substantial adverse change to the environment.
- A potential impact is considered *significant* if the analysis concludes that the impact exceeds applicable regulatory thresholds of significance and cannot be reduced to a less-than-significant level with mitigation.

In assessing the potential impacts of the VIP Amendments, the question is not whether the potential incremental impacts are significant compared with existing physical conditions (i.e., conditions without implementing any part of VIP). Rather, the question is the significance of impacts that would be caused by the proposed VIP Amendments, and comparing these with the level of significance of impacts disclosed in the Certified EIR. This approach is expressly sanctioned by the governing statutory and regulatory provisions and case law. (See CEQA § 21166; CEQA Guidelines § 15162; *Bowman v. City of Petaluma (*1986) 185 Cal.App.3d 1065.

For consistency, impact assessment methodologies used for the current analysis for the VIP Amendments are the same as those previously employed in the Certified EIR.

1.3 Cumulative Projects

Cumulative projects are assessed under CEQA to determine whether a project's incremental effect when combined with the effects of other projects does not result in a cumulatively considerable impact to the environment.

The following is an updated list of the activities and projects considered in evaluating cumulative impacts of the VIP Amendments, followed by a list of the projects no longer relevant or applicable to the analysis.

Benicia Refinery Projects Independent of VIP and VIP Amendments

Benicia Refinery-associated projects under consideration for the VIP Amendments cumulative impact analysis include the following:

- Operation (construction is completed) of the Cogeneration Plant;
- Treatment of wastewater from the Benicia Asphalt Refinery (formerly referred to as the Huntway Asphalt Refinery);
- Operation of the Naphtha Reformer Unit (NRU) Catalyst Regeneration Facility Project; and
- Ongoing refinery maintenance, including future turnarounds.

The following projects unrelated to the Benicia Refinery were identified in the Certified EIR to have construction schedules that could overlap with VIP and are still relevant to the cumulative impact assessment:

- Construction of the Benicia Bridge;
- Development of the Seeno Benicia Business Park; and
- Southampton Tourtelot Development.

In addition to those previously analyzed in the Certified EIR, four other projects have been identified by the City of Benicia as possible projects and plans underway in the vicinity of the Benicia Refinery. These projects and plans are:

- The Lower Arsenal Mixed Use Specific Plan;
- Downtown Mixed Use Master Plan;
- The Marina Area Storm Drain Project; and
- Construction and operation of the proposed Air Liquide Hydrogen Pipeline or the competing Air Products Hydrogen Pipeline.

Finally, other projects that were considered in Section 5.0 of the Certified EIR have either been completed (MTBE Phase Out Project, and Light Ends Rail Rack Arm Drains Project) or are no longer under consideration for implementation (Selective Hydrogenation Facilities Project). Therefore, the list of projects considered for the cumulative impact assessment of the VIP Amendments is incrementally different from that considered for the original VIP. **Section 4.2** of this document includes a cumulative impact analysis for the VIP Amendments.

1.4 Organization of This Document

The CEQA Guidelines do not specify the format of environmental analyses. In the absence of a prescribed format, the environmental analysis presented for the VIP Amendments has been organized as follows:

Section 1.0 ***Introduction*** identifies the purpose, scope, terminology, and organization of the environmental analysis.

Section 2.0 ***Project Description*** describes the specific refinery modifications that comprise the VIP Amendments.

Section 3.0 ***Environmental Checklist*** discusses the effects of the proposed VIP Amendments on each resource topic in terms of the impacts identified in the Certified EIR.

Section 4.0 ***Other CEQA Considerations*** discusses cumulative impacts of the VIP Amendments with other regional projects, and unavoidable impacts.

An impacts summary table comparing VIP Amendments impacts to the impact levels set by the Certified EIR is provided at the end of each resource topic discussion in **Section 3.0**.

2.0 Project Description

2.1 Summary of VIP Amendments

The VIP Amendments include the following modifications to the scope of VIP as presented in the Certified EIR:

2.1.1 Scrubber to Reduce Emissions from the Fluid Catalytic Cracking Unit and the Fluid Coker

The Main Stack Scrubber evaluated by the Certified EIR provides for treatment of combusted CO gas from the Fluid Coker (CKR). Under the VIP Amendments, Valero is proposing to treat both CKR and Fluid Catalytic Cracking Unit (FCCU) combusted CO flue gas in a common scrubber. Accordingly, the new scrubber will be described as the FCCU/CKR Scrubber. This approach will achieve significantly greater reductions in sulfur dioxide (SO_2) emissions from the CKR and FCCU than estimated in the Certified EIR. The FCCU/CKR Scrubber to be installed under the VIP Amendments will utilize regenerative amine technology, as previously evaluated by the Certified EIR, but will operate at a higher pressure. The high-pressure design will enable a new pre-scrubber which will be installed as part of the VIP Amendments to capture catalyst fines and coke fines (primarily ash). This will allow the scrubber system to provide for the equivalent control of particulate emissions and eliminate the need to operate the existing electrostatic precipitators (ESPs). Additionally, the pre-scrubber will remove about half of the sulfur trioxide (SO_3) which is not removed as effectively by the ESPs. As described in the Certified EIR, the amine solution will be regenerated in another process vessel allowing for the solution's reuse.

The Benicia Refinery's two existing PS furnaces, F-101 and F-102, cannot operate at the higher pressures necessary for the FCCU/CKR Scrubber to be installed under the VIP Amendments. Therefore, F-101 and F-102 will be shutdown and replaced by two new, high-pressure furnaces, to be designated F-105 and F-106. F-105 and F-106 will use selective catalytic reduction (SCR) for NO_X emissions control. The gas stream entering the SCR will have a higher particulate load than is typical for sources controlled by SCR technology. As discussed below, Valero will use an SCR design that will ensure that the SCR catalyst will not be contaminated by the particulate matter (PM) in the gas stream.

PM emissions downstream of F-105 and F-106 will be controlled by the pre-scrubber and the regenerative amine scrubber. The existing PS furnaces F-101 and F-102 will be decommissioned. Since F-101 and F-102 will no longer be used and PM emissions from F-105 and F-106 will be controlled by the pre-scrubber, the existing ESPs will not be needed and will be turned off to reduce electrical power demand.

The FCCU/CKR Scrubber will exhaust through a new dedicated stack. An additional small source, the F-103 furnace, which currently exhausts through the Main Stack will continue to exhaust through the Main Stack. After implementation of the VIP Amendments, only the two emergency tail gas incinerator vents from the refinery's Sulfur Recovery Units (SRUs) and F-103 will continue to be routed to the existing Main Stack.

The Certified EIR included a new refinery fuel gas (RFG) fired PS Helper Furnace. In the current configuration of the VIP Amendments, this furnace is not needed and will not be installed.

2.1.2 New Hydrogen Unit to Improve Energy Efficiency and Reduce Air Emissions

The currently approved VIP Use Permit provides for an increase in production of an existing hydrogen unit (H2U) and installation of a Pressure Swing Adsorption (PSA) Unit for improved hydrogen purity. In order to capitalize on improved energy efficiency inherent in more modern technology, Valero now plans to shut down one of the two trains of the existing H2Us and construct a new H2U. Benefits of the new H2U include greater system efficiency, decreased emissions per unit of hydrogen produced, and decreased consumption of commercial natural gas in favor of consuming RFG as the feed stock for producing hydrogen.

By consuming RFG, the new H2U will improve the refinery's fuel gas balance, which will reduce the incidences of excess fuel gas, and thus, reduce flaring. In addition, the increased energy efficiency of the modern H2U will reduce carbon dioxide (CO_2) emissions and GHGs when compared with the previously planned expansion of one train of the existing hydrogen unit evaluated by the Certified EIR. At this time, Valero does not plan to add the previously approved PSA Unit to the remaining operational H2U train. Omitting this project component will reduce the electrical demand of the VIP Amendments, thereby reducing indirect GHG emissions relative to VIP.

2.1.3 Other Minor Project Modifications

In addition to the pollution reduction, flare minimization, and energy efficiency elements described in the preceding two sections, the VIP Amendments provide clarifications of technical details related to several of the original VIP project components. However, it should be emphasized that the VIP Amendments do not seek additional increases in throughput or production rates beyond those originally assessed by the Certified EIR and authorized under the existing Use Permit issued by the City of Benicia and the Authority to Construct air permit issued by the Bay Area Air Quality Management District (BAAQMD).

The technical basis for these project components is discussed in the Certified EIR with as much detail as was reasonably possible at the time the EIR was certified. Upon completion of further engineering and operational design development, Valero is now able to provide additional technical information on construction, installation, and operation of these components. The additional information gained in design development does not significantly alter the scope of the originally identified project components. Rather it clarifies details pertinent to the technology Valero has selected for process equipment as well as provides additional information that affirms the conclusions regarding environmental impacts.

2.2 Basic Project Information

1. **Project Title:**

   Valero Improvement Project (VIP) Amendments

2. **Lead Agency Name and Address:**

   Community Development Department
   City of Benicia
   250 East "L" Street
   Benicia, CA 94510

3. **Contact Person and Phone Number:**

   Charlie Knox
   (707) 746-4280

4. **Project Location:**

   Valero Refining Company – California
   Benicia Refinery
   3400 East Second Street
   Benicia, CA 94510-1005

5. **Project Sponsor's Name and Address:**

   Todd M. Lopez, P.E.
   Environmental Manager
   Valero Benicia Refinery
   3400 East Second Street
   Benicia, CA 94510-1005

6. **General Plan Designation:**

   General Industrial 7
   Zoning: General Industrial (IG)

7. **Description of Project: (Describe the whole action involved, including, but not limited to later phases of the project, and any secondary, support, or off-site features necessary for its implementation. Attach additional sheets if necessary.)**

   See **Section 2.0** Project Description.

8. **Surrounding land uses and setting: Briefly describe the project's surroundings:**

   Land uses in the vicinity of the Benicia Refinery are characterized by general industrial and low-density residential development, with small areas of medium- to high-density residential, public/quasi public, limited industrial, and parkland.

9. **Other public agencies whose approval is required (e.g., permits, financing approval, or participation agreement.)**

   The construction and operation of the VIP Amendments will also require an Authority to Construct and Permit to Operate from the BAAQMD, and necessary building permits for the City's Building Department.

2.3 Project Location

The VIP Amendments will be located within the existing property boundaries of the Benicia Refinery as displayed in **Figure 2.3-1**.

Locations of the individual project components within the Benicia Refinery property are shown in **Figures 2.3-2** and **2.3-3**. **Figure 2.3-2** displays the project locations on a plot plan drawing where the various refinery process units are clearly outlined. This figure identifies locations of major project equipment for each project component. It should be noted that some equipment shown in **Figure 2.3-2** is currently permitted and is not part of the revision proposed by the VIP Amendments; however, they will be constructed based on the project schedule presented in the VIP Amendments.

Figure 2.3-3 displays the project locations on an aerial photograph of the Benicia Refinery. Shaded areas indicate general locations where project improvements will be installed (e.g., FCCU/CKR Scrubber, H2U, other miscellaneous equipment).

Figure 2.3-1 Project Location with Property Boundaries

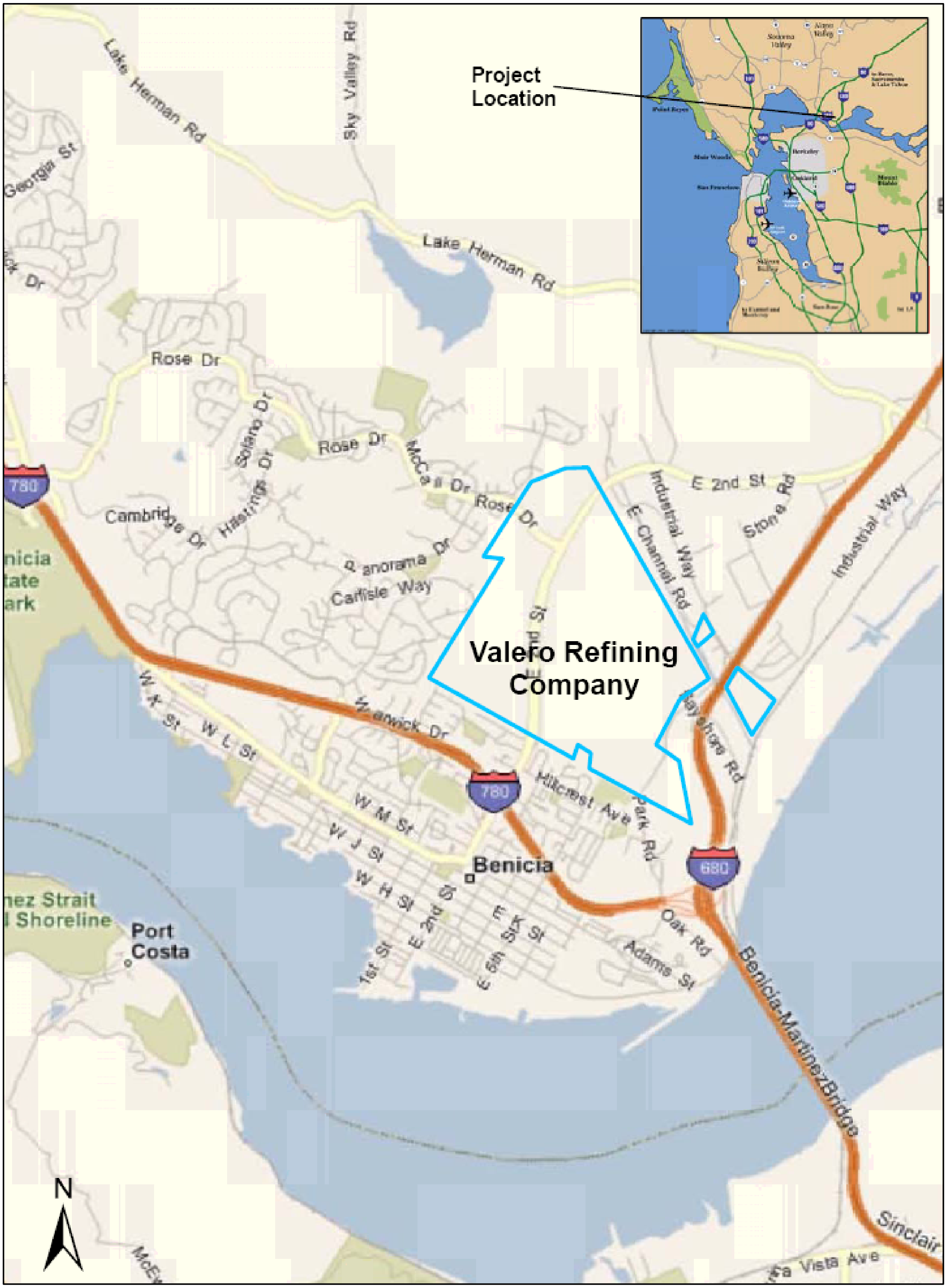


Figure 2.3-2 VIP Amendments Equipment Locations

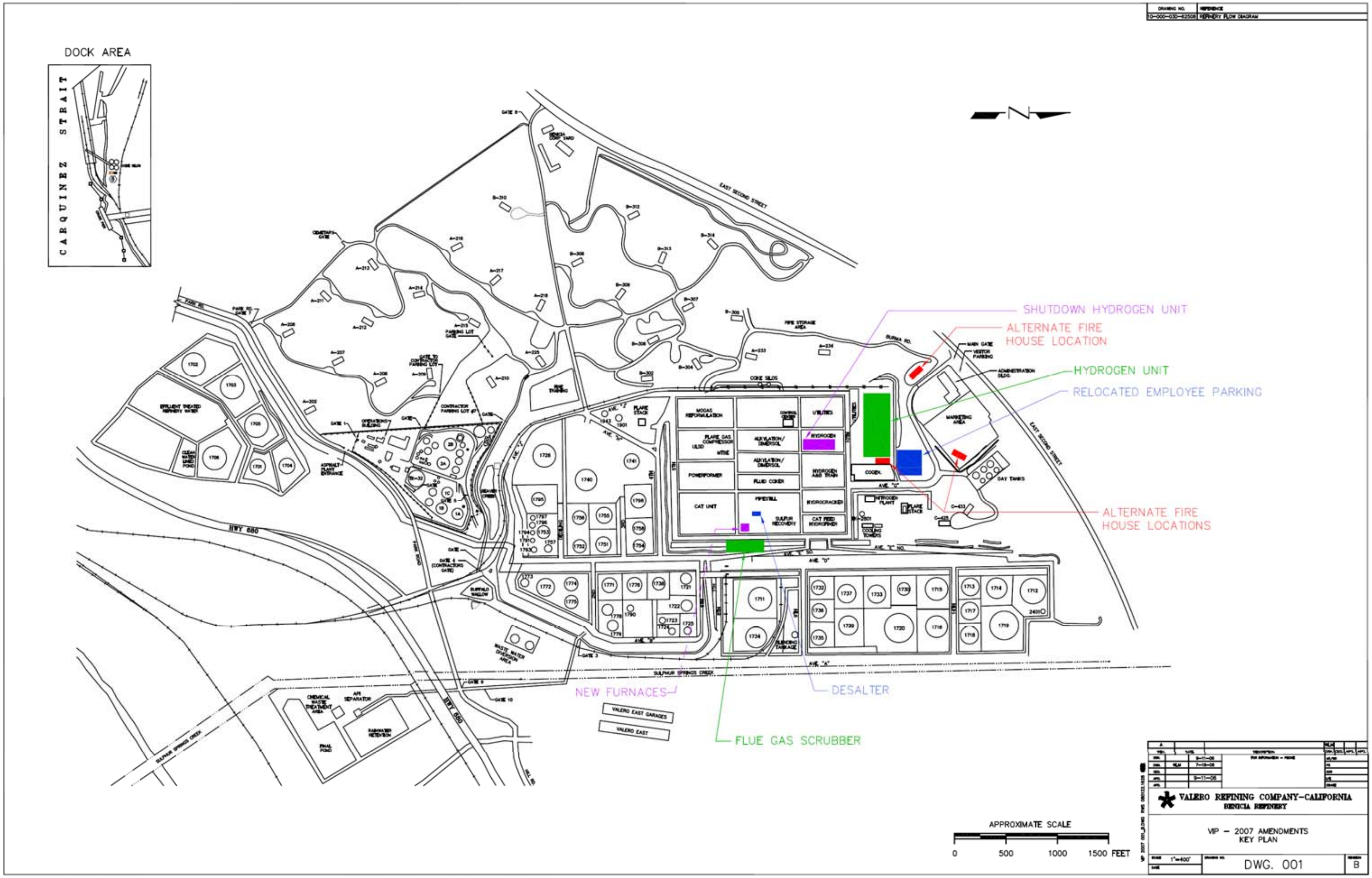


Figure 2.3-3 Project Location Aerial Photograph

2.4 Project Components

2.4.1 Introduction

The following discussion of project components amended under this application provides information about equipment and operations presently permitted under the Certified EIR and the modifications proposed under the VIP Amendments. In addition, information relating to the location and specifications of major equipment associated with each project component and a discussion of the associated processes are also included.

Table 2.4.1-1 summarizes VIP Amendment Project elements compared to those in the Certified EIR.

Table 2.4.1-1 VIP Amendments Components Compared to the Certified EIR Components

VIP Amendment Component	Component Description – Certified EIR	Component Description – VIP Amendments
FCCU/CKR Scrubber		
• Fired Heater	Pipe Still helper furnace included. Fired on RFG. F-101 and F-102 which feed CO Gas and RFG not modified.	Remove PS Furnaces F-101 and F-102 from service and replace with new high-pressure PS furnaces F-105 and F-106. Higher pressure operation improves operability of the downstream scrubber for better particulate and SO_3 removal. RFG–fired PS Helper Furnace not included. Demo F-102.
• Unfired Waste Heat Boiler	Not included.	Included to improve overall energy efficiency and reduce water evaporated in FCCU/CKR Scrubber.
• Particulate Removal	ESPs modified to separate flow of CO gas from CKR and CO gas from FCCU	Pre-scrubber vessel included for improved removal of PM and SO_3. The pre-scrubber will replace the ESPs.
• Caustic Polisher	Not included	A caustic polisher section is included with the scrubber upon further engineering to assure efficacious removal of SO_2 under all conditions.
• SCR for NO_X control at New Furnaces	Included in BAAQMD Authority to Construct Permit (for PS Helper Furnace).	Included.
• Regenerator with Amine Purification	Included	Included
• Exhaust Gas Reheat	Included	Instead of heating scrubber discharge directly which was determined to present an unacceptable corrosion risk to the equipment, a similar amount of ambient air will be heated with steam and added to the new stack on the FCCU/CKR Scrubber discharge to reduce corrosion and formation of visible vapor plumes.
• Additional Soot Blowing	Not included	Additional soot blowing steam required for unfired waste heat boiler and SCRs
• Quench Subcooling	Not included	Quench Subcooling of pre-scrubber water to improve amine system performance and to reduce water consumption and formation of visible vapor plumes.
• New Scrubber Stack	Not included; exhaust through Main Stack	New stainless steel stack to exhaust emissions from new FCCU/CKR Scrubber
Hydrogen Plant		
• Standalone PSA	Included on existing H2U to improve hydrogen impurity	Not included; the new energy-efficient and lower emitting hydrogen plant will meet the Certified EIR objectives.
• Process Modifications at NRU and Hydrogen Plant	Included to provide 30 MMSCF/day increase in production.	Not included the new energy-efficient and lower emitting hydrogen plant will meet the Certified EIR objectives.
• New Hydrogen Plant	Not included.	Shutdown one of two existing hydrogen trains and replace with a new hydrogen production unit with modern technology. Replacement is 30 MMSCF/day greater than the train shutdown to provide same production level of hydrogen as in Certified EIR. Will include hydrogen purification (e.g., PSA). New technology reduces energy consumption, lowers emissions, improves reliability, and reduces flaring.

VIP Amendment Component	Component Description – Certified EIR	Component Description – VIP Amendments
Other Project Changes		
• Second Stage Desalter	Not included	Further engineering has determined that an additional desalter vessel is required to meet Certified EIR objectives.
• Increase FCCU air rate by increasing firing rate of C-702 driver (GT-702)	Not included	Increasing air rate to FCCU requires additional input from compressor C-702. This requires increasing the firing rate of gas turbine GT-702 by 70 MMBtu/hr.
• Additional Fugitive Piping Components	Partly Included	As a result of further engineering and proposed process modifications, additional piping components such as pumps, flanges, and valves are required.

2.4.2 New FCCU/CKR Scrubber

The Certified EIR evaluated installation of a Main Stack Scrubber that utilized regenerative amine technology to control SO_2 emissions from the CKR. The scrubber is permitted in both the City Use Permit and the BAAQMD Authority to Construct. The scrubber project has not been implemented as of the date of filing this Use Permit application for the VIP Amendments. As stated in the Certified EIR, the primary purpose of the new Main Stack Scrubber was to enhance the Benicia Refinery's capability to control SO_2 emissions from the CKR.

The VIP Amendments propose to modify the design of this scrubber. The modified design of the FCCU/CKR Scrubber will treat combusted CO flue gas from both the CKR and the FCCU. This proposed FCCU/CKR Scrubber will use the same regenerative amine system technology described by the Certified EIR. The existing PS furnaces, F-101 and F-102, will be shutdown and replaced with new PS furnaces F-105 and F-106. The combined exhaust gas will be discharged through a new, dedicated stack rather than the existing Main Stack. The proposed PS Helper Furnace described in the Certified EIR will not be installed.

After the date of certification for the EIR, the United States Environmental Protection Agency (USEPA) initiated a nationwide, broad-based compliance and enforcement initiative involving the petroleum refining industry. In the interest of settlement, like many other refining companies, Valero entered into a Consent Decree with the USEPA (United States, et al, v. Valero Refining Company, et al (W.D. Tex. entered November 23, 2005)). As part of the Consent Decree, Valero agreed to install additional air pollution control equipment and implement other enhancements to air pollution management practices at its refineries to reduce air emissions. Specifically for the Benicia Refinery, Valero agreed to implement a SO_2 adsorbing catalyst additive for the FCCU (referred to as flue gas desulfurization (DeSOx) catalyst). In addition, Valero agreed to install a regenerative scrubber to control SO_2 emissions from the CKR. In lieu of using DeSOx catalyst for the FCCU, Valero has elected, with EPA's approval, to install a regenerative scrubber to control SO_2 emissions from the FCCU, in addition to the CKR. The proposed use of a scrubber will result in significantly greater reduction of SO_2 emissions from the FCCU when compared to the use of DeSOx catalyst.

Accordingly, the amendments presented in this environmental assessment not only allow Valero to satisfy the Consent Decree FCCU and CKR SO_2 requirements, but also to achieve significantly greater SO_2 reductions than originally required by the Consent Decree for the Benicia Refinery and contemplated under VIP.

2.4.2.1 Amendments to VIP Project Component

Through the VIP Amendments, Valero is revising the scope outlined in VIP to include treating SO_2 from both the FCCU and the CKR using the same regenerative amine technology originally proposed for the scrubber in the Certified EIR. This approach will achieve greater SO_2 emission reduction than originally estimated under VIP because VIP only anticipated using the scrubber to control CKR SO_2 emissions and a small portion of the FCCU emissions. Controlling both the CKR's and FCCU's combusted CO flue gases with the FCCU/CKR Scrubber will reduce SO_2 emissions from these sources by a total of 6,540 tons per year compared to the VIP baseline levels. The FCCU/CKR Scrubber is an air emission control device that will provide a greater net air quality benefit by reducing the ambient concentrations of SO_2 in the region.

In the existing refinery configuration, the CKR and FCCU CO gas is combined and routed to PS Furnaces F-101 and F-102 for use as fuel to provide process heat to the PS. The flue gases from F-101 and F-102 are commingled and routed to the existing ESPs for PM removal prior to entering the Main Stack along with exhaust gases from the small existing gas-fired furnace F-103 and emergency SRU incinerator vent gas.

Originally, VIP proposed to split the CKR and FCCU CO gas streams, so that CKR CO gas would be routed to F-102 and then to the Main Stack Scrubber to remove SO_2. Under the original project design proposed for VIP the FCCU CO gas would continue to be routed to F-101, then through the ESPs. The flue gas would then be commingled with the treated gas from the Main Stack Scrubber and flue gas from F-103 and the proposed PS Helper Furnace prior to entering the Main Stack. (Reference Section 3.4.3.5 and Figures 3-14 and 3-15 in the Certified EIR).

Under the VIP Amendments, the process design will be similar to current operations. However, the combined CKR and FCCU CO gas will feed two new PS Furnaces to be identified as F-105 and F-106, which will replace the existing F-101 and F-102 Furnaces. The flue gases from PS Furnaces F-105 and F-106 will be combined and will pass through the SCR units (which will consist of two 60% capacity units operating in parallel). After the SCR units, the gases will pass through an unfired waste heat boiler to recover heat in the form of steam. The flue gas will then enter a wet pre-scrubber that removes particulates and SO_3. After the pre-scrubber, the flue gas will then pass through the regenerative amine scrubber with a caustic polisher to remove SO_2. The cleaned flue gas will then be reheated by direct contact with up to an equimolar volume of heated ambient air and then vented through a new 15-foot diameter stainless steel stack located on top of the scrubber tower. The exhaust point will be about 100 feet above the top of the scrubber, and about 245 feet above grade level (base of scrubber). As described in the Certified EIR, the amine solution from the regenerative amine scrubber will be regenerated in a separate regenerator vessel allowing for the solution's reuse. SO_2 will be recovered as elemental sulfur in the Benicia Refinery SRUs.

The existing RFG-fired furnace F-103 and the two SRU incinerator emergency vents will continue to exhaust through the Main Stack.

The FCCU/CKR Scrubber, including SCR units and waste heat boiler, will be installed on a new 150,000 square foot pad, constructed adjacent to the Refinery Process Block as shown on **Figures 2.3-2 and 2.3-3**. The site for the scrubber is currently sloped. The area will be cut and filled and retaining walls added to create a benched elevation of 57.5 ft. above sea level, which is 39 feet below the elevation of the rest of the Process Block. The top of the scrubber stack will therefore be 207 feet above the level of the process block. An alternate installation scheme is being considered that will install a retaining wall on the east side of the sloped area, which will then be filled and compacted to create a scrubber equipment pad at about the same elevation as the Refinery Process Block. In this installation, the top of the FCCU/CKR Scrubber stack will be about 245 feet above the Refinery Process Block.

The new F-105 and F-106 Furnaces will be constructed within the PS area of the Refinery Process Block, near the current locations of F-101 and F-102. This will require that F-102 be demolished to allow maintenance access to the new PS Furnaces. In accordance with standard demolition procedures, the idled equipment will be disconnected from process, utility, and electrical supplies and then evaluated to determine whether or not asbestos containing materials (ACM) are present anywhere. If asbestos is present, it will be removed in accordance with BAAQMD and federal Toxic Substances Control Act (TSCA) requirements. Scrap metal will preferentially be recycled. Any materials that cannot be recycled will be managed properly as hazardous or non-hazardous demolition waste.

The Certified EIR included a new RFG-fired PS Helper Furnace, which was needed to balance heat duties because the CO gas feeding the existing PS furnaces would no longer be combined. Since the VIP Amendments will retain the existing configuration by combining the CKR and FCCU CO gases, this furnace will not be needed and will not be constructed.

2.4.2.2 Major Equipment

The FCCU/CKR Scrubber portion of the VIP Amendments will include equipment identified in the Certified EIR, such as an amine regenerator column of similar size to that previously permitted; support equipment like the amine purification unit to remove impurities; and pumps, piping, valve connections, and instrumentation. The primary new equipment associated with the FCCU/CKR Scrubber project not presented in the Certified EIR or that has been modified includes:

- Pre-scrubber (vessel is 30 feet diameter by 100 feet tall);
- Scrubber (vessel is 35 feet diameter and 145 feet tall compared to the dimensions for the scrubber proposed in the Certified EIR of 25 feet diameter and 150 to 200 feet tall);
- Equipment for heat transfer and quench subcooling (air-cooled heat transfer system);

- PS Furnaces F-105 and F-106 equipped with SCR units (replacing the existing PS Furnaces F-101 and F-102 and the PS Helper Furnace proposed in the Certified EIR);
- Unfired waste heat boiler (72 feet by 15 feet by 86 feet high – which includes the steam drum);
- Heated Air System consisting of steam heat exchanger and an air fan (smaller than unfired waste heat boiler) to supply up to an equimolar volume of heated ambient air); and
- Caustic polisher (included in scrubber vessel)
- New stainless steel stack on top of scrubber, 100 feet tall and 15 feet diameter.

The pre-scrubber will be a stand alone vessel and will include quench subcooling to reduce the temperature of the water which in turn lowers the gas stream temperature entering the FCCU/CKR Scrubber. The unfired waste heat boiler will recover heat to produce steam while cooling the gas prior to entering the scrubber system. The caustic polisher will be adjoined to the top of the regenerative amine scrubber and is provided to assure efficacious removal of SO_2. The heated air system will use an equivalent amount of steam produced in the unfired waste heat boiler to preheat ambient air to add to the scrubber discharge to elevate the temperature above the saturation temperature.

Figures 2.3-2 and 2.3-3 show the proposed locations of the new FCCU/CKRCKR Scrubber, amine regeneration system, and associated equipment.

2.4.2.3 Process Description

PS Furnaces

Under the VIP Amendments design configuration, the CKR and FCCU CO gases will be routed to the new PS furnaces, F-105 and F-106, which will replace the existing PS furnaces F-101 and F-102. The fired heat input capacities of the new furnaces will be the same as the furnaces they will replace. F-105 will have a maximum heat input rate of 529.3 MMBtu/hr and F-106 will have a maximum heat input rate of 259.2 MMBtu/hr. The new PS furnaces will have forced draft combustion air fans, demanding approximately 2.5 MW of electricity combined, to enable high-pressure operation needed for PM and SO_3 control in the pre-scrubber. The total electrical demands for the VIP Amendments are summarized in Section 3.1.6 and are compared to the design basis presented in the Certified EIR.

The SCR that was planned for the PS Helper Furnace in the Certified EIR will be used to control NO_X emissions in the exhaust gases from the new PS Furnaces F-105 and F-106, which will require ammonia injection. F-101 and F-102 currently use selective non-catalytic reduction (SNCR), which requires ammonia injection for NO_X control. F-105 and F-106 will be equipped with ammonia injection quills so that if needed in the future, a combination of SNCR and SCR can be used to optimize NO_X control. F-105 and F-106 will not consume additional aqueous ammonia beyond the amount currently used for F-101, F-102, and the projected amount for the PS Helper Furnace identified in the Certified EIR.

The operation of the new Unfired Waste Heat Boiler and SCR units will require an increase in steam used for soot blowing to avoid solids buildup. Approximately 6,700 pounds per hour (Lbs/Hr) of additional steam at 600 pounds per square inch (psi) pressure will be required under the VIP Amendments. This will require approximately 9 MMBtu/hr of additional firing at one or more of the refinery's boilers to produce the required quantities of steam. Since this steam exits the FCCU/CKR Scrubber Stack, an equivalent amount of water of 19,300 gallons per day (gpd) must be added to the boiler feed water system. In addition, the Unfired Waste Heat Boiler steam system will require 7,200 gpd water makeup to replace blowdown discharged to the Benicia Refinery Wastewater Treatment Plant (WWTP).

FCCU/CKR Scrubber

Under the VIP Amendments, the combined CKR and FCCU CO gas will be routed to the new PS Furnaces F-105 and F-106. The F-105/F-106 exhaust gas will pass through the SCR units, and after NO_X removal, the gas will pass through an unfired waste heat boiler which will recover heat to produce steam while cooling the gas prior to entering the scrubber system. The FCCU/CKR Scrubber will include a new pre-scrubber which will remove PM comprised of FCCU catalyst fines and coke fines (primarily ash). Accordingly, the ESPs will no longer be needed. They will not be modified as described in the Certified EIR and instead they will be deactivated and Valero will surrender the operating permits for these abatement devices. The external shells of the ESPs may remain, but their electrical equipment will not be operational, thereby reducing electrical demand by about 1 MW.

Currently, about 800 tons/year of solid waste are recovered from the ESPs. Because the fines will be removed wet instead of dry, the incremental weight of solid waste will increase to approximately 1,600 tons/year. This means an additional 800 tons per year of solid waste will be generated by the Benicia Refinery requiring additional trucking (about one per week) to the waste disposal site. The hazardous constituents of the waste will not change. The increased quantity of waste is solely due to the presence of water and is a result of using the scrubber instead of dry ESPs for particulate control. The current dry solids collected are exempt from being designated a California hazardous waste when they are recycled to a Portland cement kiln as prescribed in California Code of Regulations, Title 22, Section 66261.6(a)(5). After the FCCU/CKR Scrubber project is installed, the wet scrubber solids generated may not be eligible for the recycling exemption. Accordingly, this EA assumes the wet scrubber solids waste stream will be managed as California hazardous waste.

The pre-scrubber will include quench subcooling to reduce the temperature of the gas entering the regenerative amine scrubber tower. The circulating pre-scrubber water will pass through a heat exchanger where it will transfer heat to a cooling medium, such as a glycol/water mixture. Air-fin coolers are then used to reduce the temperature of the glycol/water mixture. The effect of quench subcooling is to cool the gas stream exiting the pre-scrubber by about 15 degrees Fahrenheit (^oF). This reduces the operating temperature of the amine scrubber and allows the amine solution to absorb more SO_2. An additional benefit of quench subcooling is that less of the pre-scrubber water is evaporated, and therefore, less makeup water is required. Evaporative losses in FCCU/CKR scrubber system are estimated to average 14,400 gpd. In winter months the, effective subcooling will be enhanced due to lower ambient temperatures. Valero will control the amount of quench subcooling to maintain good operating conditions of the FCCU/CKR Scrubber system.

After the pre-scrubber, the gas is then contacted with a lean amine stream in the regenerative amine scrubber to remove the SO_2. The regenerative amine scrubber generates a rich amine stream laden with SO_2 that is regenerated as described under the Regeneration Facilities heading below.

Before being discharged from the new stack, the scrubbed gases will pass through a caustic polisher section within the top portion of the scrubber tower. The caustic polisher is included in the VIP Amendments due to further engineering refinement to assure efficacious removal of SO_2 under all conditions. At the base of the new discharge stack, dilution air heated by steam will be added to elevate the scrubber discharge gases above the saturation point. The heated air system will use an equivalent amount of steam produced in the unfired waste heat boiler to preheat ambient air. The fans associated with the scrubber and the new pre-scrubber will be somewhat larger than those anticipated in the Certified EIR, increasing electrical demand from the scrubber by about 1 MW.

In addition, further engineering has identified the following additional water requirements: water purge from the pre-scrubber (57,600 gpd), caustic polisher purge (14,400 gpd), and the Amine Purification purge (8,600 gpd). The Amine Purification purge was identified and evaluated in the Certified EIR, although the source of water was to be recycled water and the discharge was similarly to be reused. **Table 2.4.2-1** below summarizes the changes to water use by the VIP Amendments. As the table below demonstrates, the FCCU/CKR Scrubber proposed in the VIP Amendments will use less water than was assumed in the Certified EIR.

Table 2.4.2-1 Water Use Summary for VIP Amendments FCCU/CKR Scrubber

Operating Unit	Certified EIR (gallons/day)	VIP Amendments (gallons/day)	Incremental Increase (gallons/day)
Total Main Stack Scrubber – Certified EIR	172,800	--	--
FCCU/CKR Scrubber – VIP Amendments			--
- Pre-Scrubber Evaporative Losses		14,400	
- Pre-Scrubber Purge		57,600	
- Amine Purification Purge		8,640	
- Caustic Polisher Purge		14,400	
- Unfired Waste Heat Boiler Blowdown		7,200	
- Incremental Steam for Soot Blowing (exits stack)		19,300	
- Incremental Blowdown from SRU for Amine Regeneration		2,880	
Incremental Increase for FCCU/CKR Scrubber	172,800	124,420	- 48,380

Some of the water used by the FCCU/CKR Scrubber equipment represents purges or blowdowns to the Benicia Refinery WWTP. A summary of the quantitative effects of the proposed design basis for the FCCU/CKRCKR Scrubber on wastewater discharges is shown in **Table 2.4.2-2.**

Table 2.4.2-2 FCCU/CKR Scrubber Wastewater Discharge Summary to Benicia Refinery WWTP

Operating Unit	Incremental Increase to WWTP (gallons/day)
VIP Amendments	
Pre-Scrubber Evaporative Losses	None
Pre-Scrubber Purge	57,600
Amine Purification Purge	8,640
Caustic Polisher	14,400
Unfired Waste Heat Boiler Blowdown	7,200
Incremental Steam for Soot Blowing (exits stack)	None
Incremental Blowdown from SRU for Amine Regeneration	2,880
Total Discharge to WWTP - VIP Amendments	90,720

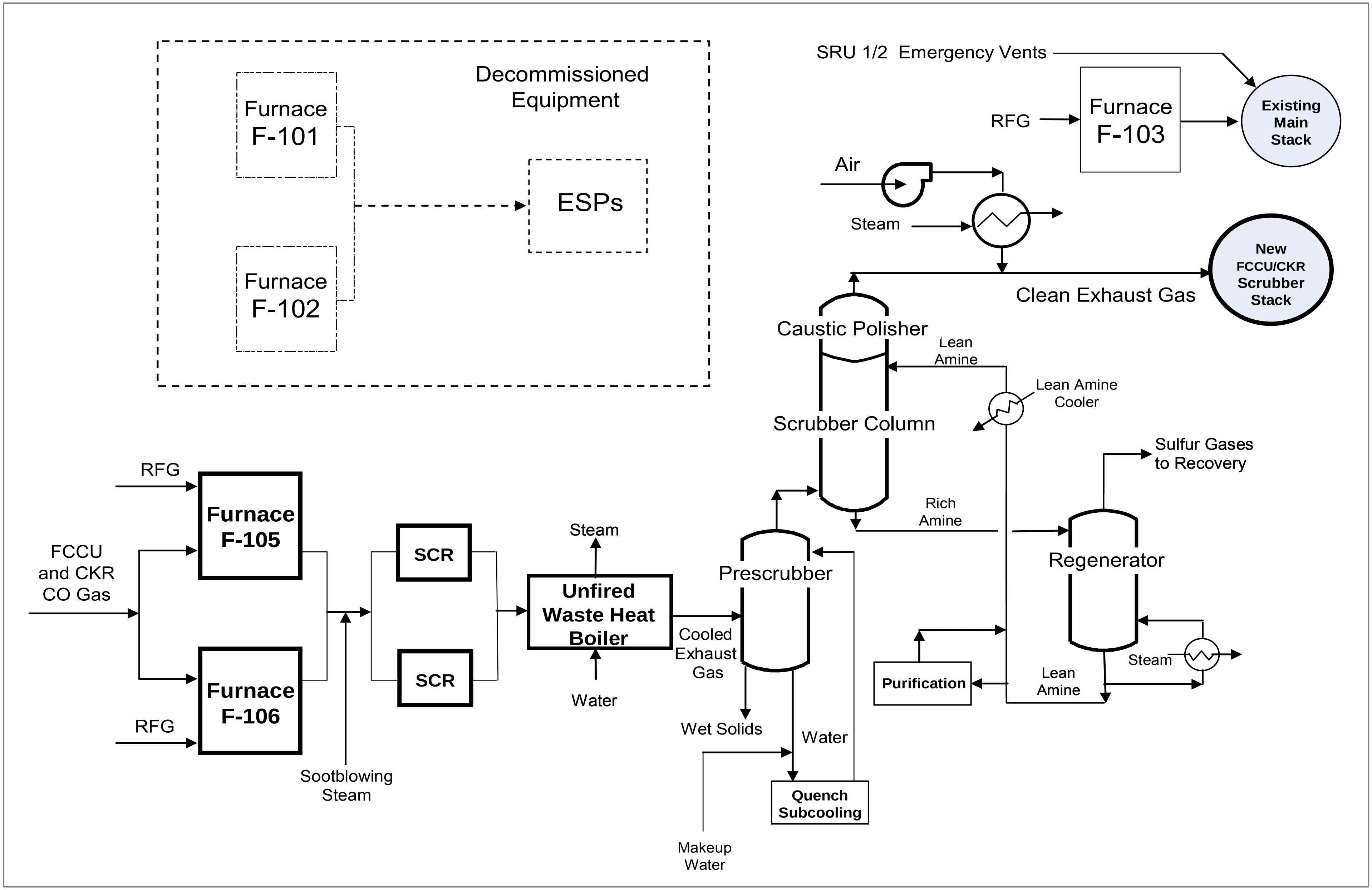
As described in **Section 3.1.10,** the incremental wastewater discharge to the WWTP from the VIP Amendments is offset by a 70 gallons per minute (gpm) or 100,800 gpd water reduction resulting from the NRU Catalyst Regeneration Facility project, which commenced routine operation in April 2007.

There is also expected to be a minor increase in consumption of caustic, a commonly used chemical at the Benicia Refinery. Delivery of this material and other minor increases in chemicals used at the Benicia Refinery will require a slight increase in truck deliveries associated with the VIP Amendments (less than one per week). Net electrical demand from the scrubber system components (not including PS Furnaces F-105 and F-106) will be similar to that estimated in the Certified EIR.

In the current refinery configuration, an RFG-fired furnace, F-103, combines with the PS Furnaces F-101 and F-102 exhaust and is discharged through the Main Stack. Upon installation of the FCCU/CKR Scrubber, F-103 will continue to discharge to the Main Stack. The Main Stack also currently vents the two SRU incinerator emergency vents; these two small sources will also continue to exhaust through the Main Stack.

A simplified flow diagram of the existing and proposed configuration is shown in **Figure 2.4-1**.

Figure 2.4-1 Existing and Proposed FCCU/CKRCKR Scrubber Flow Diagram



Regeneration Facilities

The rich amine solution containing the absorbed SO_2 will be regenerated, as described in the Certified EIR. The rich amine solution will be piped to a regeneration column where a steam reboiler is used to heat the rich amine and desorb SO_2. This creates an SO_2 rich off gas that is routed to the SRU within the Benicia Refinery for conversion to elemental sulfur. The SRU has the ability to manage this stream within its currently permitted capacity, as the anticipated additional sulfur recovered from this stream represents about one percent of the unit's permitted capacity. The regenerated lean amine will then be pumped back to the regenerative amine scrubber for SO_2 absorption. The additional steam demand for the amine regeneration at the SRU will result in an increased water demand of 2,880 gpd for blowdown and an identical increase in wastewater discharges.

A slipstream of the lean amine solution is processed in an amine purification unit to remove impurities, including filtration and demineralizer equipment. This uses small amounts of chemicals common to the Benicia Refinery. This amine purification purge stream was discussed in the Certified EIR.

2.4.3 Hydrogen Production Energy Efficiency Improvements

In the Certified EIR, Valero proposed to make process modifications in the existing H2U in order to increase hydrogen production capacity and purity and to support hydrofining and hydrocracking operations at the Benicia Refinery. The VIP proposed to enhance the production of hydrogen by implementing the following modifications:

- Switching to a new, more efficient CO_2 absorption fluid used for hydrogen purification;
- Replacing internal tubes in top section of the reformer furnaces so that incoming feed can be pre-heated;
- Modifying the Naphtha Reformer Unit (NRU) including use of a new catalyst and associated equipment modifications; and
- Adding a PSA Unit to purify medium-purity hydrogen streams.

These planned modifications would increase hydrogen production capacity by approximately 30 million standard cubic feet per day (MMscfd) from the existing rated capacity of 160 MMscfd to 190 MMscfd.

In order to meet the Benicia Refinery's hydrogen demand while reducing energy consumption and GHG emissions, Valero is proposing to modify the previous scope of the Certified EIR by shutting down one train of the existing H2U and replacing it with a new, more efficient H2U. This removes the need to implement the replacement CO_2 adsorption fluid and equipment modifications analyzed in the Certified EIR. With the new H2U, the Refinery's hydrogen production capacity will be 190 MMscfd, which is the same as permitted in the Certified EIR. However, because the new H2U will be more efficient and controlled with state-of-the-art air pollution controls, the new configuration will consume less fuel and reduce both criteria pollutant and GHG emissions.

Valero has also determined that the PSA analyzed in the Certified EIR is no longer needed and will not be built.

2.4.3.1 Amendments to VIP EIR Project Component

Valero has determined that in order to meet internal Benicia Refinery hydrogen needs, and as a way to increase energy efficiency and equipment reliability, a new H2U complete with modern process technology would be the most economical and environmentally beneficial approach to achieving increased hydrogen production up to the capacity projected in the Certified EIR. Therefore, Valero will shut down one of the two trains of the existing H2U and will install a new H2U. This means that the originally proposed use of a CO_2 absorption fluid, modifications to the reformer furnace (i.e., tube replacement), and modifications to the NRU will not be implemented. Valero will decide which existing H2U train to shut down in the future, based on process optimization needs. However, the two existing H2U trains are essentially identical, and decommissioning either H2U train would result in the same operating scenario.

The new H2U furnace will be more thermally efficient than the unit it will replace, thus reducing energy consumption per unit of hydrogen produced and thereby indirectly reducing GHG emissions. Also, the new furnace will be equipped with state-of-the-art-emissions control technology, which will significantly reduce emissions of nitrogen oxides (NO_X). The new H2U will be installed with a Hydrogen Purification Unit (HPU) (e.g., a PSA) to purify the hydrogen produced from this unit.

The H2U furnace will use an SCR to control NO_X emissions. Additional aqueous ammonia will be consumed by the SCR. The aqueous ammonia will be stored in existing aqueous ammonia storage tanks. The existing ammonia storage and handling system is adequate for the additional ammonia use, so additional storage or modifications to the aqueous ammonia delivery system would not be needed, other than the necessary piping connections.

Valero has also determined that the standalone PSA previously analyzed in the Certified EIR to support the existing H2U is no longer economically viable and will not be pursued further. This will reduce the electrical demand of the VIP Amendments by approximately 1 MW.

The Certified EIR permitted an increase in hydrogen production from 160 MMscfd to 190 MMscfd. Under the VIP Amendments, the new Benicia Refinery hydrogen production capacity will not increase beyond 190 MMscfd. **Table 2.4.3-1** shows a hydrogen production summary comparing the Benicia Refinery's pre-VIP hydrogen production capacity to the Certified EIR and the VIP Amendments.

Table 2.4.3-1 VIP Amendments Hydrogen Production Summary

Description	Rated Production Capacity MMscfd
Certified EIR	
Pre-VIP Production Capacity[1]	160
VIP Increase	+30
Certified EIR Projected Total Production Capacity	**190**
VIP Amendments	
Pre-VIP Production Capacity[1]	160
Shutdown of one H2U Train	-65
New H2U with HPU	+95
Post-VIP Amendments Total Production Capacity	**190**
Production Increase due to VIP Amendments	
VIP Amendments - Change from Certified EIR	0

1. Pre-VIP production capacity includes both trains of the existing H2U and hydrogen produced by the NRU.

The proposed hydrogen production capacity is sized to solely meet the needs of the Benicia Refinery. However, the Benicia Refinery requires two sources of hydrogen in order to ensure at least a partial supply of hydrogen during periods in which one H2U is down for maintenance or in cases of equipment failure. If all hydrogen supply was cut off, the entire refinery would need to shut down. Therefore, Valero will retain one of its existing H2U trains. Combined with the new H2U, the Benicia Refinery's total hydrogen production capacity would increase to the level proposed in the Certified EIR. When one of the two units is inoperative, the remaining unit will produce enough hydrogen for the refinery to continue operating at reduced capacity.

The new H2U achieves energy efficiency such that Valero plans to maximize its use. The remaining train of the existing H2U will normally be operated at a minimum turndown rate. In this state it can be ramped up as needed to balance hydrogen production to meet refinery needs during occasional instances when the new H2U cannot meet internal demand, the new H2U is down for maintenance, or the new H2U is operating at reduced loads or shutdown due to operational problems.

The Certified EIR envisioned an increase in firing of the two existing H2U furnaces (F-301 and F-351) of 110 MMBtu/hr combined. Because the new H2U will have a greater capacity than the unit it will replace, the 110 MMBtu/hr increase in firing the existing H2U will not take place.

The planned location for the new H2U is currently occupied by an existing employee parking lot, firehouse, and refinery training center. To compensate for the loss of employee parking, the parking lot will be relocated within the Benicia Refinery property, and will be sized to handle about the same number of parking spaces now provided in the existing lot. The relocated parking lot will be two-levels terraced into the gentle sloping area located on currently unused Valero property north of the process block shown on **Figure 2.2.3-3**. The firehouse and training center will be demolished. The staff and equipment in the training center will be relocated to existing buildings at the Benicia Refinery. The firehouse will be relocated to either the Valero Fuels Terminal on site, an area west of the Administration Building, or near the existing firehouse location after major construction of the new H2U. All proposed areas of the refinery that may be used are currently paved or graveled. The site of the new H2U may include a retaining wall or other engineered shoring to prevent erosion and other ground movement.

2.4.3.2 Major Equipment

The decision to build a new, more efficient H2U rather than expanding existing H2U capacity causes changes to the list of major equipment envisioned in the Certified EIR for achieving increased hydrogen production. Equipment modifications and installations associated with previously proposed refinery modifications for increased hydrogen production will not be implemented; instead, the following new equipment will be installed:

The new H2U and its associated HPU are expected to include the following major equipment:

- Hydrodesulfurizers (2)
- Steam Drum
- Blowdown Drum
- Hot Condensate Separator
- Cold Condensate Separator
- Reformer Furnace with SCR for NO_X Control
- Forced draft and induced draft fans
- HPU

The steam methane reforming furnace at the new H2U is expected to have a maximum capacity of 980 MMBtu/hr. In addition to these major components, the H2U will include pumps and other rotating equipment that is typical of refinery processes.

Figures 2.3-2 and 2.3-3 show the proposed locations of the new H2U with a HPU, the relocated employee parking lot, and the potential locations for the relocated firehouse. The new H2U will be constructed within an existing employee parking lot to the north of the Refinery Process Block. The new employee parking lot will be a two level structure built into a gentle sloping area northeast of the new H2U. Access to the upper level will be from the uphill side and access to the lower level will be from the downhill side. The potential locations planned for the relocated firehouse include:

- The gravel area in the refinery's Fuels Terminal, to the north of the Refinery Process Block and northeast of the Administration Building.
- The paved area west of the Administration Building across the main plant entrance, and
- An area west of the Cogeneration Plant and east of the new H2U.

All areas considered are currently on paved or otherwise disturbed land and are impacted by routine plant operations. Since the new firehouse would be visible from East Second Street for the two locations near the Administration Building, the firehouse will be subject to City of Benicia Design Review as required by Benicia Municipal Code Section 17.108.

2.4.3.3 Process Description

The new H2U will be fed primarily with desulfurized RFG and tailgas from the refinery's hydrogen consumers. When RFG is not available in sufficient quantities, the balance of the feed to the new H2U will include natural gas. The H2U feed will have a sulfur content less than 10 parts per million by volume (ppmv). The gaseous raw materials and steam will be fed to a steam methane reforming furnace that converts the water and hydrocarbon molecules into primarily hydrogen and CO using a solid catalyst housed within internal tubes inside the reformer furnace. After the reforming reaction takes place, the effluent gas stream is fed to a shift reactor that converts excess CO and water to additional hydrogen and CO_2 using a catalyst. The process stream is then fed to the HPU to remove impurities, resulting in a product that is approximately 99% pure hydrogen. The HPU tailgas, containing impurities such as CO, CO_2, and hydrocarbons, is fed to the reformer furnace, where it is mixed with RFG and burned as fuel.

The new H2U will produce more steam than it consumes, and will thereby allow for a reduction in steam production from the existing boilers at the Benicia Refinery. This process synergy represents energy efficiency inherent in the modern technology incorporated in the new H2U. The Certified EIR included a 100 MMBtu/hr increase in firing of the steam generator SG-1032 for additional steam make-up. However, the VIP Amendments and the new H2U will make it unnecessary to generate additional steam, so this increase will not occur. Thus, the VIP Amendments will cause a 100 MMBtu/hr reduction in fuel consumption associated with the same hydrogen production as in the Certified EIR, which will reduce criteria pollutant and GHG emissions.

SG-1032 was chosen for the 100 MMBtu/hr increase in steam production because it is relatively new and efficient compared to other boilers at the Benicia Refinery. Valero may continue to take advantage of the higher efficiency and increase utilization of SG-1032 beyond current operations. In this case, the 100 MMBtu/hr decrease in boiler fuel firing associated with the VIP Amendments will be achieved by reducing the firing at other boilers at the Benicia Refinery.

The new H2U will consume RFG as a primary feedstock. Since the current H2U feedstock is primarily natural gas, the modifications proposed in the VIP Amendments will increase the Benicia Refinery's internal consumption of RFG. Therefore, the VIP Amendments will improve the refinery's RFG balance. An imbalance of RFG is created when more RFG is produced by the refinery than is needed by the RFG consumers (furnaces, boilers, gas turbines, and the Cogeneration Plant). When there is an RFG imbalance, the excess RFG must be flared. In an effort to minimize flaring, the Benicia Refinery makes operational changes, including cuts to production rates, in an effort to prevent or minimize occurrences and durations of RFG imbalance and thus prevent or minimize flaring. However, fuel gas imbalances cannot always be prevented or may take a period of time to completely eliminate. Therefore, operations changes and production rate cuts cannot always prevent flaring. As such, any improvement to the refinery fuel gas balance (i.e., increased consumption of RFG), will decrease the frequency and duration of flaring.

As with the existing H2U trains, the new H2U will not cause flaring during startup and shutdown of the unit when undergoing turnarounds and other maintenance. Uncommon and infrequent operational upsets and malfunctions at the H2U can result in flaring from the existing refinery flares. The occurrence of operational upsets and malfunctions at the new H2U are expected to be less frequent than at the older H2U train that will be shut down. Therefore, the new H2U is expected to reduce any flaring that could be caused by H2U upsets and malfunctions. The new H2U will not be constructed with a new flare.

The new H2U will include forced draft and induced draft fans, and gas compressors, and miscellaneous equipment which will collectively demand approximately 4.7 MW of electricity. The electrical demand of the H2U to be shut down is approximately 0.5 MW. Since Valero will forego building the PSA projected in the Certified EIR, the projected 1 MW from that unit will not be required. Overall, the H2U production elements of the VIP Amendments will result in an increase in the Benicia Refinery's electrical demand of approximately 3.2 MW compared to the design basis outlined in the Certified EIR. See Section 3.1.6 for summary of electrical demand.

The Certified EIR estimated that modifications to the existing H2U would increase water demand by 21,600 gpd. This increased water use is not needed for the new H2U. Furthermore since the new H2U technology does not use a water based purification technology, it will consume 17,300 gpd less than the existing H2U to be shut down. Therefore, compared to the certified EIR, the new H2U proposed in the VIP Amendments will reduce water use by 38,900 gpd.

The existing hydrogen production configuration is depicted in **Figure 2.4-2. Figure 2.4-3** illustrates the proposed hydrogen system configuration, including the new H2U. The H2U block represents the new H2U and contains its own dedicated downstream PSA unit or other hydrogen purification technology. The resultant hydrogen from the existing H2U and the new H2U is used in a variety of process units throughout the Benicia Refinery to remove impurities from process intermediates and finished products.

Figure 2.4-2 Existing Hydrogen Production Configuration

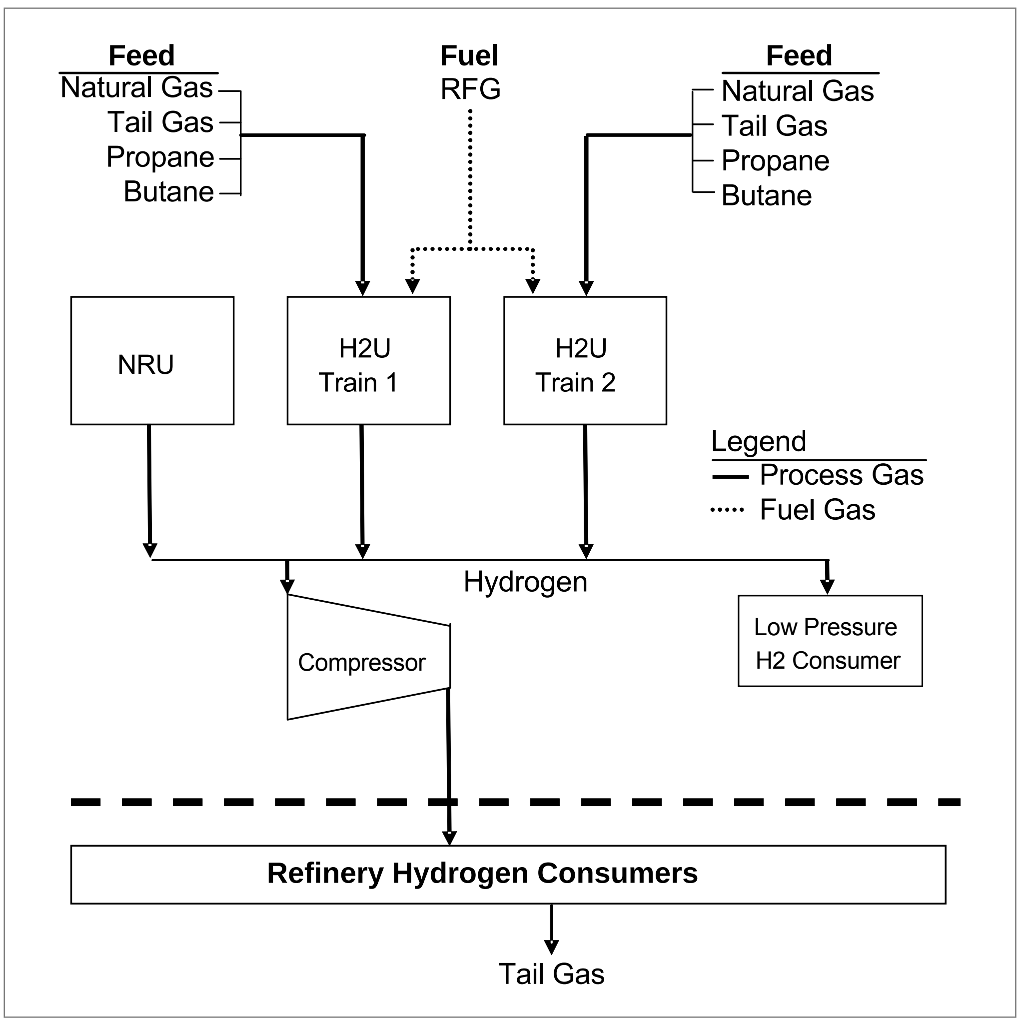
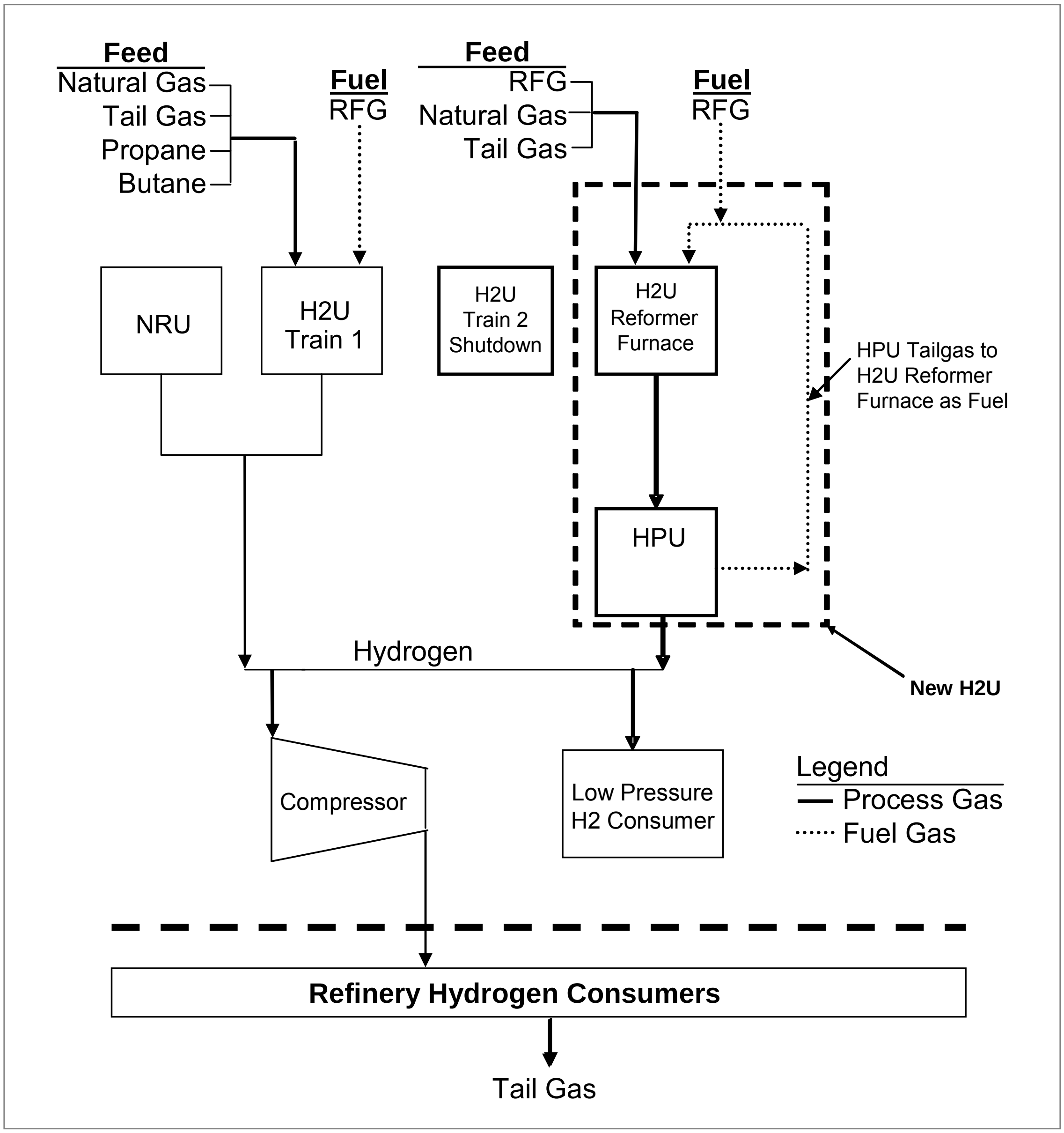


Figure 2.4-3 VIP Amendments Hydrogen Production Configuration



2.4.4 Other Minor Project Changes

Since the time VIP was approved in 2003, Valero has continued to perform detailed engineering and design work for later phases of VIP. As a result, amendments or points of clarification are needed to meet the specific operating scenarios planned at the Benicia Refinery. These amendments pertain to only a few VIP project components and are discussed below. VIP project components that are not discussed in this section remain unchanged from the Certified EIR.

2.4.4.1 Amendments to VIP Project Components

Desalter

Valero has determined that an additional desalter vessel is needed to adequately remove salts and solids from the crude feedstock. The additional desalter vessel will be installed in the Refinery Process Block near the PS and existing desalter. The additional desalter vessel will be approximately 12 feet in diameter and 80 feet long, and will use either existing process (recycled) water streams or city water or a combination based on future design evaluations. The maximum city water usage will be 65 gpm (93,600 gpd). If recycled water is used, there will not be an increase in discharge to the WWTP. Incremental fresh water will increase the flows to the WWTP as discussed in Section 3.1.10. The desalter and other miscellaneous process changes may increase the Benicia Refinery's electrical demand by approximately 0.19 MW for pumps and up to 1 MW for the electrical grid in the desalter vessel.

FCCU Modifications

The Certified EIR envisioned modifications to the FCCU to increase operational flexibility and allow the FCCU to operate at a nominal process rate of 75,000 barrels per day or higher on occasion, as compared to the present rate of 72,000 barrels per day. Increasing the process rate will require increasing the air rate at the compressor C-702, which will be accomplished by increasing the firing rate of the existing gas turbine GT-702 by approximately 70 MMBtu/hr. This increase in fired duty was not included in the Certified EIR, and has been incorporated into the analyses for the VIP Amendments. This change requires no physical modifications to GT-702, and the VIP Amendments will not include any changes to the FCCU or increases to FCCU processing capacity beyond that which was described in the Certified EIR.

Other Process Changes

The minor modifications for the new second stage desalter vessel and other VIP Amendments components will require additional piping for liquid and gas streams. The piping will include components such as valves, pumps, and flanges, which will increase fugitive emissions of precursor organic compounds (POC) by approximately 3 tons per year.

It should be noted that the Certified EIR includes several project components that collectively allow the Benicia Refinery to increase crude throughput capacity and optimize process operations. These components in the Certified EIR include:

- PS modifications to increase crude oil processing capacity by approximately 25 percent;
- FCCU Feed Flexibility modifications to increase feed rate and process different feeds;
- CKR modifications to process additional feed;
- Increased capacity to remove and recover sulfur;
- Hydrofining optimization changes;
- Modification to maximize hydrocracking, alkylation, and reforming capacity;
- Modifications to optimize fractionation processes;
- Modifications to the wastewater treatment facility; and
- Added support facilities and infrastructure.

The Certified EIR includes project components that increase the processing capacity of various process units such as the PS, the CKR, and the FCCU. The VIP Amendments do not change the previously approved and permitted throughput increases described in the Certified EIR.

2.4.4.2 Major Equipment

The new desalter will include the following equipment:

- Desalter vessel
- Heat exchange equipment; and
- Pumps, valves, flanges, and piping.

Figures 2.3-22 and **2.3-33** show the location of the new desalter vessel.

2.4.4.3 Process Description

The following is a brief description of the desalting process:

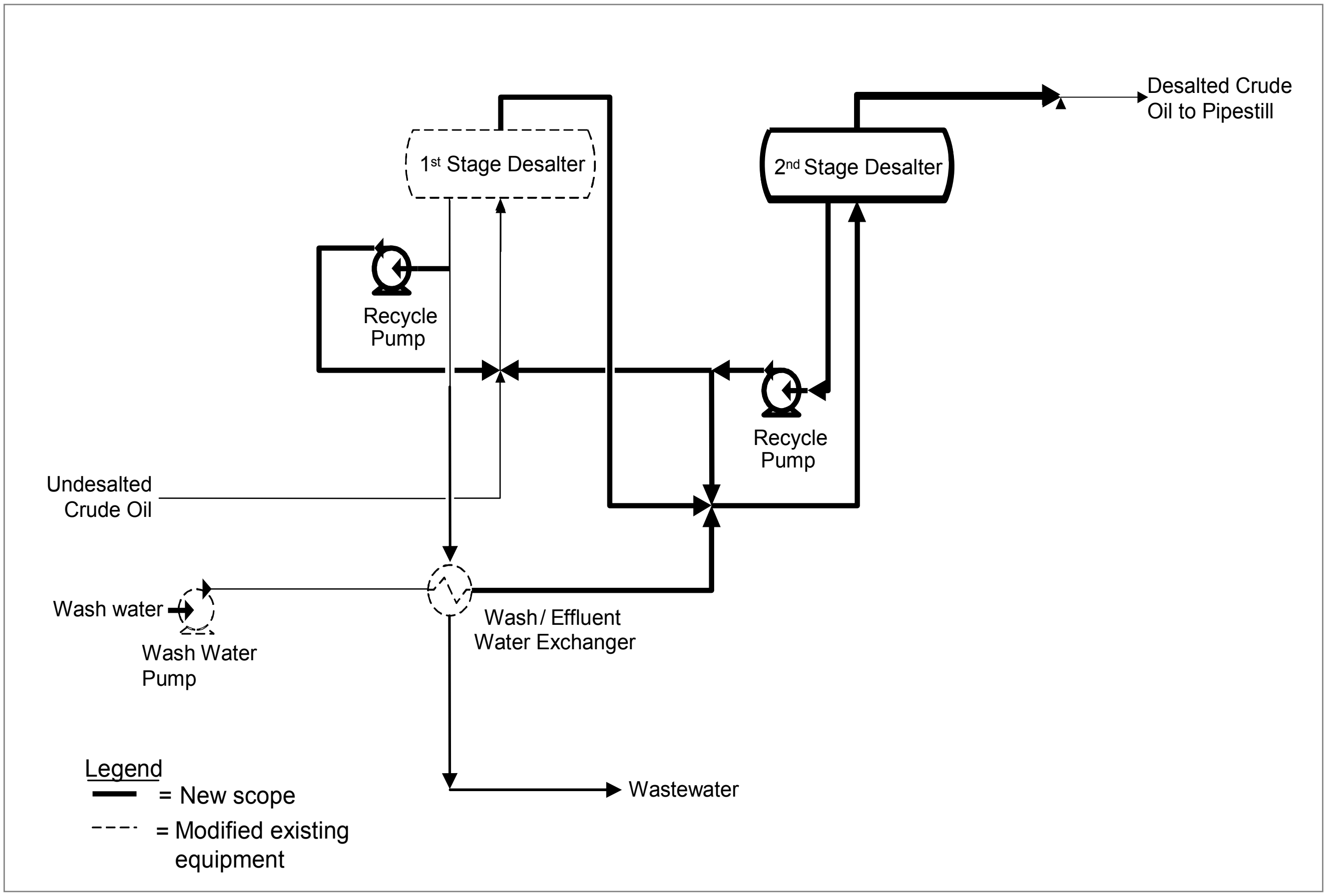
Desalter

The Benicia Refinery currently operates a single-stage desalter unit to wash salts and solids from crude oil feedstock prior to feeding it to the PS for primary separation. The second-stage desalter proposed in the VIP Amendments will be installed downstream of the existing desalter to provide an additional washing cycle to the existing process. The second-stage desalter will operate in a similar manner to the existing desalter. Additional pumps, valves, flanges, and piping associated with the second-stage desalter will be connected to existing equipment within the Refinery Process Block. The new second-stage desalter will use existing process (i.e., recycled) water streams, city water, or a combination. For each gallon of city water used, there will be a commensurate increase in wastewater discharged to the Benicia Refinery WWTP.

Figure 2.4-4 displays a simplified process flow diagram of the existing Benicia Refinery desalting process with the addition of the new second-stage desalter vessel. The figure illustrates the counter-current flow of wash water and crude in a two-stage desalting system. Wash water flows first to the second stage desalter where it is contacted with crude flowing from the first stage. Wash water from the second stage desalter loop is used to supply make-up to the first stage wash loop. Water from the first stage is blown down to wastewater treatment. This configuration provides improved removal of salts relative to the performance of a single stage. This is because the bulk of the salt in the crude coming into contact with low-salt content wash water in the second stage desalter has already been removed in the first stage. As the driving force for transfer of salt from the oil phase to the water phase is salt concentration, salt removal is increased with little or no increase of water. This configuration, known as a “staged cascade”, is a common technique for improving the efficiency of extraction in chemical processing.

At the same time that salt is being transferred from the crude to the water, water-soluble hydrocarbons such as aromatics are also transferred from the crude to the water phase. However, while two-stage operation increases the transfer of the salts in the crude oil to the water phase, it results in very little if any difference in the mass of soluble aromatics transferred from the crude to the water phase when the water is cascaded form one stage to another. The reason for this is that while the mass of salt that can be solubilized by the water phase is very much greater than the quantity of salt in the crude, the mass of aromatics and other hydrocarbons and other hydrocarbons in the crude is very large relative to the mass that can be dissolved in the wash water. Because the concentration of aromatics in the crude entering the desalter is large, it is essentially unchanged across the two stages of the desalter. As a consequence, the equilibrium concentration of aromatics and other organics in the wastewater exiting the desalter is constant – the driving force for mass transfer (concentration difference between the hydrocarbon and water phase) is unchanged by the number of desalter stages. However, if incremental city water is used, there will be an increase in total organics going to the WWTP since an increased amount of water will have about the same equilibrium concentration of organics. However, this organic loading is small relative to other streams to the WWTP.

Figure 2.4-4 Simplified Process Flow Diagram for Desalter



2.5 Construction of VIP Amendments

2.5.1 Schedule

As requested by the City of Benicia, a revised schedule for all VIP project components, including the VIP Amendments, is provided in **Table 2.5.1-1**. Construction activities related to the proposed VIP Amendments will take approximately three to five years and will use the existing workforce in the area.

Table 2.5.1-1 Project Schedule

VIP Component [2]	Start Engineering	Order Long Lead Equipment	Begin Site Preparation	Start Construction	Startup
Crude Unit Expansion to greater than 135 MBD	N/A	N/A	N/A	N/A	Jan 2009
Increased firing rates of existing Combustion Sources (3.4.3.11)	N/A	N/A	N/A	N/A	Jan 2009
FCCU Expansion, increased C-702 air rate (3.4.3.2 and Amendments)	N/A	N/A	N/A	N/A	July 2009
Crude Tanks (3.4.3.15)	Jan 2006	April 2007	April 2007	Sept 2007	Dec 2008
FCCU/CKR Scrubber (3.4.3.5 and Amendments)	April 2007	April 2008	July 2008 [1]	July 2008 [1]	Dec 2010
Hydrogen Unit (3.4.3.6 and Amendments)	Sept 2006	July 2008	July 2008 [1]	July 2008 [1]	July 2010
HCNHF Diolefin Reactor (3.4.3.7)	Jan 2008	Jan 2009	Oct 2009	Jan 2010	Mar 2011
Wastewater Modifications (3.4.3.13)	Jan 2008	Jan 2009	Oct 2009	Jan 2010	Mar 2011
Increased Sulfur Removal and Recovery (3.4.3.1, 3.4.3.4, and Amendments)	April 2007	July 2009	Oct 2009	Jan 2010	July 2011
Crude Unit Expansion up to 165 MBD and Furnace (3.4.3.1 and 3.4.3.11)	April 2009	July 2009	Oct 2009	Jan 2010	July 2011
Other Hydrofining Towers and Optimization (3.4.3.7)	April 2008	July 2009	Oct 2009	Jan 2010	July 2011
New Fractionation Towers and Fractionation Modifications (3.4.3.10)	April 2007	July 2009	Oct 2009	Jan 2010	July 2011
Expand CKR, Cat Light Ends, and Silos (3.4.3.4, 3.4.3.10, and 3.4.3.14)	Jan 2010	Jan 2011	Oct 2011	Jan 2012	Mar 2013
Butamer (3.4.3.8)	Jan 2008	Apr 2008	July 2008	Oct 2008	Aug 2009
FCCU Expansion, new electric driver for C-702 (3.4.3.2)	Jan 2012	Oct 2012	Oct 2012	Jan 2013	Mar 2014
CFHU Guard Reactor (3.4.3.9)	Jan 2012	Oct 2012	Oct 2012	Jan 2013	Mar 2014
Optimize Hydrocracker, Alkylation, Dimersol, and Reforming (3.4.3.8)	Jan 2012	Oct 2012	Oct 2012	Jan 2013	Mar 2014
RO unit for boiler feed water (3.4.3.13)	Jan 2008	Oct 2009	Jan 2010	Mar 2010	Aug 2012

Note:

1. Critical path is receipt of Benicia Land Use permit and BAAQMD authority to construct air permit.
2. Sections of the Certified EIR are listed in conjunction with the VIP Amendments

2.5.2 Construction Areas

Most construction will take place in the Refinery Process Block. Construction within the Refinery Process Block was previously analyzed in the Certified EIR. However, construction of the new H2U will occur in a contiguous area just west of the Refinery Process Block, where an employee parking lot currently exists. The existing firehouse in the new H2U area will be relocated to one of three locations. These include the Fuels Terminal located to the northeast of the administration building; a paved area southwest of the Administration Building; or an area near the Cogeneration Plant not far from the current firehouse. These locations are still within the controlled area of the Benicia Refinery and will not present different considerations regarding construction than those previously analyzed and addressed in the Certified EIR.

During construction, measures will be taken to avoid species, habitat, and sensitive biological resources. During construction of the new H2U, silt fencing shall be erected around the construction zone. Fueling and maintenance of construction equipment and vehicles will occur greater than 50 feet from the drainage ditch.

2.5.3 Demolition, Excavation and Grading

An existing 6,000 square foot firehouse as well as an existing training building located within the future location of the new H2U will be demolished as part of the VIP Amendments. No other new demolition is planned. A retaining wall or other shoring will be constructed at the site of the new H2U.

Excavation, grading and/or backfill of soil will be required for the VIP Amendments. One of the scrubber installation schemes will involve the excavation of approximately 26,000 cubic yards of soil, about 90% of which will be reused as backfill and the remainder will be sent off site as clean backfill. In the alternate FCCU/CKR Scrubber installation approach, about 175,000 cubic yards of clean fill will be required to build up the sloped area to about the same level as the Refinery Process Block. Valero will obtain as much usable fill as possible from on-site sources including the North Canyon accumulation area (about 100,000 cubic yards), and from fill material generated from routine maintenance and small projects on site. The remaining amount of backfill will be obtained from off site with up to 40 truck deliveries per day. Short term stockpiling may be required in the North Canyon area. Typical best management practices will be used to reduce any impacts from fugitive dust emissions and runoff. These will include dust suppression water and silt barriers.

Additional minor amounts of soil excavation may be required for re-grading the H2U site and to create the new parking area that is cut into the hillside. As the construction schedule allows, any excess soil will be used for fill for the alternate FCCU/CKR Scrubber installation approach. If any excess soil is generated beyond the demands of the VIP Amendments, it would preferentially be used on site for other grading purposes or accumulated in the North Canyon area for future projects.

It is expected that most soil will be reused on site. If soil is found to be contaminated and could not be reused, it will be exported from the site for disposal in compliance with legal requirements, at a Class I (hazardous) waste facility for soil classified as hazardous waste, or at a Class II landfill for non-hazardous soil classified as designated waste. At this time, the quantity of soil, if any, that would be required to be sent to a Class I or Class II facility is speculative, but is expected to be relatively small.

2.5.4 Construction Traffic and Parking

Construction traffic and parking for the VIP Amendments will be conducted in a similar fashion to that identified and previously analyzed in the Certified EIR without substantial changes. The traffic analysis presented in **Section 3.1.14** reviews potential incremental impacts to local roadways due to the VIP Amendments.

2.5.5 Construction Labor Force

The construction labor force associated with the VIP Amendments is not expected to exceed that which was presented and previously analyzed in the Certified EIR. The operation of the proposed VIP Amendments will not directly or indirectly induce population growth because the construction workforce will only temporarily utilize a construction workforce and will use the existing workforce in the area.

2.6 Post Project Operations Permanent Personnel

Valero anticipates the VIP Amendments may require up to 30 additional permanent personnel, beyond the 20 permanent personnel envisioned in the Certified EIR, to operate the new and modified facilities. The incremental increase of permanent personnel can be attributed to clarification of operational details related to the scrubber regeneration operations, and the new H2U. The traffic analysis presented in **Section 3.1.14** reviews potential impacts to local roadways due to the incremental increase of 30 permanent personnel. The increased flows to the City of Benicia wastewater treatment plant from the incremental 30 employees is estimated to be 400 gpd (using 13 gpd per employee from *Wastewater Engineering* by Metcalf & Eddy, Third Edition, Chapter 2). Similarly, the incremental water demand is estimated to be slightly more, at 450 gpd.

3.0 Environmental Checklist

Each subsection below provides supplemental information associated with the VIP Amendments. For those resource areas covered by the CEQA "Appendix G" checklist, this information is presented addressing items found on a CEQA "Appendix G" checklist. These discussions are followed by a presentation in tabular format of all environmental impacts originally identified in the Certified EIR, the stipulated mitigations associated with the Certified EIR, and a comparison of the incremental impacts associated with the VIP Amendments to the impacts identified in the Certified EIR. Please note that the discussion presented in the last three subsections for agricultural resources, mineral resources, and population and housing are topics that were not within the scope of in the Certified EIR, because VIP was not considered to affect these resources. Since these are found on the CEQA "Appendix G" checklist; tabular entries have been included in these three topics for completeness. Also, due to increasing attention to the issue of GHGs and climate change following the passage of AB 32 and other regulatory developments, this analysis presents an impact analysis of the potential GHG impacts associated with the VIP Amendments.

3.1 Project Impact Analysis

The Certified EIR analyzed the potential for environmental impacts of project components designed to increase production rates and optimize the Benicia Refinery's operations, such as expanded PS capacity, FCCU feed flexibility, CKR expansion, increased sulfur removal and recovery capacity, upgrades to the Wastewater Treatment Plant (WWTP), and various modifications to support facilities and infrastructure. The VIP Amendments do not seek additional increases in throughput or production rates beyond those originally assessed by the Certified EIR and authorized under the existing Use Permit issued by the City of Benicia and the Authority to Construct air permit issued by the BAAQMD. Rather, the VIP Amendments provide clarifications of technical details including construction, installation, and operation information related to several of these project components, as described in **Section 2.0**. The additional information gained in design development does not significantly alter the scope of the originally identified project components. Rather it clarifies details pertinent to the technology Valero has selected for process equipment as well as provides additional information. The following sections provide an analysis of the potential for impacts associated with this additional information and affirms the conclusions regarding environmental impacts presented in the Certified EIR. As was common practice with regard to other EIRs prepared at the time, the Certified EIR did not include an analysis of GHG emissions. Due to increasing attention to this issue following the passage of AB 32 and other regulatory developments, it is appropriate to include this analysis here; therefore, the analysis is provided in **Section 3.1.3**.

Certain impact analyses, including the biological resources, cultural resources, geology and seismicity, land use plans and policies, agricultural resources, mineral resources, and the storm water-related impacts associated with the hydrology and water quality section, are dependent on the location of project components. The Certified EIR analyzed locations of the Benicia Refinery including the Refinery Process Block and areas adjacent, the area to the northeast of the Refinery Process Block, the Tank Farm area, the Refinery WWTP, and open areas within the refinery boundary. The Certified EIR included a discussion of project impacts, relevant to locations of the VIP Amendments, with regard to equipment to be located within and adjacent to the Refinery Process Block, the WWTP, and the open areas of the refinery in each project impact sub-topic section. For the VIP Amendments located within these areas, as described in the Project Description, information from the Certified EIR is applicable to the VIP Amendments. For project components of the VIP Amendments located outside of these areas, new site-specific information and incremental impact analysis is provided.

3.1.1 Aesthetics

a. Would the project have a substantial adverse effect on a scenic vista? No

A visual and aesthetics analysis was conducted to assess the effects of the refinery improvements associated with the VIP Amendments. The analysis utilized the same assessment methodologies and impact significance criteria employed by the Aesthetics, Visual Quality, and Light and Glare sections of the Certified EIR. This included use of computer-generated visual simulations illustrating “before” and “after” conditions at the project site as viewed from several of the same vantage points selected for the original analysis. New areas of the Southampton housing development have been constructed since the VIP was approved; therefore, an additional vantage point from a representative point in this area was illustrated as well.

Effects on Scenic Vistas

The visual qualities of the Benicia Refinery and surrounding areas are fully described in Sections 4.1.2.2 and 4.1.2.3 of the Certified EIR, Section 4.1.2.3 in particular describes the key public view corridors in the vicinity of the Benicia Refinery. Scenic view corridors were identified by the Certified EIR. These include the portion of Interstate-680 (I-680) between Morrow Lane and the Benicia Bridge, which the Solano County General Plan designates as a “scenic street and gateway”, and the California Department of Transportation (Caltrans) vista point located at I-680 and Lake Herman Road, approximately ¾ mile northeast of the Benicia Refinery. The portion of I-680 near the vista point is also designated as a visual “gateway” in the City of Benicia’s General Plan.

All of the elevated features of the equipment associated with the VIP Amendments will be constructed within or in the general vicinity of the Refinery Process Block, which is located in the interior of the Benicia Refinery’s plot plan. Overall, the VIP Amendments would add new structures ranging in height from 30 to 245 feet. The tallest of these is the new FCCU/CKR Scrubber, which will be located immediately east of the Process Block. The FCCU/CKR Scrubber is approximately 245 feet tall, including a 100-foot stack, but only rises 207 feet above the base of the Process Block because it sits on a terraced area 39 feet below the Process Block. An alternate installation scheme is being considered that will install a retaining wall on the east side of the sloped area, which will then be filled and compacted to create a scrubber equipment pad at about the same elevation as the Refinery Process Block. In this installation, the top of the FCCU/CKR Scrubber stack will be about 245 feet above the Refinery Process Block.

The new H2U with hydrogen purification equipment would be placed in a parking lot just north of the main Refinery Process Block. The H2U’s most prominent features would be the reformer furnace and the reformer furnace vertical stack, estimated to extend to heights of 130 feet and 150 feet, respectively. The reformer furnace would appear as a rectangular structure, with a slightly pitched roof. The HPU may be comprised of up to 10 cylindrical vessels each estimated at 30 feet in height, and one tail gas surge drum which will extend to 130 feet, nearly the same height as the reformer furnace.

The remaining structures and project components such as the desalter are considered lesser visual features. The aesthetic impact associated with the addition of PS Furnace, F-105 was formerly evaluated in the Certified EIR under the project component heading the Pipe Still Helper Furnace. The addition of a second new PS Furnace, F-106, will not have any substantial visual impacts over those analyzed in the Certified EIR.

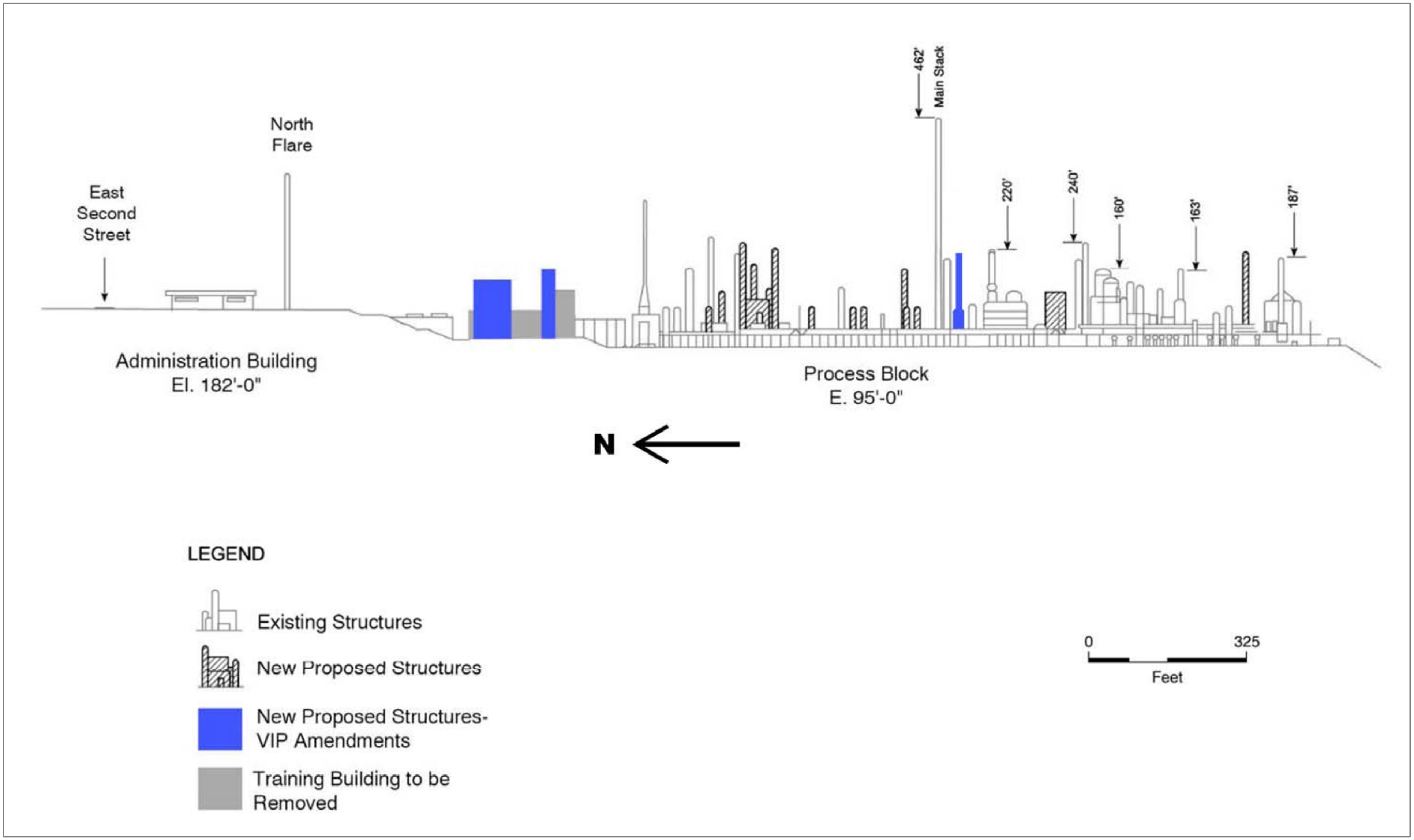
The Certified EIR also evaluated the addition of a cylindrical scrubber vessel having approximate dimensions of 150 to 200-feet in height by 25-feet in diameter. The FCCU/CKR Scrubber vessel in the VIP Amendments will be 35 feet in diameter and 145 feet tall topped with a 15-foot diameter, 100-foot tall stack. The additional pre-scrubber vessel to be added by the VIP Amendments will be up to 30-feet in diameter and 100 feet in height and accordingly visually less significant than the FCCU/CKRCKR Scrubber vessel. The pre-scrubber placed contextually within the existing visual character of the Refinery Process Block will not alter the existing visual character of the refinery. The relocated firehouse will be of similar size in height to the other buildings currently located in the area north of the Refinery Process Block, will be designed to be consistent with the visual character of this area, and would not be visible from scenic vistas. The other two proposed locations near the Refinery Administration Building will be visible from outside the Refinery and will be subject to City of Benicia Staff Level Design Review through the Community Development Director. No substantial changes in visual design features are proposed as part of the VIP Amendments. An updated section schematic of the Benicia Refinery illustrates the relationship of the VIP Amendments structures to the features previously evaluated by the Certified EIR.

Figure 3.1-1 shows a horizontal view schematic of the major pieces of equipment proposed in the Certified EIR and the equipment changes associated with the VIP Amendments, e.g. installation of a new H2U and FCCU/CKR Scrubber. The FCCU/CKR Scrubber is depicted in its proposed location on a terraced area 39 feet below the Process Block. If the alternate siting at the level of the Refinery Block is considered, the top of the stack would be 39 feet taller than what's depicted in Figure 3.1-1. At 245 feet above the refinery block elevation, the FCCU/CKR Scrubber alternative would still be significantly lower than the Main Stack, and within the general range of heights of the existing structures.

From I-680, the hills to the north and south of the Refinery Process Block screen views from both the highway lanes immediately south of the Lake Herman Road interchange and the Benicia-Martinez Highway Bridge. Only the existing 462-foot main stack and the tops of elevated towers and flare stacks in the Refinery Process Block in excess of 200 feet are visible when viewed from the Caltrans vista point.

The tallest components of the equipment included in the VIP Amendments are the stack for the FCCU/CKR Scrubber, the new H2U, and, and associated HPU components. Due to intervening terrain, none of these structures would be visible from the Morrow Lane to Benicia Bridge segment of I-680 or from the Caltrans vista point. Thus, since the VIP Amendments would not alter existing views from the designated scenic viewpoints by adding any visible new structures, no impacts to scenic vistas are anticipated.

Figure 3.1-1 Horizontal View Schematic of VIP Amendments



Effects on Other Views

Although not visible from scenic segments of I-680 or the Caltrans vista point, several elements of the VIP Amendments can be seen from other viewing points investigated in the Certified EIR, including Viewpoint 3 looking north from East 5th Street near Hillcrest Avenue, and Viewpoint 5 looking southeast from Gallagher Drive at Panoramic Drive. These potential viewing points occur in terraced neighborhoods at a lateral elevation to the Refinery Process Block (in the case of Hillcrest Avenue) or are located in a superior position (in the case of Gallagher Drive). In both instances, views of the Refinery Process Block are typically limited to the outermost ring of residential development or glimpses created by gaps in residential buildings or through street portals. The potential for visual impacts to these areas was investigated by recreating and updating the computer simulations originally performed for the Certified EIR.

Figure 3.1-2 depicts the view from approximately the same location as Viewpoint 3 (from East 5th Street near Hillcrest Avenue looking north) in Figure 4.1-6 of the Certified EIR. The viewpoint shows a northerly view of the existing Refinery Process Block, with parked cars, yards, and driveways dominating views from the center of the street in the foreground. In the mid-ground, the Refinery Process Block appears in the distance with the tall, slender towers and flare stacks rising from the center. As noted in the Certified EIR, the Benicia Refinery from this distance appears as a coherent and contained operation subsumed by the surrounding landscape.

Figure 3.1-3 depicts changes to this view resulting from the erection of equipment associated with the VIP Amendments. The only visible changes to the view are the introduction of the new 130-foot H2U, the 150-foot reformer stack, and the FCCU/CKR Scrubber, which rises 207 feet above the base of the Refinery Process Block. These appear together as shapes that are visually consistent with other structures in the Benicia Refinery and other elements in the same view. Their height does not extend above other elements of the Refinery Process Block nor alter the silhouette of the Benicia Refinery in its subordinate position against the existing horizon line created by distant ridgelines. The overall visual effect attributable to the VIP Amendments would be a slight but noticeable increase in the mass of the refinery infrastructure, resulting from the introduction of the new structures into a minor portion of the total panorama. The proposed equipment would be similar in height to existing equipment, would be constructed in already industrialized areas of the refinery property, and be similar in appearance to structures already present. No new structures cross the horizon line. Thus, impacts on views from Viewpoint 3 are considered less than significant. If the FCCU/CKR Scrubber were to be sited at the same elevation as the Refinery Block, an additional 39 feet would not constitute a considerably greater impact than presented in Figure 3.1-3.

Figure 3.1-4 depicts the view from approximately the same location as Viewpoint 5 (from Gallagher Drive at Panoramic Drive looking southeast) in Figure 4.1-8 of the Certified EIR. Views from this vantage point are residential in nature, with houses, sidewalks, trees, and streets dominant in the foreground. The taller elements of the Refinery Process Block are visible in the distant mid-ground, extending above residential rooflines. Although viewed by the outer tier of residences along Gallagher Drive, the equipment associated with the VIP Amendments is barely visible in the simulation presented in **Figure 3.1-5** due to the residences themselves screening the vista from public viewing points on the street. For the outer row of property owners, it is likely that the H2U's reformer furnace and the FCCU/CKR Scrubber Stack or its alternative higher elevation, would appear as additions to the Refinery Process Block. However, these structures would not extend above the existing skyline created by the distant hillside, nor would they be the tallest Refinery Process Block feature in the view (e.g., the Main Stack is approximately 460 feet tall). The location and dimensions of the reformer furnace vertical stack would allow it to blend in with existing stacks, and HPU vessels 1 and 2 would appear in front of the reformer furnace from this viewpoint. Therefore, the reformer furnace, reformer furnace vertical stack, and HPU vessels 1 and 2 would not have a substantial adverse effect on the view from Viewpoint 3.

The primary access road leading into the residential neighborhoods is Rose Drive, an east-west throughway that connects East 2nd Street to I-780 in western Benicia. Rose Drive affords relatively expansive southwest facing views of the entire Refinery Process Block from areas near the intersection with East 2nd Street. See **Figure 3.1-6** for a representative baseline view of the Benicia Refinery to a motorist or pedestrian descending Rose Drive. The tallest elements of the existing Refinery Process Block are partly seen against a background of other industrial components in the mid-ground. As depicted in the computer simulation provided by **Figure 3.1-7**, the H2U and FCCU/CKR Scrubber Stack at either elevation, would only be intermittently visible from points along this road. A roadside berm and existing vegetation (including mature trees and shrubs) frequently block views of the Benicia Refinery as Rose Drive descends to East 2nd Street. Since the VIP Amendments equipment would appear only in partial, intermittent views from the southeast-bound side of the road (where drivers and downhill walkers on the sidewalk would face the refinery) and would be consistent with existing visible structures, it is not considered to have a significant visual impact.

Figure 3.1-8 depicts a view from Addison Court, within the Southampton housing development, a location not evaluated in the Certified EIR. This viewpoint looking southeastward from Addison Court toward the Benicia Refinery Process Block is from the public right-of-way of Addison Court. As shown in the figure, the viewpoint location area is currently being developed with single-family residences. Currently, portions of the Refinery Process Block are visible from this location, though it is not as prominent as the view seen from other viewpoints evaluated in the Certified EIR. This is due to the larger geographical distance between Addison Court and the Refinery Process Block, when compared to the distances from other evaluated viewpoints to the Refinery Process Block. As depicted in the computer simulation in **Figure 3.1-9**, the FCCU/CKR Scrubber and H2U would be visible from this viewpoint. Although not included in the simulation, the alternate FCCU/CKR Scrubber, at 39 feet taller, would be similarly visible. However, once the residences in this area have been constructed, it is highly likely that view corridors from this location would be such that publicly accessible views of the Refinery Process Block would be blocked to a greater degree than is the case under existing conditions. Under future residential buildout conditions, views of the Refinery Process Block would include the tops of refinery vertical stacks and most likely would not include views of the FCCU/CKR Scrubber at either of its elevations, or the H2U.

Visits to a number of locations throughout the residential area indicated that views of the proposed facilities from nearby locations would likely be similarly screened by terrain. Despite the visibility of the H2U from the backyards of homes along Allen Way, it is likely that the plant would not be seen from public viewpoints located at lower elevations on Gallagher Drive and along Allen Way. From these locations, much of the Refinery Process Block is obscured by the hillside on which the homes sit. As such, the line of sight extends above and beyond the Refinery Process Block, rather than directly at it.

Figure 3.1-2 Existing view from East 5th Street near Hillcrest Avenue (Viewpoint 3) looking north

Figure 3.1-3 Simulation view (VIP and Amendments) from East 5th Street near Hillcrest Avenue looking north

Figure 3.1-4 Existing view from Gallagher Drive at Panoramic Drive (Viewpoint 5) looking southeast

Figure 3.1-5 Simulation view (VIP and Amendments) from Gallagher Drive at Panoramic Drive looking southeast

Figure 3.1-6 Existing view from Rose Drive looking southwest

Figure 3.1-7 Simulation view (VIP and Amendments) from Rose Drive looking southwest

Figure 3.1-8 Existing view from Addison Court looking southeast.

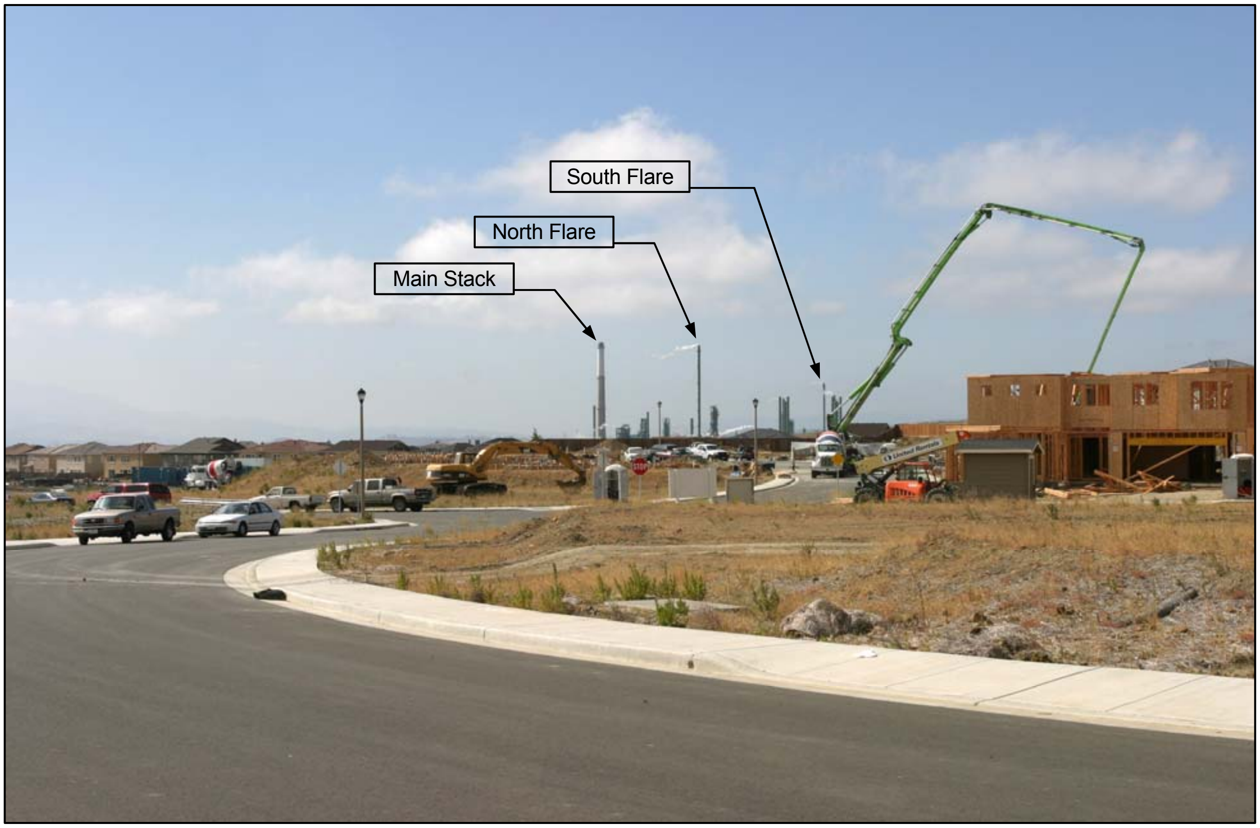
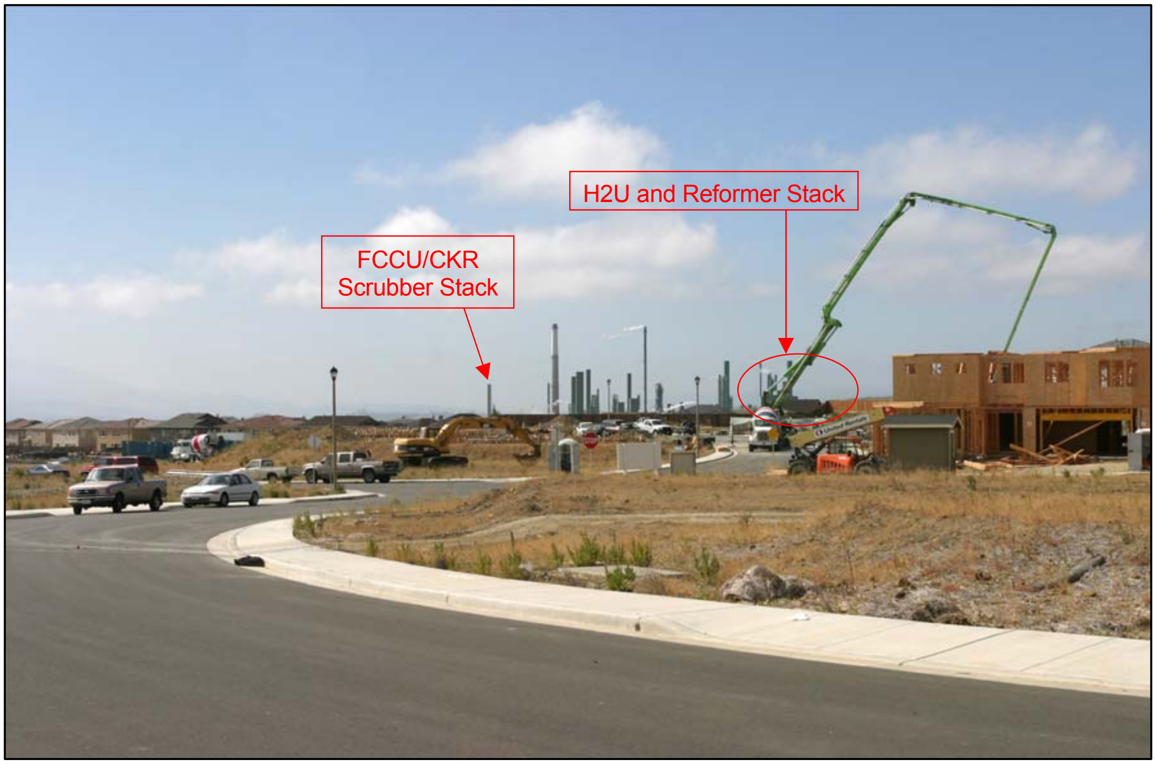


Figure 3.1-9 Simulation view (VIP and Amendments) from Addison Court looking southeast



Other Project Components

Other project components to be located in the Refinery Process Block include a desalter vessel, a pre-scrubber, and other equipment associated with the FCCU/CKR Scrubber. Because of the nature of the industrial landscape within the Refinery Process Block and the relative dimensions of the additional equipment, views of these modifications will be obscured or visually insignificant in the context of the visual character of the Refinery Process Block.

A new parking lot will be constructed to the north of the Refinery Process Block. Based on the size and location, the parking lot will not be visible from vantage points outside the Benicia Refinery. Three alternate locations are being considered for the relocated firehouse. One is near the Cogeneration Plant by the Refinery Process Black and would not be visible from outside the Benicia Refinery. The other two locations (east or west of the Administration Building) would be visible from outside the Benicia Refinery. If either of these locations are selected, the structure will go through Staff Level Design Review with the City of Benicia and colors and architectural features will be selected that are in harmony with the visual backdrop.

Water Vapor Plume Visibility

The Certified EIR evaluated the potential for formation of a visible water vapor plume from the 460-foot-tall Main Stack after a scrubber was installed. This was estimated to occur for about 28 hours per year, with three hours occurring during daylight, non-fog hours. Hourly periods of night time, precipitation, fog, and 100 percent relative humidity (RH) hours are typically excluded because a plume would either not be visible or difficult to distinguish against the background conditions.

Since the new FCCU/CKR Scrubber will handle combusted CO gases from both the FCCU and CKR, larger amounts of sulfur compounds will be removed. In addition, stack gas volume, stack exit temperature, stack location and elevation, and moisture content will be different than the case modeled for the Certified EIR. These factors required a reanalysis of the effect on the potential for the FCCU/CKR Scrubber to emit a visible water vapor plume.

ENSR [2008] (see **Appendix A**) used conservative modeling approaches and site-specific meteorological data to estimate this potential. Practical engineering controls such as heated dilution air will be provided to reduce potential for visible water vapor formation. The visible water vapor plume is now projected to occur no more than 66 hours per year, all of which would be either at night or under conditions of precipitation, fog or 100% RH. Under such conditions, any plume that forms would be difficult to distinguish against the background and would not create a significant visual impact. Furthermore, these 66 hours were predicted to occur in winter months. The models were rerun using the winter stack conditions which account for the improved efficiency of the quench subcooling system. Under these conditions, no hours of visible plume were predicted to occur. The projected frequency of visible pluming is summarized in **Table 3.1.1-1**.

Table 3.1.1-1 Vapor Plume Modeling Results - Frequency

Case	Hours per Year with Visible Plume	Days per Year with Visible Plume (1)
Summer Process Conditions		
All Hours of the Year	66	19
Daytime Only, excluding hours of precipitation, fog and 100% RH	0	0
Winter Process Conditions		
All Hours of the Year	0	0
Daytime Only, Excluding Hours of precipitation, fog and 100% RH	0	0

1. Number of days of the meteorological data set with at least one hour of a visible plume was predicted.

A modeling analysis was also performed to determine if visible water vapor plumes would touch ground. The model was first run on the full year of meteorological data using the summer stack parameters. This analysis predicted that the visible vapor plume would touch ground for three hours during the year. Since the model also predicted that these hours all occurred during the winter, the analysis was repeated using the winter stack parameters. As described in **Section 2.3.2**, the quench subcooling system is more effective during colder weather. This further analysis predicted that there would be no visible plumes that form. Accordingly, visible water vapor plumes are not predicted to touch ground during the winter months or at any other time during the year.

As described in the Certified EIR, a water vapor plume will most likely form during ambient conditions of fog, rain, or 100% RH. Water vapor plumes would not be expected to be visible against the background sky during such ambient conditions. After the VIP Amendments, water vapor plumes are predicted to occur for no more than 66 hours per year (using summer process conditions in summer and winter). These occur during night and other times with fog, rain, or 100% RH. No visible plume is predicted to occur during the times when they would be most noticeable, that is during daylight hours when there were no adverse weather conditions of fog, rain, or 100% RH. Modeling also predicted that visible vapor plumes would not touch the ground or roadways. Therefore the presence of visible water vapor plumes associated with the VIP Amendments is considered to be less than significant because the frequency and duration of plume visibility would be very limited (less than 66 hours per year) and the plumes would not touch the ground.

b. Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway? No

The proposed VIP Amendments would not substantially damage scenic resources because they would not be visible in or from any area where such resources exist. The new facilities will be located within the footprint of the existing Benicia Refinery, which does not presently contain scenic resources (e.g. trees, rock outcroppings, and historic resources). I-680, in the vicinity of the proposed VIP Amendments, is not designated as a designated scenic corridor and is not subject to any state-mandated requirements related to visual conditions.

c. Would the project substantially degrade the existing visual character or quality of the site and its surroundings? No

The equipment proposed as part of the VIP Amendments would be located within or adjacent to the Refinery Process Block. The reformer furnace vertical stack, HPU vessels, and FCCU/CKR Scrubber and associated equipment would be compatible in shape, scale, and color to other visual conditions in the surrounding area. When placed contextually within the existing visual character of the Refinery Process Block this equipment will not alter the existing visual character of the refinery.

A new parking lot and a firehouse will be constructed to the north of the Refinery Process Block. Based on the size and location of the parking lot and the firehouse, they will not be visible from vantage points outside the Benicia Refinery and they would be designed to be consistent with the visual character of the refinery.

As discussed above in subsection a, the FCCU/CKR Scrubber will provide a slight, but insignificant increase in the potential for a visible water vapor plume. This water vapor plume would appear similar to the plumes that currently occur on site from cooling towers.

d. Would the project create a new source of substantial light or glare which would adversely affect day or nighttime views in the area? No

The H2U would have lighting on the staircases and the roof of the reformer furnace. Similarly the new FCCU/CKR pre-scrubber and scrubber equipment structures will have lighting on stairways, walkways, and work platforms. The light fixtures would be similar to those on nearby equipment in the Refinery Process Block and would be directed downward to provide safe access and working areas for personnel on the equipment. When viewed from off site, the additional lighting would blend in with lighting in the rest of the Refinery Process Block and would not create a new source of substantial light or glare that would adversely affect day or nighttime views in the area. In conformance with **Use Permit Condition No. 12** (Planning Commission Resolution No. 03-5) for the VIP, the design of proposed exterior lighting fixtures shall comply with requirements of City of Benicia Zoning Ordinance Section 17.70.240 D.2, and shall be submitted to the City for approval.

1. Aesthetics, Visual Quality, Light and Glare

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would the proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would the proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.1-1: VIP would add new equipment and facilities to developed, industrial portions of the refinery. These new facilities, which could potentially alter the visual character of the setting, could be seen from public view corridors such as I-680, a designated scenic corridor. This would be a less than significant impact.	Less than Significant.	No Mitigation Required. Use Permit Condition 11: All equipment installed as part of VIP shall be painted to blend with the refinery's overall color scheme. Any paint colors other than the existing green and gold shall be submitted to the Community Development Department in advance for approval.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments components will be painted to blend with the refinery's overall color scheme. Further, in views from public viewpoints in the surrounding residential neighborhoods, the proposed structures would not substantially differ in height, scale, or character from previously existing structures.	No significant effects previously identified.
Impact 4.1-2: Refinery operations could cause flaring events. This impact would be less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	Not applicable to the proposed VIP Amendments. It is expected that the VIP Amendments will minimize the frequency and magnitude of flaring at the Refinery.	Not applicable to the proposed VIP Amendments. It is expected that the VIP Amendments will minimize the frequency and magnitude of flaring at the Refinery.
Impact 4.1-3: Operation of the proposed new scrubber could create vapor plumes visible to surrounding residents and motorists. This impact would be less than significant.	Less than Significant	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. New significant effects were not identified.	No. Although an increase occurs in the potential for visible steam vapor plumes, this is not deemed to be significant.
Impact 4.1-4: The proposed development would introduce new lighting on-site. This impact would be less than significant.	Less than Significant.	No Mitigation Required. Use Permit Condition 12: The design of proposed exterior lighting fixtures, and drawings showing the plans for installation shall comply with requirements of Zoning Ordinance Section 17.70.240 D.2, and shall be submitted to the Community Development Director or designee in advance for approval.	No Mitigation Required. Less than Significant.	No. Any proposed exterior lighting fixtures and drawings showing the plans for installation will comply with requirements of Zoning Ordinance Section 17.70.240 D.2, and will be submitted to the Community Development Director or designee in advance for approval.	No significant effects previously identified.

1. Aesthetics, Visual Quality, Light and Glare

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would the proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would the proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.1-5: The reasonably foreseeable projects at the Valero Refinery would expand the industrial appearance of the overall complex. However, none of the changes associated with individual projects would be expected to substantially affect visual resources. As such, the projects would be expected to produce a less than significant cumulative visual quality impact.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments within the existing Refinery Process Block would not cause the cumulative visual impact to become significant.	No significant effects previously identified.
Impact 4.1-6: Other non-refinery cumulative projects, together with VIP and other Benicia Refinery projects, would combine to alter the general appearance of the southeast portion of the City. However, none of the changes would be considered to substantially impact visual resources. As such, the cumulative projects would be expected to produce a less than significant visual impact.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments within the existing Refinery Process Block would not cause the cumulative visual impact to become significant.	No significant effects previously identified.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Interviews, Valero personnel, January 2007.

Resolution 03-4, City of Benicia Planning Commission, A Resolution of the Planning Commission of the City of Benicia Approving a Use Permit for the Valero Certifying the Final Environmental Impact Report, Adopting CEQA Findings and Adopting a Mitigation Monitoring and Reporting Program for the Valero Improvement Project (PLN2002-00022).

Resolution 03-5, City of Benicia Planning Commission, A Resolution of the Planning Commission of the City of Benicia Approving a Use Permit for the Valero Improvement Project (PLN2002-00022).

ENSR, Visible Plume Modeling Report for Valero Benicia Refinery, February 20088.

3.1.2 Air Quality

a. Would the project conflict with or obstruct implementation of the applicable air quality plan? No

Under the California Clean Air Act (CCAA) nonattainment classifications, the San Francisco Bay Area Air Basin is classified as a "serious" nonattainment area for ozone. (The state classification system for nonattainment areas uses the designations "Moderate", "Serious", "Severe", and "Extreme".) The air basin had been classified a "moderate" nonattainment area for CO, but the air basin was redesignated an attainment area for the State CO standard in 1994. Thus, the CCAA's planning requirements for CO nonattainment areas no longer apply to the Bay Area. The San Francisco Bay Area Air Basin is also classified as nonattainment under the state standards for fine particulate matter less than 10 microns in diameter (PM10) and particulate matter less than 2.5 microns in diameter (PM2.5), and is in attainment with the air quality standards for SO_2 and Nitrogen Dioxide (NO_2).

The *Bay Area 1997 Clean Air Plan* (CAP) was prepared pursuant to the 1988 CCAA. Prepared by the BAAQMD in cooperation with the Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments (ABAG), its main objective is to attain state air quality standards for ozone. The CAP presents a comprehensive strategy to reduce ozone precursor emissions (i.e. NO_X and POC) from stationary, area, and mobile sources. The CAP includes a specific measure which encourages cities and counties to develop and implement local plans, policies, and programs to reduce auto use and improve air quality. The most recent CAP was published in 2000 as a triennial update of the 1997 CAP. Since 2000, the CAP has been replaced with the Bay Area Ozone Strategy; the most recent version is the 2005 Ozone Strategy.

The 2005 Ozone Strategy strives to reduce emissions by implementing additional and more stringent stationary source control measures. These include measures to control emissions from surface coating and solvent use, fuels/organic liquids storage and distribution, refinery and chemical processes, combustion of fuels, and other industrial/commercial processes. The 2005 Ozone Strategy indicates how the Bay Area region will attain the State ozone standard by the earliest practicable date. The control measures outlined in the 2005 Ozone Strategy include: (1) additional control measures for existing stationary sources; (2) a permitting program that will result in no net increase in emissions from new stationary sources; (3) provisions for indirect source controls; and (4) transportation control measures.

As with the VIP elements proposed in the Certified EIR, the VIP Amendments will conform with the 2005 Ozone Strategy, as all new equipment subject to BAAQMD permitting requirements will employ state-of-the-art pollution control technologies and, thus, be consistent with the provision to install additional control measures. Further, the new equipment is subject to New Source Review (NSR) requirements of the BAAQMD’s permitting program, including the requirement to provide emission offsets for any NO_X or POC emission increase from stationary sources and, thus be consistent with the no net increase provision (2) of the 2005 Ozone Strategy, which requires that new projects will result in no net increase in emissions from new stationary sources.

b. Would the project violate any air quality standard or contribute substantially to an existing or projected air quality violation? No

In order to determine the air quality impact of the VIP Amendments, the emissions resulting from the project are compared to the emissions estimated in the Certified EIR. The net change in emissions is then compared to the previously established BAAQMD significance thresholds to determine the significance of the impacts.

The VIP Amendments will result in net reductions in the Benicia Refinery’s operational air emissions of NO_X, SO_2, and PM10 when compared to the emissions predicted for the VIP in the Certified EIR. For the purposes of this analysis, fine particulate matter smaller than 10 microns in diameter is also assumed to be less than 2.5 microns in diameter (PM2.5). Therefore, emissions of PM2.5 are numerically equal to emissions of PM10. The VIP Amendments may cause an increase in CO emissions of 63.1 tons per year and an increase in POC emissions of 3.0 tons per year when compared to the emissions predicted for the VIP in the Certified EIR. As demonstrated below, neither of these increases represents a significant impact.

With the VIP Amendments, the FCCU/CKR Scrubber will abate SO_2 emissions from the FCCU and the CKR, achieving substantially greater reductions in SO_2 emissions than abating the CKR alone, as was described in the design basis in the Certified EIR. Under the VIP Amendments design basis, the CKR and FCCU CO gas will be routed into the new CO furnaces, F-105 and F-106. These new furnaces will be subject to BACT for all criteria pollutants, which will require lower emissions than the existing CO furnace configuration. Additionally, the existing CO furnaces F-101 and F-102 will be shut down also contributing to lower emissions. F-103, which was not planned to be controlled under VIP, will be unchanged and will continue to vent through the Main Stack. Accordingly, the new scrubber and furnace configuration will result in a decrease in emissions from the FCCU and CKR relative to VIP.

The operation of the new furnaces and associated SCR NO_X control system will require additional steam for soot blowing. Generating the needed steam will require an increase in firing of one of the refinery's steam generators (for example SG-1032) of approximately 9 MMBtu/hr. However, even with this additional steam demand, the new scrubber and furnace configuration will result in a decrease in emissions from the FCCU and CKR relative to VIP.

The new H2U Reformer Furnace will utilize state-of-the-art SCR emission control technology to further reduce NO_X emissions. In addition, the new H2U will produce up to 100 MMBtu/hr of high-pressure steam for process needs, which the existing H2U does not produce. The air quality impacts evaluated in the Certified EIR included emissions from a 100 MMBtu/hr increase in firing of one of the refinery's steam generators (for example SG-1032). The steam produced by the new H2U will offset the need for this increased fuel, while still consuming the same quantity of energy projected for hydrogen production in the Certified EIR. The new H2U proposed for the VIP Amendments will thereby result in a reduction in fuel combustion at the Benicia Refinery of 100 MMBtu/hr relative to VIP. The new H2U will also be a significant new consumer of RFG, both as a feedstock to the steam-methane reformer process and as a fuel consumer. This increased consumption of RFG will improve the refinery's fuel gas balance by decreasing the incidences of oversupply of RFG, thereby reducing incidences of flaring and periods when the refinery is required to reduce processing rates to correct fuel gas imbalances.

Implementing the increase in FCCU capacity permitted by VIP will require an increase in the fired duty of the gas turbine, GT-702, which provides power to the compressor C-702. GT-702 will not be physically modified, but will operate at an average firing rate that is 70 MMBtu/hr greater than current operations. This increase in firing rate at GT-702 was not analyzed in the Certified EIR. This change in firing rate will not increase the permitted capacity of the FCCU beyond what was included in VIP. The increase in firing is required to fully implement the projects identified in the Certified EIR, which are still part of the design basis, and is included here to ensure that all impacts from previously permitted changes are fully assessed.

The increase in firing rate of GT-702, combined with the decrease in firing of one or more steam generating units described above, will reduce the Benicia Refinery's average refinery fuel gas combustion by 21 MMBtu/hr relative to VIP, which will result in a decrease in air emissions associated with refinery fuel combustion.

The VIP Amendments will also require a slight increase in trucking to deliver additional chemicals and to haul hazardous waste to a licensed facility. Valero estimates that one additional truck trip per week will be required for these shipments. This will cause an insignificant increase in indirect air emissions from mobile sources, as discussed later in this section.

To determine if the VIP Amendments will incrementally violate air quality standards or contribute substantially to an existing or projected air quality violation, changes in direct and indirect operational emissions from as analyzed in the VIP Certified EIR are estimated and compared to the BAAQMD's CEQA mass significance thresholds. Emissions of CO are also modeled and compared to the BAAQMD's CEQA concentration-based CO significance threshold. Emission estimates for the insignificant direct and indirect operational emissions, and the CO modeling analysis are discussed below. A more complete discussion of the potential emissions associated with the VIP amendments can be found in **Appendix B**.

Construction Emissions

Construction-related emissions are generally short-term in duration, but must be evaluated because they can have the potential to cause adverse air quality impacts. PM10/PM2.5 are the pollutants of greatest concern with respect to construction activities. PM10/PM2.5 emissions can result from a variety of construction activities, including excavation, grading, demolition, vehicle travel on paved and unpaved surfaces, and vehicle and equipment exhaust. Construction-related emissions can cause increases in short-term localized concentrations of PM10/PM2.5. Particulate emissions from construction activities can lead to adverse health effects as well as nuisance concerns, such as reduced visibility and soiling of exposed surfaces.

Construction PM10/PM2.5 emissions can vary greatly depending on the level of activity, the specific operations taking place, the equipment being operated, local soils, weather conditions and other factors. Despite this variability in emissions, experience has shown that there are a number of feasible control measures that can be reasonably implemented to substantially reduce PM10/PM2.5 emissions from construction activities.

The BAAQMD's approach to CEQA analyses of construction impacts is to emphasize implementation of effective and comprehensive control measures rather than detailed quantification of emissions (BAAQMD 1999). Therefore, construction emissions are not estimated for this Use Permit application consistent with the BAAQMD's CEQA Guidelines.

Consistent with BAAQMD CEQA Guidelines, and also consistent with the Certified EIR, the VIP Amendments will focus on implementing feasible PM10/PM2.5 control measures for construction activities. These designated feasible control measures identified by the BAAQMD are listed in Table 2 of the BAAQMD CEQA Guidelines (BAAQMD 1999). Following implementation of feasible control measures indicated in Table 2 of the Guidelines (as appropriate, depending on the size of the project area), the air pollutant emissions from construction activities would not have a significant adverse impact to air quality.

The construction activities are expected to be similar in nature and magnitude to the activities described in the Certified EIR, and the impacts described and mitigation measures proposed will be the same as described in the Certified EIR. The VIP Amendments are not expected to create any additional construction emissions.

Operational Mass Emissions

Several elements of the VIP Amendments will emit criteria pollutants. A brief summary of the emission calculation methodology is provided below, along with source-specific summaries of operational emissions. A comprehensive discussion of the air emissions with detailed emission calculations is provided in **Appendix B**. Post-VIP Amendments project emissions are compared to the post-VIP emission rates discussed in the Certified EIR. Incremental emissions are then compared to the BAAQMD's CEQA significance thresholds to determine whether the incremental contribution of the proposed VIP Amendments will have a significant impact on air quality.

<u>PS Furnace Emissions</u>

The Certified EIR anticipated the installation of a scrubber to control SO_2 emissions from the CKR unit. As part of the VIP Amendments, Valero will install a scrubber which will control SO_2 emissions from the FCCU in addition to the CKR. This will result in substantially greater SO_2 emission reductions than estimated for VIP. In addition, Valero will replace the two existing PS Furnaces with new PS furnaces F-105 and F-106, to combust the CO gas from the CKR and FCCU. These new furnaces will be equipped with emission controls to minimize pollutant emissions. The existing furnaces F-101 and F-102, which currently combust the CO gases from the CKR and FCCU, will be shut down.

In the current refinery configuration, RFG-fired furnace, F-103, combines with the PS Furnaces F-101 and F-102 exhaust and is discharged through the Main Stack. Upon installation of the FCCU/CKR Scrubber, F-103 will continue to discharge to the Main Stack. The Main Stack also currently vents the two SRU incinerator emergency vents; these two small sources will also continue to exhaust through the Main Stack. The emissions from the new PS Furnaces (F-105 and F-106) and existing F-103, following the implementation of the VIP Amendments, are compared to the emissions proposed in VIP in **Table 3.1.2-1**.

Table 3.1.2-1 PS Furnace Emissions – Change from VIP

	PS Furnace Emissions (Tons/Year)				
	NO_X	SO_2	PM10/ PM2.5	POC	CO
Net Increase over Certified EIR	-155.2	-2,311.3	2.1	0.0	10.7

In the Certified EIR, PS Furnace POC emissions were estimated to be 6.5 tons/year. However, this estimate was based on the results of a single source testing event, consisting of three fifty minute test runs, averaged to obtain a POC hourly emission rate. Subsequent testing has shown that this test was not representative of typical POC emissions. The emission rate is now estimated to be 16.1 tons/year and Valero submitted an application to BAAQMD in October 2006 to correct the baseline emission estimate. For the purposes of determining whether or not there is an incremental increase in POC emission related to the VIP Amendments, the emission rate from subsequent additional testing was used. PS furnace POC emissions are not expected to change as a result of the VIP Amendments.

As discussed in **Section 2.1.1**, the pre-scrubber will remove SO_3 from the F-105/F-106 exhaust gas, which is not currently removed effectively by the existing ESPs. Since SO_3 reacts with water in the atmosphere to become H_2SO_4, this will correspond to a reduction in sulfuric acid (H_2SO_4) mist (SAM) emissions. Based on a vendor guaranteed 60% SO_3 removal efficiency in the pre-scrubber, Valero estimates that SAM emissions will be reduced by approximately 965 tons/year compared to VIP.

<u>Emissions From Other Combustion Sources</u>

The VIP Amendments include the installation of a new H2U and the decommissioning of one of the existing H2U trains. The new H2U has a higher overall thermal efficiency than the plant it replaces. The higher overall thermal efficiency is realized primarily in the production of high-pressure steam as a byproduct. Due to this production of steam in the new H2U, an increase in the firing of a steam generator (for example SG-1032), which was projected to occur in VIP, will not be necessary to meet the Benicia Refinery's steam requirements.

As noted, the new H2U will have a greater hydrogen production capacity and larger reformer furnace than the plant it replaces; however, the Benicia Refinery's hydrogen production capacity will not increase above the 190 million standard cubic feet per day (MMscfd) proposed for VIP, and the refinery fuel gas consumption for the production of hydrogen will be at the level proposed for VIP (approximately 1,010 MMBtu/hr). For this application, Valero has evaluated emissions from H2U furnaces based on a likely scenario for actual operation of the unit. The following basis was used to develop this emission estimate:

1. One existing H2U furnace is shut down, a net reduction in firing rate of 450 MMBtu/hr (historic average firing rate).
2. The remaining existing H2U furnace operates at 50 percent of maximum load (equal to 302.5 MMBtu/hr), a net reduction of 147.5 MMBtu/hr when compared to historic usage of 450 MMBtu/hr.
3. New H2U furnace operates to supply balance of 1,010 MMBtu/hr H2U furnace load – it will operate at 707.5 MMBtu/hr.

Valero will decide which existing H2U train to shut down in the future, based on Valero's process optimization needs. However, the two existing H2Us are identical, and decommissioning either H2U train would result in the same emissions scenario.

As noted above, the 100 MMBtu/hr increase in firing demand from SG-1032 identified in VIP is not required, resulting in a 100 MMBtu/hr decrease in incremental emissions from VIP. The 110 MMBtu/hr increase in firing of existing H2U furnaces F-301 and F-351, which was projected for VIP, will not occur (one will be shut down and the other will operate at reduced loads under the VIP Amendments). However, GT-702 will require an increase in firing duty of 70 MMBtu/hr to provide additional air to the FCCU that was not identified in the Certified EIR. Despite this increase, as noted above, this does not increase FCCU permitted capacity.

Additionally, as noted above, the operation of the new PS furnaces, F-105 and F-106, and associated SCR NO_X control system will require additional steam for soot blowing. Generating the needed steam will require an increase in firing of one of the refinery's steam generators (for example SG-1032) of approximately 9 MMBtu/hr.

In addition, the refinery's boilers will be required to increase fired duty by 9 MMBtu/hr to provide additional steam for soot blowing in the new PS Furnaces and associated SCR equipment. Detailed combustion emission calculations are provided in **Appendix B**. The VIP Amendments combustion emissions were compared to the emissions for the operating scenario described in the Certified EIR. The results of this comparison are presented in **Table 3.1.2-2.** This table only addresses emissions from combustion sources that did not formerly vent through the Main Stack; these sources are addressed separately at the beginning of this section.

Table 3.1.2-2 Combustion Source Emissions - Change from VIP

Project	Incremental Firing MMBtu/hr	Incremental Emissions (tpy)				
		NO_X	SO_2	PM10/ PM2.5	POC	CO
Net Increase over Certified EIR	-21	-123.6	3.3	-10.8	-0.1	52.3

The VIP Amendments will increase the refinery's consumption of RFG which will result in a reduction of flaring at the Benicia Refinery. The existing H2U consumes natural gas as its primary feedstock. The new H2U proposed as part of the VIP Amendments will consume RFG as a primary feedstock. The decommissioning of one train of the existing H2U and replacing its production by operating the new H2U will, therefore, increase the amount of RFG used in producing hydrogen. This increase in usage of RFG will minimize instances of RFG imbalance, which results when more RFG is produced than is needed by the refinery's fuel combustion equipment. When there is an RFG imbalance, the excess RFG must be flared. Therefore, improving the RFG balance by installing the new H2U as an RFG consumer will result in fewer flaring events. The emission reductions from the change in flaring have not been quantified.

Fugitive Emissions

The methodology used to calculate future fugitive emissions resulting from the VIP Amendments is the same methodology used in the original VIP. Fugitive emissions are based on 2005 actual emissions measured in accordance with EPA and BAAQMD leak detection regulations. Emissions are calculated using the facility-specific emission factors presented in the document entitled "Environmental Analysis – Valero Benicia Refinery Proposed Refinements to VIP," submitted to the City of Benicia on December 15, 2006.

Valero has estimated that the VIP Amendments will result in up to an additional three tons per year of fugitive POC emissions from sources such as flanges, valves, and pump seals beyond what was included in the Certified EIR. The annual emission rate is divided by 365 days per year to determine daily project emissions. **Table 3.1.2-3** presents fugitive POC emissions as compared to the Certified EIR.

Table 3.1.2-3 Fugitive Emissions – Change from VIP

Project	POC Emissions Tons/Year
Net Increase over Certified EIR	3.0

Storage Tank Emissions

The VIP Amendments will have no impact on storage tank throughput or emissions.

Indirect Operational (Off-site) Emissions

The VIP Amendments project elements will result in up to two additional truck trips per week on average beyond that which was analyzed by URS and presented in the Certified EIR. This is due to the delivery of additional chemicals and the transportation of additional wet solid waste from the scrubber and additional aqueous ammonia deliveries for the new H2U emissions controls.

Truck exhaust emission factors were developed based on the latest version of the California Air Resources Board Emission Factors model (EMFAC 2007) for the BAAQMD airshed (CARB 2002). Entrained road dust emission factors were derived from CARB Methodology 7.9 (CARB 1997). Emissions are calculated based on these emission factors and the total predicted travel distance within the Bay Area air basin defined by the BAAQMD regional boundary. All trucks are assumed to travel a route from the Benicia Refinery south on Interstate 680 (I-680) to Interstate 580 (I-580) East, exiting the BAAQMD boundary near Tracy, California. The total travel distance predicted for the VIP Amendments is shown in **Table 3.1.2-4**.

Table 3.1.2-4 Additional Vehicle Activity for VIP Amendments

Truck Route	Trucks/Week	Miles R/T	Total Trucks/Year	Total Miles/Year
BAAQMD Boundary to Valero	2	100	104	10,400
Totals	2	100	104	10,400

Indirect operational emissions are shown in **Table 3.1.2-5**. The calculations of daily delivery truck exhaust and entrained road dust emissions are provided in **Appendix B**.

Table 3.1.2-5 Indirect Operational Emissions – Change from VIP

Project	Incremental Emissions (tpy)				
	NO_X	SO_2	PM10/ PM2.5	POC	CO
Net Increase over Certified EIR	0.18	0.0002	0.01	0.01	0.1

Summary of Operational Emissions

The incremental emissions of the VIP Amendments relative to the emissions in the Certified EIR are compared to the BAAQMD's CEQA annual mass-based significance thresholds in **Table 3.1.2-6**. The BAAQMD thresholds are the same significance thresholds used in the Certified EIR. As shown in **Table 3.1.2-6,** emissions of NO_X, PM10/PM2.5, and SO_2 will incrementally decrease relative to the Certified EIR following implementation of the VIP Amendments. Emissions of POC may increase slightly (3.0 tons/year) relative to VIP.

This increase is well below the BAAQMD significance threshold. Emissions of CO may increase by about 63 tons/year from VIP levels. There is no mass-based CEQA significance threshold for CO; instead, BAAQMD guidance stipulates that impacts should be evaluated using air dispersion modeling. As shown in **Table 3.1.2-6**, the change in CO emissions as a result of the VIP Amendments will not cause a significant impact. VIP and the VIP Amendments combined will result in a decrease in emissions for all criteria pollutants. Therefore, the VIP Amendments will not substantially increase the severity of previously disclosed significant impacts beyond those already identified in the Certified EIR. Accordingly, the VIP Amendments will not have a significant adverse impact with respect to federal or state Ambient Air Quality Standards (AAQS) for which the area is in nonattainment status.

Table 3.1.2-6 VIP Amendments Emission Summary

	Emissions (tons per year)				
Source Type	**NO_X**	**SO_2**	**PM10/ PM2.5**	**POC**	**CO**
Certified EIR (ref. Table 4.2-12)					
Post-VIP Emissions	1,939.1	2,799.3	235.5	303.7	761.2
VIP Amendments Change from VIP					
FCCU/CKR + F-103[1]	-155.2	-2,311.3	2.1	0.0	10.7
Combustion Sources	-123.6	3.3	-10.8	-0.1	52.2
Fugitive Emissions	0.0	0.0	0.0	3.0	0.0
Mobile Source Emissions	0.2	0.0	0.0	0.0	0.1
Post-VIP Amendments Emissions	1,660.4	491.3	226.8	306.7	824.3
CEQA Evaluation					
VIP Amendments Net Increase/Decrease Over Certified EIR	-278.7	-2,308	-8.7	3.0[2]	63.1[2]
CEQA Significance Threshold	***15***	***NA***	***15***	***15***	***NA***
Significant?	**No**	**No**	**No**	**No**	**No**

1. Includes the installation of the FCCU/CKR Scrubber and the replacement of F-101 and F-102 with F-105 and F-106.
2. Emissions of POC and CO decrease for the combined VIP and VIP Amendments projects.

Localized Air Quality Analysis for Operational Emissions

The BAAQMD CEQA Guidelines (BAAQMD 1999) require evaluation of the project emissions of CO to determine if the emissions would have a detrimental impact to local ambient air quality. For NO_X, PM10/PM2.5, and POC, the BAAQMD's annual mass significance thresholds serve as a surrogate for an air quality analysis. The BAAQMD does not have either concentration-based or mass-based significance thresholds for SO_2 emissions.

The analysis of CO emissions was conducted in accordance with the U.S. Environmental Protection Agency (USEPA) Guidelines on Air Quality Models (GAQM; as incorporated in Appendix W of 40 Code of Federal Regulations [CFR] Part 51) and the BAAQMD modeling guidelines "Permit Modeling Guidance, May 2005".

Air quality impacts from project emissions under normal operating conditions were compared to the State and National AAQS. A summary of the modeling procedure is provided below; a complete discussion of the analysis is provided in **Appendix C**.

Modeled Parameters

CO emissions from the new H2U were included in the model. Historical CO emissions from the existing H2U were modeled with a negative emission rate to reflect the reduction of impacts achieved by decommissioning the unit. The furnace with the lowest reported emissions was modeled to ensure that emission reductions were not overestimated. This analysis presents a conservative estimate of the impacts, as it assumes that the new H2U operates at full load, without accounting for the reduction in utilization of the remaining H2U.

In addition to a 10.7 ton/year increase in CO emissions from the FCCU/CKR Scrubber Stack relative to the Main Stack emissions in the Certified EIR, there will be a new stack discharge point and the temperature, moisture content and the exit velocity of the exhaust are altered. These changes affect the dispersion characteristics of the emissions and could potentially affect downwind ambient CO concentrations at ground-level receptors. To represent the changes to emissions and stack location and discharge characteristics, the VIP Amendments (FCCU/CKR Scrubber Stack and F-103 discharging through the Main Stack) were modeled in the air dispersion model with the post-VIP Amendments emission rate, while the Main Stack was modeled the emission rate predicted in the Certified EIR entered as a negative number. Stack parameters from the Certified EIR were used.

Emissions associated with the changes in incremental firing of other combustion sources dispersed through the Benicia Refinery, including GT-702 and SG-1032, were not included in the modeling, as the overall emissions from these sources are lower than in VIP.

Modeling Approach

The USEPA GAQM prescribes a set of approved models for regulatory applications for a wide range of source types and dispersion environments. The AERMOD model is used to assess air quality impacts for the VIP Amendments. AERMOD is a state-of-the-art dispersion model that incorporates modeling improvements for applications involving building downwash and complex terrain. AERMOD is the model recommended by the USEPA for general use and it has replaced the Industrial Source Complex – Short Term 3 model. The latest version of AERMOD (07026), the AERMET (06341) meteorological preprocessor, and the AERMAP (06341) terrain preprocessor were used for this analysis.

In order to assess the maximum pollutant concentrations for one-hour and eight-hour CO impacts, AERMOD was applied with one year (2005) of meteorological data from two sites: the Valero Administration Building monitoring station (Station # 8704) and the Valero Warehouse Met Station (Station # 8702). These sites are both near the modeled sources. The Valero Administration Building Met Station is located in the northwest portion of the facility and is closest to the sources modeled. One year (2005) of wind speed, wind direction and temperature data taken from the on-site meteorological towers, National Weather Service cloud data from Buchanan Field Airport in Concord, California, and concurrent upper air data from Metropolitan Oakland International Airport in Oakland, California, obtained from BAAQMD, were processed with AERMET. The maximum concentrations were always highest when using the Administration Building meteorological dataset, so the reported AERMOD results are from evaluations using the Administration Building meteorological dataset.

A comprehensive Cartesian receptor grid extending to approximately 12.4 miles (20 kilometers [km]) from the refinery's Main Stack was used in the AERMOD modeling to resolve the maximum ground-level pollutant concentrations. This receptor grid is sufficient to resolve the maximum impacts and identify any significant impact area(s).

The Cartesian receptor grid consists of the following receptor spacing:

- Fenceline to 9,842 feet (3,000 m) at 328-foot (100-m) increments;
- Beyond 9,842 feet (3,000 m) to 16,400 feet (5,000 m) at 656-foot (200-m) increments;
- Beyond 3.1 miles (5 km) to 6.2 miles (10 km) at 1,640-foot (500-m) increments;
- Beyond 6.2 miles (10 km) to 12.4 miles (20 km) at 3,280-foot (1,000-m) increments

Discrete receptors were placed approximately every 164 feet (50 m) along the Benicia Refinery fenceline for increased resolution of impacts along the facility boundary.

The AERMAP modeling domain corresponds to a 3.1-mile (5-km) buffer beyond the receptor grid, which provides sufficient resolution of the hill height scale required for each receptor. Terrain elevations from 7.5-minute Digital Elevation Model (DEM) data were acquired from the United States Geological Survey (USGS) and were processed with AERMAP to develop the receptor terrain elevations and corresponding hill height scale required by AERMOD. All of the DEM files are from Universal Transverse Mercator (UTM) Zone 10 and referenced to North American Datum 27 (NAD27).

The USEPA modeling guidelines require the evaluation of the potential for physical structures to affect the dispersion of emissions from stack sources, termed "Good Engineering Practice" (GEP). A GEP stack height analysis was performed for stacks associated with the VIP Amendments in accordance with USEPA's GEP stack height guidelines (USEPA, 1985). The GEP stack height for the proposed stacks was determined using the USEPA Building Profile Input Program-PRIME (BPIPPRM version 04274) that performs the GEP calculation for a multi-building complex on a stack-by-stack basis. Additionally, BPIPPRM calculates the effects of building downwash on plume dispersion; these effects are then incorporated into AERMOD.

The Main Stack GEP height was calculated using BPIPPRM to be 231.5 feet (70.6 m). The actual heights of all other modeled sources are less than the GEP stack heights calculated by BPIPPRM, including the stack height of the H2U furnace to be decommissioned, therefore, the actual stack height is used in the modeling analysis.

Modeling Results

As shown in **Table 3.1.2-7**, potential CO emissions associated with the proposed VIP Amendments will not cause or contribute to an exceedance of the State AAQS. Based on the modeling analysis, the proposed VIP Amendments will not substantially increase the severity of the impact of CO emissions. Accordingly, the proposed VIP Amendments will not have a significant adverse impact on ambient air quality.

Table 3.1.2-7 Ambient Air Quality Impacts Analysis Results for Normal Operations

Pollutant	Averaging Period	Maximum Predicted Impact (μg/m³)	Background Conc. (μg/m³)[1]	Total Conc. (μg/m³)	California AAQS (μg/m³)	Exceed AAQS?
CO	1-hour	32.2	4,639	4,671	23,000	**No**
	8-hour	8.6	3,931	3,940	10,000	**No**

1. The background level is the highest value from the years 2004-2006 reported in the CARB database for the closest monitoring site, Tuolumne Street in Vallejo, California. Values of ppmv were converted into micrograms per cubic meter (μg/m³) using BAAQMD guidelines.

c. Would the project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)? <u>No</u>

According to the BAAQMD CEQA Guidelines, any proposed project that would individually have a significant air quality impact would also be considered to have a significant cumulative air quality impact. For any project that does not individually have significant operational air quality impacts, the determination of significant cumulative impact is based on an evaluation of the consistency of the project with the local general plan and of the general plan with the regional air quality plan.

In the Certified EIR, VIP was determined to have a less-than-significant impact on regional air quality, and would not contribute to a significant adverse cumulative impact. The VIP Amendments would result in further reductions in emissions of NO_X, SO_2, and PM10/PM2.5 as compared to VIP. The VIP Amendments will have an increase in POC and CO emissions when compared to VIP. However, as demonstrated in **Table 3.1.2-6**, POC emissions will not result in a significant impact because the annual mass emission increase is below the CEQA significance threshold. Additionally, CO emissions will not result in a significant impact because emissions from the project will not cause or contribute to an AAQS violation (**Table 3.1.2-7**). Thus, the VIP Amendments will not cause a significant air quality impact.

Because the proposed VIP Amendments do not have significant operational air quality impacts, the determination of significant cumulative impact is based on an evaluation of the consistency of the project with the local general plan and of the general plan with the regional air quality plan. The appropriate general plan for the VIP Amendments is the City of Benicia General Plan, and the appropriate regional air quality plan is the 2005 Ozone Strategy. The VIP Amendments would be consistent with the 2005 Ozone Strategy as discussed above in the response to checklist question **a.**

The implementation of the VIP Amendments would be consistent with the City of Benicia General Plan. Specifically, the Community Health and Safety provisions of the General Plan include the following:

1. Goal 4.9: Ensure clean air for Benicia residents
2. Policy 4.9.1: Establish whether a significant air pollution problem exists in Benicia and the City's role in resolving it
3. Goal 4.10: Support improved regional air quality
4. Policy 4.10.1: Support implementation of the BAAQMD CAP

The VIP Amendments would not result in a significant air quality impact. Thus, the project is consistent with these policies of the General Plan. Based on compliance with the applicable General Plan and 2005 Ozone Strategy, the proposed VIP Amendments would not contribute to a significant cumulative impact.

d. Would the project expose receptors to substantial pollutant concentrations? <u>No</u>

The VIP Amendments may result in a slight increase of toxic air contaminants (TAC) compared to VIP. The new H2U will emit gaseous and particulate TAC as products of combustion, though the shutdown of one H2U train will result in reductions of TAC emissions. New piping components in hydrocarbon service will emit organic TAC as fugitive emissions. Trucks associated with the operation of the VIP Amendments will emit diesel particulate matter (DPM) along the transport routes.

A project is considered significant if predicted cancer risk exceeds ten excess cancer cases per million exposed persons (ten in one million or 10×10^{-6}), or if either chronic non-carcinogenic or acute hazard indices (HI) exceed 1.0 at any off-site receptor. Two Health Risk Assessments (HRAs) were conducted to determine if the VIP Amendments would incrementally expose sensitive receptors to substantial TAC pollutant concentrations. One HRA was performed for TAC emissions from the normal operation of stationary sources at the refinery, and a second, separate HRA was performed for the DPM emissions from trucks along the truck transport route.

The HRA for stationary sources included TAC emissions from the new H2U furnace and fugitive volatile TACs from piping components. TAC emission estimates from the H2U furnace assumed continuous operation at the furnace's maximum capacity. The HRA did not account for reductions in TAC emissions from the decommissioned H2U furnace (F-301 or F-351) in order to provide a conservative evaluation of health risks.

Emissions of TACs from the FCCU/CKR Scrubber are not expected to change from the Main Stack emissions in the Certified EIR because the changes being proposed do not increase fuel combustion. In addition, the operation of the FCCU/CKR Scrubber will not contribute any additional TAC emissions. Therefore, TAC Emissions from the FCCU/CKR Scrubber Stack were not included in the stationary source HRA.

Emissions from other combustion sources will decrease relative to VIP (91 MMBtu/hr decrease for SG-1032, and 70 MMBtu/hr increase for GT-702, or a net reduction of 21 MMBtu/hr), and were not included in the HRA.

As demonstrated by both the stationary source and mobile source HRAs, the incremental TAC emissions from the VIP Amendments would not cause a significant adverse impact as explained in **Section 3.1.8, Public Health**. Accordingly, impacts to public receptors from the VIP Amendments will remain insignificant. The HRAs are described in more detail in **Section 3.1.8, Public Health**.

Demolition of F-102 would not expose receptors to substantial pollutant concentrations. If asbestos containing material (ACM) is present, practices required by BAAQMD and TSCA regulations will assure that ACM is properly controlled to minimize any airborne emissions to the maximum practical level.

e. Would the project create objectionable odors affecting a substantial number of people? <u>No</u>

During construction of the project, diesel fuel will be combusted in the construction equipment, asphalt may be used for the access roads and parking areas, and paint may be applied to protect the equipment and structures. These activities may emit odors; however, given the short-term nature of the emissions and the distance to the nearest off-site receptors, odors from construction activities are not expected to cause an objectionable odor to off-site receptors.

The FCCU/CKR Scrubber will reduce SO_2 emissions from the refinery beyond the reductions previously quantified in the Certified EIR. The emission reductions will further reduce any potential odors from the refinery. The FCCU/CKR Scrubber will use an amine-based reagent for SO_2 emission reductions. This reagent is similar to materials currently used at the Benicia Refinery, and will not be exposed to ambient air during normal operations. This material has no odor and therefore will not contribute to off-site odors.

The H2U furnace will burn RFG and HPU tailgas. Existing furnaces F-101 and F-102 will combust RFG. Combustion byproducts from these gaseous fuels are not known to cause objectionable odors. The CO-laden gases combusted by the new PS Furnace F-105 and F-106 will be the same gases currently combusted by F-101 and F-102. Combustion of gaseous fuels in the furnaces installed or modified as part of VIP Amendments will therefore, not cause odorous impacts beyond what was analyzed in the Certified EIR.

The SCR proposed for NO_X emissions control at the new H2U and the new furnaces F-105 and F-106 will use aqueous ammonia as the reducing agent. The aqueous ammonia will be stored in a pressurized tank that will emit no ammonia vapors under normal operating conditions and, consequently, is not expected to cause objectionable odors. The ammonia slip in the furnace exhaust is not expected to exceed 10 ppmv. The odor threshold for ammonia is about 5 ppmv (Agency for Toxic Substances & Disease Registry (ASTDR)). However, because of the buoyancy of the heated exhaust emissions, the dispersion of emissions over distance, and the distance from the stack to the nearest receptor (the closest that a receptor could be would be at the fenceline, more than 2,000 feet from the stack), ammonia slip emissions are not expected to cause a detectable odor.

Based on these factors, odor impacts from the VIP Amendments will remain insignificant.

2. Air Quality

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would the proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would the proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.2-1: Construction activities associated with project construction would generate short-term emissions of criteria pollutants, including suspended and respirable particulate matter and equipment exhaust emissions.	Significant	Mitigation Measure 4.2-1a: During construction, Valero shall require the construction contractor to implement the following dust control procedures to maintain project construction-related impacts at acceptable levels. • Water all active construction areas at least twice daily. Watering should be sufficient to prevent airborne dust from leaving the site. Increased watering frequency may be necessary whenever wind speeds exceed 15 miles per hour. Reclaimed water should be used whenever possible. • Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least two feet of freeboard (i.e., the minimum required space between the top of the load and the top of the trailer). • Pave, apply water three times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites. • Sweep all paved access roads, parking areas and staging areas at construction sites daily. Sweep City streets (with water sweepers using reclaimed water if possible) at the end of each day if visible soil material is carried onto adjacent paved public roads. • If construction activities for any project component or group of components undergoing simultaneous construction will occur on a construction site greater than four acres in area, Valero shall require the construction contractor to implement the following enhanced dust control procedure: – Hydroseed or apply (non-toxic) soil stabilizer to inactive construction areas (previously graded areas inactive for ten days or more). – Enclose, cover, water twice daily, or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.) – Limit traffic speeds on unpaved roads to 15 mph. – Install sandbags or other erosion control measures to prevent silt runoff to public roadways. – Replant vegetation in disturbed areas as quickly as possible.	Less than Significant With Mitigation.	No. The construction activities under the VIP Amendments are substantively similar to activities described in VIP, and the expected impacts described and mitigation measures proposed will be the same as described in the Certified EIR.	No. The construction impacts associated with the VIP Amendments will be less than significant as a result of the previously identified mitigation measures.

2. Air Quality

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would the proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would the proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
		Mitigation Measure 4.2-1b: To mitigate impact of construction equipment exhaust emissions, the project sponsor shall require its construction contractors to comply with the following requirements: • Construction equipment shall be properly tuned and maintained in accordance with manufacturers' specifications. • Best management construction practices shall be used to avoid unnecessary emissions (e.g., trucks and vehicles in loading and unloading queues would turn their engines off when not in use). Any stationary motor sources (such as generators and compressors) located within 100 feet of any residence shall be equipped with a supplementary exhaust pollution control system as required by the BAAQMD and CARB. In such cases, the project sponsor shall require construction contractors to mitigate diesel emission by measures such as the use of catalyzed diesel particulate filters, and/or use of USEPA and CARB 1996 certified diesel engines.	Less than Significant with Mitigation.	No. The construction activities under the VIP Amendments are substantively similar to activities described in VIP, and the expected impacts described and mitigation measures proposed will be the same as described in the Certified EIR.	No. The construction impacts associated with the VIP Amendments will be less than significant as a result of the previously identified mitigation measures.
Impact 4.2-2: Operational activities associated with the implementation of the proposed project could lead to increase in regional air pollutant emissions into the air basin.	Significant	Mitigation Measure 4.2-2: As a condition of approval of the use permit for VIP, Valero must implement the Light Ends Rail Rack Arm Drains project. Use Permit Condition 2: This approval is based in part on representations of the applicant, consistent with conditions of approval expected to be imposed by the BAAQMD, that there will be no net increase in overall refinery emissions as a result of VIP. The BAAQMD proposed conditions include emission limitations, based on the three-year baseline emissions reported to the BAAQMD by Valero for purposes of this project, to insure there will be no net increase in emissions as a result of VIP. A change in the project, or in the proposed BAAQMD conditions of approval, such that the project facilities would result in such a net emission increase shall require a use permit amendment with associated CEQA review.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments would result in a reduction in facility emissions of NO_X, SO_2, and PM10/PM2.5 relative to the Certified EIR. There will be a less-than-significant increase in POC emissions. While there will be an increase in CO emissions, modeling analysis demonstrates that the increase does not cause a violation of AAQS, and will not have a significant adverse impact. As the	No. The VIP Amendments will not cause a substantial increase in already identified significant effects.

2. Air Quality

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would the proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would the proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
		Use Permit Condition 3: Valero shall provide the City with copies of any application to the BAAQMD for a new Authority to Construct or any amendment to an existing Authority to Construct for any part of VIP, so that the City may evaluate the proposals for consistency with the scope of the use permit approval and the Certified EIR analysis. The documents shall be provided at no cost to the City. Use Permit Condition 4: Valero shall provide the City with copies of its emissions reports to the BAAQMD whenever such reports are requested by the City to evaluate whether VIP is being constructed or operated consistent with Condition 1. Reasons for such a request may include, but are not limited to, approval by the BAAQMD of a new or amended Authority to Construct for any part of VIP. The documents shall be provided at no cost to the City. Use Permit Condition 14a: Valero shall construct and operate the FCCU/CKR Scrubber at the same time that the sulfur plant expansion is constructed. Use Permit Condition 14b: Notwithstanding any BAAQMD permit conditions that may allow higher crude rates without such restriction, the refinery shall not operate more than a total of 1,096 consecutive or non-consecutive days at crude rates above 135,000 barrels per day and/or with the third air blower in operation without installing and operating the scrubber. If the scrubber is not completed and operating by the deadline, the refinery shall not process more than 135,000 barrels of crude per day, and shall deactivate the third air blower, if operating, until such time as the scrubber is in operation.		impacts evaluated in the Certified EIR were less than significant, the VIP Amendments will not result in a significant adverse impact. As shown above, the net emission change due to the proposed project does not exceed the BAAQMD's significance thresholds for annual mass emissions for any criteria pollutant, and does not cause an exceedance of the federal or California AAQS.	

2. Air Quality

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would the proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would the proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.2-3: Operational activities associated with the implementation of the proposed refinements to VIP could lead to increase in odorous emissions. This would be a less than significant impact.	Less than Significant.	No Mitigation Required.	No Mitigation Required.	No. The proposed project elements are not expected to cause odor issues.	No significant effect previously identified.
Impact 4.2-4: The proposed refinements to VIP, along with other ongoing and approved projects would lead to a net reduction in emissions relative to the baseline levels. This would constitute a net air quality benefit.	Environmental Benefit.	No Mitigation Required.	No Mitigation Required.	No. The VIP Amendments, along with other ongoing and approved projects would lead to a net reduction in NO_X, SO_2, and PM10/PM2.5 emissions relative to the Certified EIR The VIP Amendments would also result in a decrease in emissions associated with flaring.	Not Applicable. This item is an Environmental Benefit, not an impact.

References:

Agency for Toxic Substances & Disease Registry, Medical Management Guidelines for Ammonia, http://www.atsdr.cdc.gov/mhmi/mmg126.html

Bay Area Air Quality Management District, Bay Area 1997 Clean Air Plan.

Bay Area Air Quality Management District, Bay Area 2000 Clean Air Plan, December 2000a.

Bay Area Air Quality Management District, Bay Area 2005 Ozone Strategy, January 4, 2006.

Bay Area Air Quality Management District, BAAQMD CEQA Guidelines – Assessing the Air Quality Impacts of Projects and Plans, December 1999.

Bay Area Air Quality Management District, Association of Bay Area Governments, Metropolitan Transportation Commission, Bay Area Clean Air Plan, 1997.

Bay Area Air Quality Management District, Permit Modeling Guidance, May 2005.

Bay Area Air Quality Management District, BACT/TBACT Workbook, located at http://www.baaqmd.gov/pmt/bactworkbook/default.htm.

Bay Area Air Quality Management District, Source Emission Inventory, Plant #12626, September 2006.

Bay Area Air Quality Management District, Air Quality Monitoring Data, http://gate1.baaqmd.gov/aqmet/aq.aspx

California Air Resources Board, EMFAC 2001, EMFAC 2002 User's Guide, 2002.

California Air Resources Board, Emission Inventory Methodology 7.9, Entrained Paved Road Dust, 1997.

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Environmental Analysis: Valero Benicia Refinery, New Crude Oil Storage Tank Project, September 2006.

Interview, Valero personnel, January 2007.

South Coast Air Quality Management District, Rule 1156, Further Reductions of Particulate Emissions from Cement Manufacturing Facilities, November 2005.

United States Environmental Protection Agency, Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations) (EPA-450/4-80-023R), 1985.

United States Environmental Protection Agency, User's Guide for the Industrial Source Complex (ISC3) Dispersion Models (EPA-454/B-95-003b), September 1995.

United States Environmental Protection Agency Guidelines on Air Quality Models, 1978.

URS Corporation, Valero Improvement Project, Air Emission Calculations: Baseline and Project Emissions June 2002.

3.1.3 Greenhouse Gases

3.1.3.1 Introduction,

Recently there has been an increase in public attention to climate change and global warming issues, at the international, federal, state and even the local level. In California, this attention has included calls for CEQA documents to incorporate analysis and mitigation of climate change impacts from project contributions to greenhouse gas (GHG) emissions. However, neither CEQA nor the CEQA Guidelines provide any guidance as to the appropriate significance thresholds or analytic methodology for the potential contribution to global climate change impacts that might be attributable to the GHG emissions of individual projects. A white paper titled "CEQA and Climate Change" released by the California Air Pollution Control Officers Association (CAPCOA) in January 2008 offers several possible approaches to evaluating the significance of project related GHG emissions but does not endorse any particular approach and is intended as an informational resource, not a guidance document. In the absence of established significance thresholds, project impact and mitigation analysis is premature, in which case the CEQA Guidelines instruct that the lead agency "should note its conclusions and terminate discussion of the impact." (CEQA Guidelines § 15145).

Nevertheless, in light of the importance of this topic, an evaluation of GHG emissions under the VIP Amendments was completed. The analysis demonstrates that the VIP Amendments will result in a net decrease in GHG emissions. Accordingly, even in the absence of established significance thresholds and methodology, it can be concluded that the project will not contribute to an increase in GHG emissions which are linked to climate change.

3.1.3.2 Climate Change – Environmental Setting

Global climate change has been described as alterations in weather features such as temperature, wind patterns, precipitation, and storms, which occur across the Earth as a whole. Global temperatures are modulated by naturally occurring components in the atmosphere capturing heat radiated from the Earth's surface, which in turn warms the atmosphere. This phenomenon is known as the "greenhouse effect." GHGs are gases that trap heat in the atmosphere. CO_2 and methane are the GHGs that are emitted in the greatest quantities from human activities. Emissions of CO_2 are largely by-products of fossil fuel combustion, whereas methane results from off-gassing associated with agricultural practices and landfills. By some accounts it is thought that enhancement of the greenhouse effect can occur when concentrations of these gases from human activities exceed the natural concentrations in the atmosphere.

3.1.3.3 Legal and Regulatory Background

The following is a brief synopsis of some of the on-going legal and regulatory developments related to climate change and GHG impacts, which to date do not provide any guidance as to the appropriate significance thresholds or analytic methodology for the analyzing the potential contribution to global climate change impacts or GHG emissions of individual projects.

1. <u>Federal Law</u>

In April 2007, in *Massachusetts v. U.S. Environmental Protection Agency*, 127 S. Ct. 1438 (2007), the U.S. Supreme Court held that carbon dioxide is an "air pollutant" subject to regulation by the U.S. EPA under the federal Clean Air Act. In response to that decision, EPA has announced that it will initiate rulemaking efforts with regard to reduction of GHG emissions from new motor vehicles.

2. State Law

SB 527. Enacted in 2001, SB 527 formed the California Climate Action Registry (CCAR). CCAR is a non-profit voluntary registry for GHG emissions. When organizations become participants, they agree to register their GHG emissions, along with indirect emissions from electricity use. Valero is a member of CCAR.

AB 1493. Enacted in 2002, AB 1493 directs the California Air Resources Board (CARB) to develop and implement regulations that achieve the "maximum feasible reduction" of GHG emissions from passenger vehicles, light-duty trucks and other noncommercial vehicles. Pursuant to AB 1493, in 2004 CARB approved regulations limiting the amount of greenhouse gases released from motor vehicles.[2] California has requested that the U.S. EPA waive preemption of its state motor vehicle emission control standards pursuant to the federal Clean Air Act. The U.S. EPA has indicated that it will make a decision on California's waiver request by the end of 2007.

Executive Order S-3-05. This 2005 Executive Order establishes GHG emission reduction targets for California:

- By 2010, reduce greenhouse gas emissions to 2000 levels
- By 2020, reduce greenhouse gas emissions to 1990 levels
- By 2050, reduce greenhouse gas emission to 80 percent below 1990 levels

AB 32. California Global Warming Solutions Act of 2006. AB 32 establishes statewide greenhouse gas reduction targets, requiring:

- California to reduce its greenhouse gas emissions to 1990 limits (as determined by the CARB by January 1, 2008) by 2020.
- GHG emission standards to be implemented by 2012.
- CARB to develop an implementation program and adopt greenhouse gas control measures "to achieve the maximum technologically feasible and cost-effective greenhouse gas emission reductions from sources or categories of sources."

SB 1368. Enacted in 2006, this bill requires the California Public Utilities Commission and California Energy Commission to establish GHG performance standards for electric power generation utilities.

Executive Order S-1-07. This 2007 Executive Order establishes a Low Carbon Fuel Standard:

- By 2020, fuel providers (including refiners, blenders, producers, and importers) must reduce their average "carbon intensity" by 10%.
- This reduction is expected to result in replacement of 20% of on-road gasoline consumption with lower-carbon fuels and lead to the addition of seven million alternative fuel or hybrid vehicles on California roads.

CEQA. Pursuant to CEQA, the purpose of an environmental impact report is to identify the significant environmental effects of a project (if any), to identify alternatives to the project, and to indicate the manner in which those significant effects can be mitigated or avoided. (Cal. Pub. Res. § 21002.1(a)). "Significant effect" is defined as a "substantially or potentially substantial, adverse change in the environment." (§ 21068). To date, no significance thresholds have been established for assessing the contribution of an individual project's GHG emissions to a significant impact on climate change and global warming.

SB 97. Enacted in August 2007, SB 97 requires the Office of Planning and Research to develop guidelines for the mitigation of greenhouse gas emissions or the effects of greenhouse gas emissions by July 1, 2009, and the Resources Agency to adopt those guidelines by January 1, 2010.

2. These regulations are the subject of pending litigation by the automotive industry on federal preemption grounds.

3. Other Guidance

CAPCOA's "CEQA and Climate Change". In January 2008, CAPCOA, in coordination with CARB, and the Governor's Office of Planning and Research, released this white paper to provide a common platform of information and tools to support public agencies in addressing GHG emissions under CEQA. It reviews a variety of policy choices, significance thresholds, analytical tools, and mitigation options, but does not advocate any particular approach. The white paper is intended as a resource, not as a guidance document or legal advice, and it does not dictate the manner in which a public agency should address GHG emissions under CEQA.

3.1.3.4 Project-Related GHG Emissions

As previously stated, neither CEQA, the CEQA Guidelines, nor on-going legal and regulatory developments provide any methodology for analysis of the potential contribution to climate change impacts from the GHG emissions of individual projects, nor do they provide any thresholds for determining the significance of such impacts or for mitigating impacts determined to be significant. Under SB 97, such guidelines are not required to be adopted until 2010. Thus, achieving the purpose of CEQA analysis, i.e., identifying significant environmental effects and mitigating or avoiding those effects to a level of insignificance, is not possible at this time.

Nevertheless, in order to address this important emerging issue, the changes in direct and indirect emissions of GHGs from the Benicia Refinery as a result of the VIP Amendments are addressed in this section. The analysis demonstrates that the VIP Amendments will result in a net decrease in GHG emissions.

As illustrated in **Table 3.1.2-2,** combustion of gaseous fuels will decrease due to the increased efficiency of the H2U furnace. As presented in **Section 3.1.6**, the Benicia Refinery's electrical demand will be unchanged relative to VIP. Finally, as shown in **Table 3.1.2-4**, there will be an increase in truck traffic associated with the VIP Amendments, relative to VIP. These trucks will emit GHGs in addition to criteria pollutants.

The changes to the Benicia Refinery's GHG emissions as a result of the VIP Amendments were estimated using emission factors and protocols developed by the California Climate Action Registry (CCAR), a non-profit, voluntary registry for GHG emissions. The emission changes due to fuel combustion were estimated using emission factors presented in the CCAR General Reporting Protocol Version 2.2 (CCAR 2007). Carbon dioxide (CO_2) emissions from mobile sources were estimated using the EMFAC2007 model (CARB 2002). Mobile source emissions of the GHGs nitrous oxide (N_2O) and methane (CH_4) were estimated using CCAR emission factors and protocols.

Table 3.1.3-1 presents the changes in GHG emissions resulting from the VIP Amendments, relative to VIP. GHG emissions are expressed in metric tons per year CO_2 equivalent (Tonnes/year CO_2-e). The VIP Amendments will result in a decrease in GHG emissions compared to VIP.

Table 3.1.3-1 Changes in Greenhouse Gas Emissions from VIP to VIP Amendments

Source	**GHG Emissions Tonnes/year CO_2-e**
Fuel Combustion (21 MMBtu/hr reduction)	-11,450
Electrical Consumption (No change)	0
Mobile Sources (Heavy-Duty Trucks, 52,624 mi/yr)	101
Total change from VIP	**-11,350**

This analysis demonstrates that the VIP Amendments will result in a net decrease in GHG emissions. The refinery remains committed to further reductions of GHG emissions as may be required under regulations now being developed. As stated in CAPCOA [2008][3], if a project can be shown by substantial evidence not to increase GHG emissions, then there can be no fair argument that the project contributes considerably to a significant cumulative climate change impact.

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3. Greenhouse Gases

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would the proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would the proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
None – GHGs not analyzed in Certified EIR	N/A	Not Applicable	Not Applicable	No. GHG emissions will decrease as a result of the proposed project, so there will be no significant effect.	No. GHG emissions will decrease as a result of the proposed project, so there will be no increase in any already identified significant effects.

References:

Bay Area Air Quality Management District, Source Inventory of Greenhouse Gas Emissions, (November 2006).

Assembly Bill 32 (Nunez), Ch. 488, Cal. Stats. 2006.

Assembly Bill 1493 (Pavley), Ch. 200, Cal. Stats. 2002.

California Air Pollution Control Officers Association, CEQA and Climate Change: Evaluating and Addressing Greenhouse Gas Emissions from Projects Subject to the California Environmental Quality Act, January 2008.

California Air Resources Board, EMFAC2007.

California Climate Action Registry, General Reporting Protocol version 2.2, California Climate Action Registry, March 2007.

California Energy Commission, Inventory of California Greenhouse Gas Emissions and Sinks: 1990 – 2004, Staff Final Report, (December 2006).

Climate Action Team Report to Governor Schwarzenegger and the Legislature (March 2006).

Emissions & Generation Resource Integrated Database, EGRID2006 version 2.1.

Executive Order S-3-05, June 1, 2005.

Executive Order S-1-07, January 18, 2007.

Massachusetts v. Environmental Protection Agency, 127 S.Ct. 1438 (2007).

Public Resources Code §§ 21002.1, 21068.

Senate Bill 97 (Dutton), Ch. 185, Cal. Stats. 2007.

Senate Bill 1368 (Perata), Ch. 598, Cal. Stats. 2006.

Senate Bill 1771 (Sher), Ch. 1018, Cal. Stats. 2000, as amended by Senate Bill 527 (Sher), Ch. 769, Cal. Stats. 2001.

UN Intergovernmental Panel on Climate Change, Climate Change 2007 – The Physical Science Basis, Contribution of Working Group I to the Fourth Assessment Report of the IPCC, (2007).

3.1.4 Biological Resources

a. Would the project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service? No

The Certified EIR (EIR Section 4.3) addressed records of candidate, sensitive, and special-status species identified within the area bounded by the Carquinez Strait, uplands north of I-680, and the coast between Southampton Bay and Goodyear Slough. A focused list of special-status species with the potential to occur in or near the Benicia Refinery was compiled from these records and was included in the Certified EIR in Table 4.3-1. Specific locations that the Certified EIR evaluated for biological impacts included the Benicia Refinery Process Block and adjacent developed land, the WWTP, the area to the northeast of the Refinery Process Block, the Tank Farm, and open areas of the Benicia Refinery. Within these areas, no candidate, sensitive or special-status species or habitats for species were identified (EIR Section 4.3.2), except for habitat in the area of the Tank Farm. Since none of the improvements associated with the proposed VIP Amendments are to be located within the Tank Farm, habitat of the Western Pond Turtle, Curved-foot hygrotus diving beetle, California tiger salamander, Tricolored blackbird, Suisun song sparrow, and California red-legged frog in the area of the Tank Farm is not anticipated to be disturbed . Additionally, two biological surveys conducted for the refinery in 1988 and 1991 did not identify any special-status plant species or suitable habitat (EIR Section 4.3.2).

To address specific effects from the VIP Amendments on biological resources within areas not previously determined to be affected, site-specific updates to the information presented in the Certified EIR (EIR Section 4.3.2) were undertaken. The site-specific updates are included as **Appendix D** of this application. These site-specific assessments were conducted in the area designated for the new H2U location, the relocated employee parking lot, the FCCU/CKR Scrubber, and in several alternative potential locations for the relocated firehouse. The site for the relocated firehouse southwest of the Refinery Process Block that was considered in the Appendix D survey is not currently being considered as an option. However, the assessment is included for completeness as it was evaluated as an alternative location.

The new H2U will be constructed in the existing employee parking lot. Due to the heavily developed and disturbed nature of this area, no suitable habitat for special-status plant or wildlife species is present.

The site-specific survey of the relocated employee parking lot, which will be a two-level lot terraced into the gentle sloping area located on currently unused Valero property north of the Refinery Process Block, found that the area consists of ice plant (*Mesembryanthemum crystallinum L.)* and various annual grasses. No suitable habitat for any special-status species were documented or observed to occur in this area.

The site-specific survey of the FCCU/CKR Scrubber, located on and adjacent to a steep northeastern facing slope abutting Avenue E, found that the area is mostly comprised of bare earth, predominantly ice plant (*Mesembryanthemum crystallinum* L) that has died off. There is an engineered drainage ditch mid-slope, running parallel to Avenue E. Concrete open-culverts convey runoff down to the base of the slope where another engineered drainage connects and conveys runoff to two beehive storm water drains. The storm water drains convey the runoff to the Benicia Refinery's WWTP. The area immediately surrounding the site consists of paved roads and facilities associated with refinery operations. On the day of the survey, standing water from recent heavy rains was observed in the drainage platform mid-slope and in the concrete drainage culverts running down the face of the slope. Plant species occurring in this area include cattail (Typha sp.), rush (Juncus sp.) and moss-algae species, among others. There is evidence of annual vegetation die-back, indicating that the standing water is not a natural seep and was created by the poor grading contours of the man-made drainage ditch. Due to the heavily disturbed nature of the area, no suitable habitat for special status plant or wildlife species is present, with the exception of nesting birds. Although, cattails are potential nesting habitat for the Suisun song sparrow, a California species of concern, no candidate, sensitive, or special-status species were present. Maintenance of the engineered drainage was completed in February and performed without disturbing the existing vegetation, which is expected to die-off naturally and it will then be removed for weed abatement (fire protection).

Three alternative locations for the relocated firehouse are currently being evaluated. Alternative 1 entails relocating the firehouse to the southeast corner of the existing Fuels Terminal. Alternative 2 would place the firehouse in the existing paved parking lot across the main plant entrance west of the Administration Building. Alternative 3 considers relocating the firehouse to near its existing location (next to the proposed new H2U location) and west of the Cogeneration Plant after construction of the new H2U. All three alternative locations are either paved or previously disturbed areas lacking suitable habitat for special-status plant or wildlife species. All construction activities associated with the firehouse relocation would be conducted within the paved or disturbed site boundaries.

b. Would the project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations, or by the California Department of Fish and Game or US Fish and Wildlife Service? No

As described in the Certified EIR (EIR Section 4.3.2), the habitat types located within the Benicia Refinery included non-native grassland, freshwater emergent wetland (and pond), riparian, and estuarine open water. The open areas of the Benicia Refinery contain non-native grasslands. The freshwater emergent wetland was described in the Tank Farm area. The riparian habitat was described in the area of Sulphur Springs Creek and in drainage swales located within the Benicia Refinery. Estuarine open water habitat was described as the waters of Suisun Bay, which accept the WWTP outfall. According to the Certified EIR, patches of habitat observed within the refinery boundaries are too small to support a full suite of species identified for those habitats (EIR Section 4.3.2).

The WWTP, through planned modifications addressed in the Certified EIR, would treat additional wastewater loading from the VIP Amendments including blowdown from the unfired scrubber waste heat boiler and other steam generation; purges from the pre-scrubber, amine purification unit, and caustic polisher; and desalter vessel wash water. The steam generation blowdown, amine purification purge, and desalter wash water streams will have typical characteristics of other Benicia Refinery wastewater streams and thus will be effectively treated by the WWTP. The pre-scrubber purge and caustic polisher purge may slightly alter the WWTP discharge characteristics due to the increases of nickel, vanadium, aluminum, and sulfates. As required by its current NPDES permit and consistent with the Certified EIR in implementing VIP components and the VIP Amendments, the Benicia Refinery will in consultation with the San Francisco Bay Regional Water Quality Control Board (RWQCB) determine whether a technical study of potential loading impacts will be required to address the mass increase of pollutants proposed to be discharged and propose new treatment units, if necessary, to maintain water quality in Suisun Bay. Therefore, the VIP Amendments will be designed to be protective and will not have a substantial adverse effect on sensitive natural communities in Suisun Bay.

The majority of the project components for the VIP Amendments are located in highly disturbed and developed areas within the existing industrial footprint of the Benicia Refinery. This includes the Refinery Process Block and adjacent developed land. Due to the heavily disturbed and developed nature of the Benicia Refinery, no suitable habitat for special-status plant or wildlife species was described in the Certified EIR as present within these areas (EIR Section 4.3.2). VIP Amendments project components located within the Refinery Process Block and adjacent developed land are the desalter, the pre-scrubber, and FCCU/CKR Scrubber. The H2U and firehouse will be in a developed area of the Benicia Refinery outside of the process block. The only new project component not located within the existing industrial footprint of the Benicia Refinery is the new employee parking lot. A site-specific survey was conducted in the areas outside of the Refinery Process Block for the purpose of this Use Permit application and is provided in **Appendix D**.

According to observations, the area proposed for the relocated employee parking lot is located in a gentle sloping area located on currently unused Valero property north of the Refinery Process Block. The area proposed for the parking lot area mainly consists of ice plant (*Mesembryanthemum crystallinum L.)* and various annual grasses. No riparian habitat or sensitive natural communities were observed in this area. The vegetation associated with the FCCU/CKR Scrubber site is highly disturbed, predominantly ice plant (*Mesembryanthemum crystallinum L*), and other ruderal vegetation that has died off and does not provide suitable habitat to be considered a sensitive natural community. The three alternative site locations for the relocated firehouse are all either paved or previously disturbed areas. Unpaved areas consist mainly of ice plant (*Mesembryanthemum crystallinum L*), wild rosemary (*Ledum palustre*), and other ruderal vegetation. All three sites lack riparian habitat or other sensitive natural communities.

c. Would the project 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? No

As set forth in the Certified EIR, construction and operation of VIP does not fall under the jurisdiction of the federal Clean Water Act (CWA), as no fill of jurisdictional wetland is expected. Similarly, no such fill is planned for the VIP Amendments. Work associated with the VIP Amendments has also been designed to avoid impacts on certain patches of habitat observed near the project area described below.

A site-specific survey identified a drainage ditch that is approximately 6 feet wide and several hundred feet long to the north of the proposed new H2U location. The ditch appears to have been constructed to capture the minimal runoff from an adjacent berm. The drainage ditch extends west through an approximately eight-inch culvert and continues for several hundred feet down the slope where it drains into a tributary to Sulphur Springs Creek. No special-status species or habitat was observed in the constructed drainage ditch. However, the Sulphur Springs tributary to which the ditch drains contained cattail (*Typha sp*.), rush (*Juncus sp*), and willow (*Salix sp*.) species. Wildlife detected or observed at this site included Pacific tree frog (*Hyla regilla*) and house finch (*Carpodacus mexicanus*). The drainage ditch could be considered an unvegetated water and, as such may fall under the jurisdiction of the U.S. Army Corps of Engineers (USACE) who regulate waters of the U.S. and wetlands under Section 404 of the Clean Water Act (CWA). Construction of the new H2U will avoid the drainage ditch.

A second site-specific survey of the FCCU/CKR Scrubber project identified a drainage platform and drainage ditch which conduct storm precipitation from upland and developed areas to the site's WWTP and do not contain permanent water flow. These areas would not be considered waters of the U.S. under USACE jurisdiction or wetlands under CWA Section 404.

No federally protected wetlands, as defined by CWA Section 404, or USACE jurisdictional wetlands exists in any of the three alternate sites for the relocated firehouse.

d. Would the project 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

According to the Certified EIR (EIR Section 4.3.2), the project areas (Refinery Process Block and adjacent developed land, the area to the northeast of the Refinery Process Block, the WWTP area, and the FCCU/CKR Scrubber project site) are not utilized by native, resident, or migratory birds, fish, or wildlife species, nor are these areas within established native resident or migratory wildlife corridors. The Certified EIR (EIR Section 4.3.2) also indicates that construction and operation in these areas would not impede the use of native wildlife nursery sites. The proposed VIP Amendments project locations outside of the Refinery Process Block and adjacent developed land include the area to the northeast of the Refinery Process Block, and the WWTP. These areas were observed as part of the previous analysis. Locations of proposed VIP Amendments components do not have the potential to be used as a native wildlife nursery and the proposed VIP Amendment project components would not interfere with the movement of native or migratory wildlife or with established wildlife corridors.

e. Would the project conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance? No

The development identified in the Certified EIR was determined to be consistent with the City's General Plan policies addressing Open Space and Conservation Resources (EIR Section 4.3.2). As with VIP, the majority of the development of the proposed sites for the VIP Amendments are located within the Refinery Process Block and adjacent developed land and other areas of the Benicia Refinery that do not contain native trees, such as oaks, or other significant vegetation protected by local policies or ordinances. Therefore, the VIP Amendments would not conflict with any local policies or ordinances protecting biological resources.

f. Would the project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan? No

The VIP Amendments project components are located outside the area addressed in the Suisun Marsh Protection Plan. The discharge from the Benicia Refinery WWTP occurs within the Marsh Protection Area. As described above the VIP Amendments may alter the WWTP discharge characteristics; however, the VIP Amendments will be designed to be protective and will not have a substantial adverse effect on sensitive natural communities in Suisun Bay. See **Sections 3.1.10 and 3.1.15(a)** below, for more detailed discussion of wastewater treatment.

4. Biological Resources

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.3-1: Potential disturbance of western pond turtle and California red-legged frog could occur during construction at the Tank Farm retention pond site.	Significant.	Mitigation Measure 4.3-1: Unless protocol surveys during the period May 1 through November 1 establish that the retention ponds are not occupied by either species, the modification of any Tank Farm retention pond shall be preceded by a period of at least six months during which the pond is drained and minimal water allowed to collect in the basin. If such pond drying is not possible, the project shall adhere to the following mitigation protocols: At least 45 days prior to working at the site, Valero shall notify City and a City-designated biologist to ensure that no work occurs without appropriate pre-construction surveys 48 hours before work begins. Notification shall be in writing and clearly define proposed construction schedule such that pre-construction surveys can be completed. The City-designated biologist shall be present at all times during construction at the ponds, and as required during construction at the ponds, and as required during construction near non-sensitive areas, as an on-site monitor to detect frogs or pond turtles which may enter the area of disturbance. If a California red-legged frog is identified in the project construction zone during pre-construction surveys or construction, no work in the immediate area can begin (or ongoing construction shall be halted) until the USFWS Sacramento Field Office is contacted and concurs that the project will not result in harm or harassment to the species. Western pond turtles may be relocated to suitable habitat by the City-designated biologist.	Less than Significant with Mitigation.	No. None of the other listed VIP Amendments project areas contain habitats for concern. Note that this impact originally focused on the Tank Farm area. This EA for the VIP Amendments addresses all areas within the Refinery that could be impacted.	No. None of the listed VIP Amendments project areas contain habitats for concern. Note that this impact originally focused on the Tank Farm area. This EA for the VIP Amendments addresses all areas within the Refinery that could be impacted.

4. Biological Resources

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.3-2: Potential disturbance of special-status and protected native birds (e.g., tricolored blackbird and Suisun song sparrow) during the breeding season could occur at the Tank Farm retention ponds.	Significant.	Mitigation Measure 4.3-2: Construction at the Tank Farm shall be limited to the non-breeding season for most birds, *i.e.*, all work shall occur September through February. Alternatively, if construction must occur during the breeding season, all vegetation that could be used for nesting shall be removed during the September through February period preceding construction.	Less than Significant with Mitigation.	No. None of the other listed VIP Amendments project areas contain habitats for concern. Note that this impact originally focused on the Tank Farm area. This EA for the VIP Amendments addresses all areas within the Refinery that could be impacted.	No. The Tank Farms are not part of the VIP Amendments project. This impact addresses potential species located within the Tank Farm area. Construction near the top of the levee for Sulphur Springs Creek would not potentially disturb the Suisun Song Sparrow. The timing of the spanned crossing will not conflict with nesting or breeding periods. None of the listed VIP Amendments project areas contain habitats for concern. Note that this impact originally focused on the Tank Farm area. This EA for the VIP Amendments addresses all areas within the Refinery that could be impacted.
Impact 4.3-3: Potential impacts to special status fisheries could occur with additional water discharges into Suisun Bay or from increased ship traffic associated with increased refinery capacity. The Suisun Marsh Protection Plan (BCDC, 1976) requires that the disposal of wastewater from any existing outfall follow the permit conditions from water quality oversight agencies. Therefore, by continued compliance with discharge requirements of the refinery's National Pollutant Discharge Elimination System (NPDES) permit this impact is less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The Benicia Refinery will in consultation with the San Francisco Bay Regional Water Quality Control Board (RWQCB) determine whether a technical study of potential loading impacts will be required to address the mass increase of pollutants proposed to be discharged and propose new treatment process units, if necessary, to maintain water quality in Suisun Bay. Therefore, the VIP Amendments will not affect the discharge.	No significant effects previously identified.

4. Biological Resources

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.3-4: Potential impacts to special status fisheries could occur with additional water discharges from other non-refinery industrial projects, together with cumulative refinery projects. By continued compliance with the discharge requirements of the refinery's NPDES permit this impact is less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The Benicia Refinery will in consultation with the San Francisco Bay Regional Water Quality Control Board (RWQCB) determine whether a technical study of potential loading impacts will be required to address the mass increase of pollutants proposed to be discharged and propose new treatment process units, if necessary, to maintain water quality in Suisun Bay. Therefore, the VIP Amendments will not affect the discharge.	No significant effects previously identified.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Interview, various Valero personnel, January 2007.

Resolution 03-4, City of Benicia Planning Commission, A Resolution of the Planning Commission of the City of Benicia Approving a Use Permit for the Valero Certifying the Final Environmental Impact Report, Adopting CEQA Findings and Adopting a Mitigation Monitoring and Reporting Program for the Valero Improvement Project (PLN2002-00022).

Resolution 03-5, City of Benicia Planning Commission, A Resolution of the Planning Commission of the City of Benicia Approving a Use Permit for the Valero Improvement Project (PLN2002-00022).

3.1.5 Cultural Resources

a. Would the project cause a substantial adverse change in the significance of a historical resource as defined in 15064.5 of the CEQA Guidelines? <u>No</u>

According to the CEQA Guidelines (Section 15604.5 (a) (3)), generally a resource shall be considered to be "historically significant" if it meets the criteria for listing on the California Register of Historic Resources. Records searches and surveys have been conducted throughout the Benicia Refinery and are documented in the Certified EIR. As discussed in the Certified EIR, one potential historical resource was identified on site that was designated as P-48-000516, or the Benicia Arsenal Igloo Bunker #C-425, located to the northeast of the Refinery Process Block. Disturbance of Bunker #C-425 is not expected as a result of the VIP Amendments, as this area is not in proximity to construction activity.

No other such historic resources are known to be present at the Benicia Refinery. However, there is always the potential that ground-disturbing activities, such as those planned as part of VIP Amendments, could uncover unknown resources with cultural significance. Accordingly, adherence to Mitigation Measure 4.4-1 of the Certified EIR will ensure that impacts to cultural resources remain less than significant.

b. Would the project cause a substantial adverse change in the significance of an archaeological resource pursuant to 15064.5 of the CEQA Guidelines? <u>No</u>

The Certified EIR did not identify any significant archaeological resources at the site. However, the development of the proposed VIP Amendments project elements could uncover unknown archaeological resources during construction. Accordingly, adherence to Mitigation Measure 4.4-1 of the Certified EIR will ensure that impacts to archaeological resources remain less than significant.

c. Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature? <u>No</u>

The Certified EIR did not identify any significant paleontological resources or unique geologic features within the existing footprint of the Benicia Refinery. As described in the Certified EIR, development, including construction and grading within the Benicia Refinery, could uncover unknown paleontological resources. As such, this potential impact could occur with the project elements of the VIP Amendments, which occur within the existing footprint. Accordingly, adherence to Mitigation Measure 4.4-1 of the Certified EIR will ensure that impacts to unknown paleontological resources or unique geologic features remain less than significant.

d. Would the project disturb any human remains, including those interred outside of formal cemeteries? <u>No</u>

As described in the Certified EIR, there is the potential that human remains could be unearthed during grading activities within the existing Benicia Refinery footprint. As such, the additions and modifications associated with the development of the proposed VIP Amendments within the existing refinery footprint could potentially unearth human remains. Accordingly, adherence to Mitigation Measure 4.4-1 of the Certified EIR will ensure that impacts remain less than significant. Additionally, if human remains are discovered, Section 15064.4 (e) (1) of the CEQA Guidelines would be implemented.

5. Cultural Resources

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.4-1: Construction of the refinery modifications may cause substantial adverse changes to the significance of currently unknown cultural resources.	Significant.	Mitigation Measure 4.4-1: Pursuant to CEQA Guidelines 15064.5(f), "provisions for historical or unique archaeological resources accidentally discovered during construction" shall be instituted. Therefore, in the event that any prehistoric or historic subsurface cultural resources are discovered during ground disturbing activities, all work within 50 feet of the resources shall be halted and Valero shall consult with a qualified archaeologist or paleontologist to assess the significance of the find. If any find is determined to be significant, representatives of Valero and the qualified archaeologist and/or paleontologist shall meet to determine the appropriate avoidance measures or other appropriate mitigation. All significant cultural materials recovered shall be subject to scientific analysis, professional museum curation, and a report prepared by the qualified archaeologist according to current professional standards.	Less than Significant with Mitigation.	No. Implementation of the previously identified mitigation measures will prevent any substantial increase in already identified impacts due to changes in the project.	No. No significant effects previously identified with mitigation measures.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Interviews, Valero personnel, January 2007.

Resolution 03-4, City of Benicia Planning Commission, A Resolution of the Planning Commission of the City of Benicia Approving a Use Permit for the Valero Certifying the Final Environmental Impact Report, Adopting CEQA Findings and Adopting a Mitigation Monitoring and Reporting Program for the Valero Improvement Project (PLN2002-00022).

Resolution 03-5, City of Benicia Planning Commission, A Resolution of the Planning Commission of the City of Benicia Approving a Use Permit for the Valero Improvement Project (PLN2002-00022).

3.1.6 Energy

a. Would the project encourage activities that result in the use of large amounts of fuel or energy? <u>No</u>

As described in the Certified EIR, VIP would add 23-megawatts (MW) to the Benicia Refinery's baseline electrical demand of 50 MW. Since the time the EIR was certified, Valero has implemented several VIP components, and has also implemented several small additional projects. Furthermore, refinements to the design of specific VIP components have resulted in modifications to electrical demand estimates. As a result, the Benicia Refinery has revised its overall projections for future electrical demand relative to the VIP baseline.

Table 3.1.6-1 presents a summary of the changes to the Benicia Refinery's electrical demand as a result of the VIP Amendments.

Table 3.1.6-1 Refinery Electrical Demand

	Electrical Demand (MW)	
Project	**Individual Projects**	**Category Total**
Completed VIP Elements		3.2
Alky debottleneck	0.5	
ULSD unit	2.6	
SRU tail gas air blower	0.075	
VIP Amendments		
Hydrogen unit		3.2
New forced draft/induced draft fans and other equipment	4.71	
Decommission One Existing H2U Train	-0.5	
Not install PSA on Existing H2U	-1.0	
FCCU/CKR Scrubber System		5.0
New furnace blowers	2.60	
Scrubber System Pumps and Quench Subcooling	2.98	
Waste Heat Boiler Pump and Dilution Air Blower	0.75	
Shutdown F-101/F-102 Blowers	-0.26	
Shutdown ESPs	-1.1	
Other Project Changes		1.2
Desalter Pump	0.19	
Desalter Electricals	1.0	
Other VIP Elements		10.40
Sulfur Processing	3.27	
VLE expansion	0.67	
Butamer	0.75	
FCCU C5 gasoline hydrotreater	0.49	
WWTP Reliability	0.75	
HCU expansion	1.86	
Crude expansion	1.49	
C-2201C	1.12	
Total		23.0
Certified EIR Increase		23.0
Change from VIP		0.0

The construction of the VIP Amendments will result in no increase in demand over the projected post-VIP conditions.

Overall combustion of gaseous fuels (primarily RFG) at the Benicia Refinery, after the implementation of the VIP Amendments, will be lower than the usage projected in the Certified EIR. Increased thermal efficiency of the new H2U furnace will result in reduced energy consumption per unit of hydrogen produced. The new H2U will also generate more steam than it consumes, which will eliminate the need for increased usage of the Benicia Refinery's steam generators projected in the Certified EIR. This reduction in needed for production of steam will be partially but not entirely offset by an increase in firing rate of steam boilers for soot blowing and an increase in the firing rate of GT-702. The new PS furnaces (F-105 and F-106) will collectively combust the same amount of fuel as anticipated for the existing PS furnaces (F-101 and F-102) in the Certified EIR. Therefore, the VIP Amendments will not increase fuel or electrical energy consumption.

The VIP Amendments will reduce the Benicia Refinery's consumption of natural gas. The existing H2U consumes natural gas as its primary feedstock. The new H2U proposed as part of the VIP Amendments will feed primarily RFG. Thus, decommissioning of one train of the existing H2U and replacing its production by operating the new H2U will reduce the amount of natural gas used in producing hydrogen.

b. Would the project use fuel or energy in a wasteful or inefficient manner? No

An important objective of the proposed VIP Amendments is to reduce energy consumption, increase hydrogen supply, and improve refinery fuel gas balance within the Benicia Refinery.

The new H2U furnace proposed as part of the VIP Amendments will primarily be fueled by RFG and HPU tailgas, and will also use RFG as a process feed. This increased RFG demand will reduce the Benicia Refinery's demand for natural gas and also result in the productive use of refinery fuel gas by reducing refinery fuel gas imbalances. In the absence of the VIP Amendments, an excess of RFG may result in flaring and necessitate reducing process unit rates in order to lower RFG production. The H2U will generate steam as a byproduct of its operations, without increasing fuel consumption for hydrogen production beyond the level projected in the Certified EIR. As discussed in **Section 2.4.3.3**, the Certified EIR anticipated that one of the Benicia Refinery's steam generators, such as SG-1032, would be fired at an increased rate of 100 MMBtu/hr. As a result of the VIP Amendments, this firing rate increase will no longer be necessary. The additional steam production from the new H2U will allow the Benicia Refinery's steam demands to be met without additional firing of existing boilers, resulting in an overall energy savings. This will be partially offset by an increase in firing rate of the gas turbine GT-702 by 70 MMBtu/hr, described in **Section 2.4.4.1**. Overall, the VIP Amendments will reduce the Benicia Refinery's combustion of gaseous fuels by an average of 21 MMBtu/hr relative to the Certified EIR.

6. Energy

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.5-1: Operation of VIP facilities would increase electricity consumption. This impact is less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments will not incrementally increase electricity consumption at the Refinery. Therefore, the VIP Amendments would not cause a significant impact.	No significant effects previously identified.
Impact 4.5-2: Operation of VIP facilities would increase natural gas and other fuels consumption. This impact would be less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments will not incrementally increase fuels consumption. Therefore, the VIP Amendments would not cause a significant impact.	No significant effects previously identified.
Impact 4.5-3: Implementation of VIP along with other projects at the Benicia Refinery will result in a net reduction in electrical demand during normal operating conditions, when the cogeneration unit is operating. This impact would be less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments will not incrementally increase in electrical demand. Therefore, the VIP Amendments would not cause a significant impact.	No significant effects previously identified.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Environmental Analysis: Valero Benicia Refinery, New Crude Oil Storage Tank Project, September 2006.

Interviews, Valero personnel, January 2007.

Resolution 03-4, City of Benicia Planning Commission, A Resolution of the Planning Commission of the City of Benicia Approving a Use Permit for the Valero Certifying the Final Environmental Impact Report, Adopting CEQA Findings and Adopting a Mitigation Monitoring and Reporting Program for the Valero Improvement Project (PLN2002-00022).

Resolution 03-5, City of Benicia Planning Commission, A Resolution of the Planning Commission of the City of Benicia Approving a Use Permit for the Valero Improvement Project (PLN2002-00022).

3.1.7 Geology and Seismicity

a. Would the project 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? No***
- ***ii) Strong seismic ground shaking? No***
- ***iii) Seismic-related ground failure, including liquefaction? No***
- ***iv) Landslides? No***

The Benicia Refinery 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. The Certified EIR (EIR Section 4.6.2.2) concluded that there are no known active faults that pass through the Benicia Refinery property, so fault slip is not considered a potential geologic hazard capable of causing damage to equipment at the Benicia Refinery. The nearest active fault to the Benicia Refinery is the Concord-Green Valley fault, as shown on Figure 4.6-1 in the Certified EIR. The Concord-Green Valley fault runs northwesterly and is located approximately 1.5 miles east of the Benicia Refinery. The potential for substantial adverse effects from rupture of an earthquake fault is minimal.

Seismic hazards include ground shaking, liquefaction, lateral spreading, and landslides. As identified in the Certified EIR (EIR Section 4.6.2.2), there is the potential for seismic ground shaking that could result in injuries to persons or structural damage to the VIP improvements. Such conditions could also be encountered with the construction and operation of the proposed VIP Amendments.

Due to the relatively flat terrain of the majority of the Benicia Refinery, the potential for landslides is low. The proposed location for the new H2U, the area proposed for the new employee parking lot, and the three potential sites for the relocated firehouse are north of the Refinery Process Block. The bedrock material of the slope in this area is mudstone with an out of slope dip of 20 to 60 degrees to the southwest, as discussed in the Geotechnical and Geologic Assessment (URS May 2002). The H2U will be constructed on a flat plain with sloped areas to the north and south. The new employee parking lot will be built in a benched location within a gentle slope northeast of the H2U. The downhill slope south of the H2U will be equipped with a retaining wall or other engineered shoring and the parking structure will help to locally stabilize the gentle sloping area. The relocated firehouse will be constructed in one of three locations: 1) just east of, and on the same flat plain as, the H2U; 2) at the top of a constructed benched location to the northeast of the Administration Building atop a slope to the south; or 3) to the southwest of the administration building, in a flat area within a current parking lot to the northeast of a small ravine.

The FCCU/CKR Scrubber and associated equipment will be constructed on a 150,000 square foot pad immediately east of the Refinery Process Block on a site that is currently sloped. The area will be re-graded to an elevation of 57.5 ft. above sea level, creating a terrace 39 feet below the elevation of the Process Block to the west and 30 feet above Avenue D to the east. This will involve the excavation of approximately 26,300 cubic yards of soil, of which 23,500 cubic yards will be reused as backfill and the remainder will be stored on site in the North Canyon area as clean backfill. A retaining wall or other engineered shoring will be constructed around the terraced area to stabilize the surrounding slopes.

The alternate installation scheme considered will install a retaining wall on the east side of the sloped area which will then add about 175,000 cubic yards of clean fill which will be compacted to create a scrubber equipment pad at about the same elevation of the Refinery Process Block. As described in **Section 2.5.3** about 100,000 cubic yards of fill will come from the North Canyon area of the Benicia Refinery where clean fill has been accumulated from other projects over the years. Additional fill that is needed will be brought in by trucks from off site. All fill will be tested for proper geotechnical properties prior to placement to ensure it will not be susceptible to liquefaction, landsides, settlement, or other effects that would impair the structural stability of equipment place on the fill.

Although the new construction areas to the north and east of the Process Block have the potential to be affected by landslides due to their proximity to sloped areas, design features such as retaining walls, and other shoring devices, and use of appropriate fill material will reduce the likelihood of such an occurrence. Adherence to Mitigation Measures 4.6-1a through 4.6-1e of the Certified EIR, to address these potential impacts associated with the proposed VIP Amendments, would ensure that these potential impacts remain less than significant.

b. Would the project result in substantial soil erosion or the loss of topsoil? No

The development of the new and modified equipment for the VIP Amendments will mostly take place on relatively flat terrain and should not result in soil erosion or loss of topsoil. The FCCU/CKR Scrubber and the new employee parking lot will be built in sloped locations and could create the potential for soil erosion or loss of topsoil. These issues are standard design considerations and the FCCU/CKR Scrubber and parking lot will be designed to minimize the potential for soil erosion. As described in the Certified EIR, appropriate design and construction measures in accordance with federal, state, and local regulation will be used to design and construct the VIP Amendments. Proper design of the VIP Amendment components consistent with standards specified in the Certified EIR will ensure that soil erosion impacts remain insignificant.

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? No

Several of the VIP Amendments involve equipment installations in the Refinery Process Block. These include equipment such as F-105 and F-106 and the desalter vessel. Impacts associated with building within and adjacent to the Refinery Process Block were previously discussed in the Certified EIR. Work sites outside the Refinery Process Block include the new H2U just north of the Process Block, the new employee parking lot, the potential areas designated for relocation of the firehouse, and the FCCU/CKR Scrubber just east of the Process Block. These areas were assessed in the Geotechnical and Geologic Assessment (URS May 2002) and were discussed in the Certified EIR.

According to information in the Certified EIR, none of the areas in which VIP Amendments equipment will be constructed are located on a geologic unit or soil that has a high risk of instability due to being situated along existing and filled stream and flood plains or tidal and submerged areas.

As discussed in the Geotechnical and Geologic Assessment, a 3- to 5-foot-thick layer of loose, wet, poorly sorted sand roughly 10 to 15 feet beneath the ground surface is present beneath the southeastern half of the proposed H2U installation site. Subsurface soils in the southwestern part of the site consist of up to approximately 15 feet of clay fill. Because of the presence of the loose, wet sand layer, this area has the potential for liquefaction, lateral spreading, and subsidence. However, as described in the Geotechnical and Geologic Assessment, since this is a limited layer of loose soils, the effect can be eliminated by either removal of the layer or placing foundations on piers into bedrock or other stable soils. Based on the Geotechnical and Geologic Assessment, the bedrock material in the area of the H2U is competent and has good foundation bearing capacity. Also engineered shoring will occur in the area of the H2U. With these provisions in design, the potential for liquefaction, lateral spreading, and subsidence at the proposed H2U location is considered very low.

The new employee parking lot will be built uphill of the H2U and would tend to reduce the potential for landslides once constructed. Please refer to part a. of this section for further discussion on the potential of landslides.

As described in the Certified EIR, adherence to Mitigation Measures 4.6-1a through 4.6-1e of the Certified EIR will ensure that there are no construction or operational impacts attributable to lateral spreading, subsidence, and liquefaction. Adherence to these mitigation measures would ensure that these potential impacts remain less than significant for the VIP Amendments as well.

d. Would the project 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? No

As described in the Certified EIR, the southern portion of the Benicia Refinery, which includes the WWTP, is located on unconsolidated estuarine and alluvial sediments. Soils with expansive characteristics may have formed over the alluvial soils. Mitigation Measures 4.6-1a through 4.6-1e of the Certified EIR were proposed to ensure that there would be no impacts as a result of construction and operation of VIP project components. No VIP Amendments project components are located in the WWTP area. Nevertheless, adherence to Mitigation Measures 4.6-1a through 4.6-1e for the VIP Amendments will ensure that any potential impacts remain less than significant, even if the expansive soils are encountered.

e. Would the project have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater? No

No septic tanks are proposed as part of the proposed VIP Amendments. Wastewater generated by project improvements will be managed using the Benicia Refinery's existing infrastructure, including interconnects with the facility's existing wastewater collection and treatment system. No soils related constraints are anticipated.

7. Geology and Seismicity

VIP EIR Impact	VIP EIR Pre-Mitigation Significance	Condition of Approval/ VIP EIR Mitigation Measure	VIP EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.6-1: In the event of a major earthquake in the region, seismic ground shaking could potentially injure persons at the project site due to structural damage or structural failure. Ground shaking could potentially expose persons and property to seismic-related hazards, including localized liquefaction, related ground failure and seismically-induced settlement.	Significant.	Mitigation Measure 4.6-1a: Seismic design consistent with current professional engineering and industry standards shall be used in construction for resistance to strong ground shaking, especially for lateral forces. The implementation of the seismic design criteria as required by the California Building Code will reduce the potential for structural failure, major structural damage, and loss of life, and reduce the primary effects of ground shaking on structures and infrastructures to generally acceptable level. At a minimum, the California Building Code requirements or a more stringent building code shall be followed during design and construction of all elements of VIP. Additional requirements recommended by the project California Certified Engineering Geologist or Geotechnical Engineer, based on site-specific studies and specific project requirements, shall be followed, and become part of the project specifications.	Less than Significant with Mitigation.	No. The proposed VIP Amendments would not cause any new significant impacts due to changes in the project, as these amendments will be mitigated utilizing the same mitigation measures identified in the Certified EIR.	No. Implementation of the previously identified mitigation measures will prevent any substantial increase in already identified impacts due to changes associated with the VIP Amendments.
		Mitigation Measure 4.6-1b: Appropriate grading and design, in accordance with the California Building Code requirements or a more stringent standard, shall be used to reduce the secondary effects of ground shaking on structures and infrastructure. Subsurface site conditions shall be investigated for all project facilities to identify poor foundation materials that may be susceptible to the effects of liquefaction, lateral spreading, and differential settlement. Poor foundation materials shall be removed prior to construction or be subjected to ground improvement techniques. In addition, deep pile foundations shall be driven through the poor foundation soils and into more competent materials.	Less than Significant with Mitigation.	No. The proposed VIP Amendments would not cause any new significant impacts due to changes in the project, as these amendments will be mitigated utilizing the same mitigation measures identified in the Certified EIR.	No. Implementation of the previously identified mitigation measures will prevent any substantial increase in already identified impacts due to changes associated with the VIP Amendments.

7. Geology and Seismicity

VIP EIR Impact	VIP EIR Pre-Mitigation Significance	Condition of Approval/ VIP EIR Mitigation Measure	VIP EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
		Mitigation Measure 4.6-1c: Structural fill placed during the construction of VIP shall be designed to reduce fill settlement with keyways and subsurface drainage, and adequately compacted (i.e., Minimum 90 percent compaction as defined by American Society for Testing and Materials (ASTM D1557)).	Less than Significant with Mitigation.	No. The proposed VIP Amendments would not cause any new significant impacts due to changes in the project, as these amendments will be mitigated utilizing the same mitigation measures identified in the Certified EIR.	No. Implementation of the previously identified mitigation measures will prevent any substantial increase in already identified impacts due to changes associated with VIP Amendments.
		Mitigation Measure 4.6-1d: All structural foundations, aboveground utilities, and underground utilities shall be designed to accommodate estimated settlement without failure, especially across transitions between fills and cuts.	Less than Significant with Mitigation.	No. The proposed VIP Amendments would not cause any new significant Impacts due to changes in the project, as these amendments will be mitigated utilizing the same mitigation measures identified in the Certified EIR.	No. Implementation of the previously identified mitigation measures will prevent any substantial increase in already identified impacts due to changes associated with VIP Amendments.
		Mitigation Measure 4.6-1e: Final design of the proposed improvements shall be made in conjunction with a design-level geotechnical investigation submitted to the City of Benicia for review prior to issuing any grading or construction permits.	Less than Significant with Mitigation.	No. The proposed VIP Amendments would not cause any new significant Impacts due to changes in the project, as these amendments will be mitigated utilizing the same mitigation measures identified in the Certified EIR.	No. This Mitigation Measure has already been implemented (Geotechnical and Geologic Assessment, URS May 2002). Application of the study results to the new construction will prevent any substantial increase in already identified impacts due to changes associated with VIP Amendments.
Impact 4.6-2: Proposed foundation construction could be subjected to the geologic hazards related to expansive soils and natural settlement.	Significant.	Implement 4.6-1a through 4.6-1e.	Less than Significant with Mitigation.	No. The proposed VIP Amendments would not cause any new significant impacts due to changes in the project, as these amendments will be mitigated utilizing the same mitigation measures identified in the Certified EIR.	No. Implementation of the previously identified mitigation measures will prevent any substantial increase in already identified impacts due to changes associated with VIP Amendments.

7. Geology and Seismicity					
VIP EIR Impact	**VIP EIR Pre-Mitigation Significance**	**Condition of Approval/ VIP EIR Mitigation Measure**	**VIP EIR Post-Mitigation Significance**	**Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?**	**Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?**
Impact 4.6-3: Construction of additional tanks or treatment units in the crude storage tank area and/or WWTP area could potentially adversely affect the stability of slopes along the retention pond perimeter berms.	Significant.	Mitigation Measure 4.6-3: To reduce potential slope instability hazards related to static and dynamic forces in the retention pond areas, a slope stability analysis of the retention pond perimeter berms shall be conducted by a licensed professional engineer. All recommendations shall be used in the design and construction of the tanks and submitted to the City of Benicia for review.	Less than Significant with Mitigation.	No. The proposed VIP Amendments would not cause any new significant impacts due to changes in the project, as these amendments will be mitigated utilizing the same mitigation measures identified in the Certified EIR.	No. Implementation of the previously identified mitigation measures will prevent any substantial increase in already identified impacts due to changes associated with the VIP Amendments.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Environmental Analysis: Valero Benicia Refinery, New Crude Oil Storage Tank Project, September 2006.

Interviews, Valero personnel, January 2007.

Microsoft Terraserver Imagery, accessed 01/12/07, http://terraserver-usa.com.

Resolution 03-4, City of Benicia Planning Commission, A Resolution of the Planning Commission of the City of Benicia Approving a Use Permit for the Valero Certifying the Final Environmental Impact Report, Adopting CEQA Findings and Adopting a Mitigation Monitoring and Reporting Program for the Valero Improvement Project (PLN2002-00022).

Resolution 03-5, City of Benicia Planning Commission, A Resolution of the Planning Commission of the City of Benicia Approving a Use Permit for the Valero Improvement Project (PLN2002-00022).

United States Geological Survey topographic map, 7.5-minute series, Benicia, CA 1959, photorevised 1980.

URS Corporation, Geotechnical and Geological Assessment for the Valero Improvement Project, May 2002.

NCSS Web Soil Survey http://websoilsurvey.nrcs.usda.gov/app/

3.1.8 Public Health

a. Would the project expose receptors to substantial pollutant concentrations? No

As described in **Section 3.1.2.**, emissions of TACs from stationary sources associated with the proposed VIP Amendments include products of combustion from the H2U furnace and fugitive organic emissions from additional piping components in hydrocarbon service such as valves, flanges, and pumps associated with the new desalter and other process components. Also as described in **Section 3.1.2.**, emissions of TACs from the FCCU/CKR Scrubber are not expected to change from the Certified EIR because the changes being proposed do not represent an increase in fuel combustion. Indirect emissions of TACs from mobile sources include DPM from trucks transporting materials and wastes associated with the VIP Amendments.

The potential health impacts of the VIP Amendments were assessed in an HRA. Separate HRAs were conducted for the new stationary sources and the increase in emissions from mobile sources. Health risk for the VIP Amendments is analyzed relative to the Certified EIR. However, for completeness purposes, for each analysis, the incremental impacts at the off-site point of maximum impact (PMI) from the VIP Amendments were also added to the impacts at the PMI identified in the Certified EIR. The overall impact was then compared to significance levels established by the Office of Environmental Health Hazard Assessment (OEHHA).

Health Risks Associated with Construction

Construction-related emissions are generally short-term in duration but must be evaluated because they can have the potential to impact public health. DPM from diesel-fueled vehicles and off-road construction equipment is the pollutant of greatest concern with respect to construction activities. Construction-related emissions can cause increases in localized concentrations of DPM.

The construction activities are expected to be similar in nature and magnitude to the activities described in the Certified EIR, and the health impacts described will be the same as described in the Certified EIR. The VIP Amendments are not expected to create any additional construction emissions.

Health Risks Associated with Stationary Sources

Emissions of TACs from the PS Furnaces F-105 and F-106 are not expected to change from the TAC emissions evaluated in the Certified EIR (from the existing PS Furnaces F-101 and F-102 and the proposed PS Helper Furnace) because the changes being proposed do not represent an increase in fuel combustion. In addition, the operation of the FCCU/CKR Scrubber will not contribute any additional TAC emissions. Therefore, TAC Emissions from the FCCU/CKR Scrubber Stack were included in the stationary source HRA.

Emissions from other combustion sources will decrease relative to VIP (91 MMBtu/hr decrease for SG-1032 or other boilers, and 70 MMBtu/hr increase for GT-702, or a net reduction of 21 MMBtu/hr), and were also not included in the HRA. New fugitive components will result in an increase in TAC emissions from valves, flanges, and other components.

In order to provide a conservative representation of health risks associated with the VIP Amendments, the HRA only included TAC emission increases from the new H2U and from the fugitive piping components, without accounting for the net decreases that will occur as a result of shutting down one train of the existing H2U or reduced firing at other combustion sources. In addition, the HRA modeled the TAC emissions from the new H2U assuming continuous operation at the maximum furnace firing rate.

The HRA for stationary sources was conducted in three steps. First, emission increases of TACs from the proposed equipment were estimated. Second, exposure calculations were performed using the Industrial Source Complex – Short Term 3 (ISCST3) dispersion model (version 99155) integral to the CARB Hot Spots Analysis and Reporting Program (HARP) software (Version 1.3, Build No. 23.04.05). Third, results of the exposure calculations along with the cancer potency factor, and chronic non-carcinogenic and acute reference exposure levels (RELs) for each TAC were used to perform the risk characterization to quantify individual health risks. The second and third steps were performed using the HARP software (Version 1.3, Build No. 23.04.05), which includes an integrated ISCST3 dispersion model and risk analysis software for conducting health risk assessments.

The HRA included TAC emissions from the new H2U furnace and fugitive volatile TACs from piping components. TAC emission estimates from the H2U furnace assumed continuous operation at the furnace's maximum capacity. The HRA did not account for reductions in TAC emissions from the decommissioned H2U furnace (F-301 or F-351) in order to provide a conservative evaluation of health risks.

Emissions of TACs from the new H2U furnace, other than ammonia, were derived from source testing of a similar combustion source. Emissions of ammonia from the H2U furnace were based on the proposed BACT outlet concentration.

TAC emissions from fugitive sources were calculated by multiplying the maximum additional POC emissions of 3-tons/year by the greatest weight concentration of each compound in the Benicia Refinery's process streams.

The incremental TAC emission rates for the VIP Amendments stationary sources during normal operations are summarized in **Table 3.1.8-1**. TAC emission estimates and detailed calculations and explanations are provided in **Appendix B**.

Table 3.1.8-1 Incremental TAC Emissions from Stationary Sources During Normal Operations

CAS No	Pollutant	H2U Reformer Furnace Emission Factor (lb/MMBtu)	H2U Reformer Furnace Emissions (lb/yr) 980 MMBtu/hr	Fugitive Emissions (lb/yr)	Total TAC Emissions (lb/yr)
75-07-0	Acetaldehyde	2.3E-06	2.0E+01	---	2.0E+01
7664-41-7	Ammonia	4.5E-03	3.9E+04	---	3.7E+04
7440-38-2	Arsenic	2.5E-07	2.1E+00	---	2.1E+00
71-43-2	Benzene	2.0E-06	1.7E+01	1.2E+02	1.4E+02
56-55-3	Benzo(a)Anthracene	7.6E-10	6.5E-03	---	6.5E-03
50-32-8	Benzo(a)Pyrene	7.6E-10	6.5E-03	---	6.5E-03
205-99-2	Benzo(b)Fluoranthene	7.6E-10	6.5E-03	---	6.5E-03
205-82-3	Benzo(k)Fluoranthene	7.6E-10	6.5E-03	---	6.5E-03
7440-43-9	Cadmium	9.2E-08	7.9E-01	---	7.9E-01
7440-47-3	Chromium (Total)	9.2E-07	7.9E+00	---	7.9E+00
7440-50-8	Copper	1.1E-06	9.2E+00	---	9.2E+00
53-70-3	Dibenzo(a,h)Anthracene	7.6E-10	6.5E-03	---	6.5E-03
100-41-4	Ethylbenzene	---	---	1.2E+02	1.2E+02
50-00-0	Formaldehyde	1.0E-05	8.7E+01	---	8.7E+01
18540-29-9	Hexavalent Chromium	1.6E-07	1.4E+00	---	1.4E+00
7783-06-4	Hydrogen Sulfide	2.3E-04	1.9E+03	---	1.9E+03
193-39-5	Indeno(1,2,3-cd)Pyrene	7.6E-10	6.5E-03	---	6.5E-03
7439-92-1	Lead	2.7E-07	2.3E+00	---	2.3E+00
7439-96-5	Manganese	4.9E-07	4.2E+00	---	4.2E+00
7439-97-6	Mercury	3.0E-07	2.5E+00	---	2.5E+00
91-20-3	Naphthalene	9.4E-05	8.1E+02	---	8.1E+02
7440-02-0	Nickel	1.9E-06	1.7E+01	---	1.7E+01
108-95-2	Phenol	3.7E-06	3.2E+01	---	3.2E+01
108-88-3	Toluene	5.6E-06	4.8E+01	3.0E+02	3.5E+02
108-38-3	Xylene	2.8E-06	2.4E+01	3.6E+02	3.8E+02
7440-66-6	Zinc	2.8E-06	2.4E+01	---	2.4E+01

Emissions shown in scientific notation: 4.5E-03 = 4.5×10^{-3} = 0.0045

The methods used to assess potential human health risks are consistent with the *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* published by the OEHHA (OEHHA 2003).

Stack parameters used for the new H2U furnace represent 100 percent load conditions. Fugitive emissions are assumed to be an area source encompassing the Refinery Process Block, reflecting the fact that new piping components associated with the VIP Amendments may be located at various points throughout the process area. The coordinates are in UTM Zone 10, referenced in USGS NAD27. Building downwash was calculated internally by HARP, using building location and height information from VIP modeling.

The HARP Industrial Source Complex (ISC) module was run using one year (2005) of meteorological data from the Valero Administration Building monitoring station (Station # 8704) to assess the maximum TAC concentrations. This is the nearest monitoring station to the proposed sources. The development of the receptor grid is discussed below.

A comprehensive Cartesian receptor grid extending to approximately 20 km from the Main Stack at the Benicia Refinery was used for the ISCST3 modeling to resolve the maximum ground-level pollutant concentrations. Receptors were generated in UTM Zone 10, NAD27. This receptor grid will be more than sufficient to resolve the maximum impacts and any significant impact area(s).

The Cartesian receptor grid consists of the following receptor spacing:

- Fenceline to 9,842 feet (3,000 m) at 328-foot (100-m) increments;
- Beyond 9,842 feet (3,000 m) to 16,400 feet (5,000 m) at 656-foot (200-m) increments;
- Beyond 3.1 miles (5 km) to 6.2 miles (10 km) at 1,640-foot (500-m) increments; and
- Beyond 6.2 miles (10 km) to 12.4 miles (20 km) at 3,280-foot (1,000-m) increments.

Discrete receptors were placed approximately every 164 feet (50 m) along the plant fenceline for increased resolution of impacts along this boundary. The Cartesian and fenceline receptors used in the CO AERMOD modeling were imported to HARP.

Terrain elevations were acquired from DEM data obtained from USGS. AERMAP was used to develop the receptor terrain elevations and imported into HARP. All of the DEM files were in UTM Zone 10 and referenced to NAD27.

Carcinogenic risks and chronic non-carcinogenic and acute health effects were assessed using the dispersion modeling described above and numerical values of toxicity provided by OEHHA. Exposure pathways included inhalation, homegrown produce (using default Urban ingestion fractions), and dermal, soil, and mother's milk absorption.

The following HARP modeling options were used for the risk analysis to estimate potential health impacts.

- Residential Cancer Risk – Derived (Adjusted) Method
- Chronic Hazard Index – Derived (OEHHA) Method
- Acute Hazard Index – Simple (Concurrent Max)

For the cancer and chronic hazard index impacts at off-site worker receptors, the HARP modeling option "modeled GLC and default exposure assumptions" was used. The cancer potency factors and RELs used are consistent with the current values as determined by OEHHA and as provided in the HARP software.

Table 3.1.8-2 presents the risk assessment results for each group of receptors, as applicable. Although the VIP Amendments impacts are evaluated relative to the Certified EIR, the impacts presented in the Certified EIR are presented as well for reference. The predicted cancer risk does not exceed ten in one million, and the predicted chronic non-carcinogenic and acute hazard indices (HIs) do not exceed 1.0 at any off-site receptor. Therefore, the incremental stationary source emissions associated with the VIP Amendments will result in a less-than-significant impact with respect to exposure of any sensitive receptors to TAC pollutant concentrations. **Table 3.1.8.2** conservatively assumes that the maximum impacts from both the Certified EIR and VIP Amendments occur at the identical location.

Table 3.1.8-2 Maximum Predicted Risks Due to Stationary Sources

Receptor	Cancer Risk (Per Million)	Chronic Hazard Index	Acute Hazard Index
Maximum Residential			
Certified EIR	0.665	0.006	0.152
VIP Amendments	0.453	0.00122	0.0068
Total Risk	**0.789**	**0.0064**	**0.158**
Maximum Off-site			
Certified EIR	0.671	0.0099	0.244
VIP Amendments	0.598	0.00161	0.0078
Total Risk	**1.27**	**0.0115**	**0.252**
CEQA Significance Threshold	10.0	1.0	1.0
Significant? (Yes/No)	***No***	***No***	***No***

Health Risks Associated with Mobile Sources

The VIP Amendments will result in a potential increase of truck transport trips to and from the Benicia Refinery beyond that of which was analyzed in the Certified EIR. Additional truck traffic is associated with the transportation of additional wet solid waste from the pre-scrubber, additional aqueous ammonia deliveries for the new H2U emissions controls, and ammonia needed for NO_X emission control on Furnaces F-105 and F-106. These deliveries and waste shipments will result in two additional truck trips per week on average. The trucks will be diesel-fueled and will emit DPM, classified as a carcinogenic TAC by the State of California. Therefore, a health risk assessment of the potential incremental cancer risk to residential populations along the truck transport route from the increase in export truck traffic was performed.

The truck routes are assumed to include the leg of I-680 between Highway 4 in Martinez, California and the Benicia Refinery, crossing the Benicia Bridge. For the purpose of conducting a risk analysis, it was assumed that all additional trucks would be completing a round trip along this route (i.e. 4 total truck trips per week). Since other truck routes will have fewer than two additional trucks per week, the route on I-680 from Highway 4 to the Benicia Refinery is assumed to represent the “worst-case” exposure scenario. Therefore, only this region was included in the risk assessment.

The transport route was modeled using meteorological data from the Shell East monitoring station (Station #2742), which is considered representative of the modeled area because it is located near the highway along the transport route.

The truck route was simulated with the ISCST3 module in HARP (Version 1.3, Build No. 23.04.05) as a series of volume sources spaced 328 feet (100 m) apart, as recommended by the USEPA’s ISC Model guidance (USEPA, 1995). That source spacing was chosen because it is twice the assumed average 164-foot (50 m) width of the roadway along the truck route. Assuming a source spacing of 328 feet (100 m), a total of 100 volume sources were used to represent emissions along the truck route

Truck DPM exhaust emission factors were developed using EMFAC 2007 for the BAAQMD airshed. Assuming an average truck speed of 55 miles per hour, DPM emissions from heavy-duty diesel trucks are estimated to be 0.341 grams/mile. Overall, the increase in truck traffic due to the VIP Amendments will incrementally increase DPM emissions within the BAAQMD region by approximately 7.8 lb/year.

Based on 24-hour operation of truck transport and assuming emissions are spread evenly throughout the day and throughout the year, the individual emission rate for a single volume source was 0.0097 lb/year-source, as computed below:

ERsource = 0.341 g/mi-source x 2 trucks/week x 2 trips/truck x week/7 days x day/24 hr x mi/5280 ft x 3.28 ft/m x 100 m/source x 1 lb/454 g x 8,760 hr/year

= 0.0097 lb/year –source

Where ERsource = Emission rate of DPM per source

The height of the emissions from each volume source was assumed to be 13 feet (4.0 m), approximately the height of the exhaust of a truck. The initial horizontal and vertical plume standard deviations were computed following guidance from Table 3-1 of the ISCST3 User's Guide (USEPA, 1995). For the horizontal standard deviation, the source-to-source spacing of 328 feet (100 m) was divided by 2.15 to yield 152 feet (46.5 m). For the vertical standard deviation, the truck cab top was assumed equal to exhaust height, and the standard deviation was estimated as the cab height of 13 feet (4 m) divided by 2.15 to yield 6.1 feet (1.86 m). The use of the truck cab top for estimating the vertical standard deviation is conservative (i.e., likely underestimates the true value) because it does not account for any increase in vertical dispersion produced by the mechanical wake of moving vehicles in multiple adjacent lanes of traffic or for the plume rise from the exhaust stacks.

Receptors with a spacing of 328 feet (100 m) were placed along the entire truck route. The grid was placed around the transport route beginning approximately 164 feet (50 m) from the centerline of the roadway out to 1,148 feet (350 m), i.e., three rows of receptors following the roadway beginning approximately 164 feet (50 m) from the centerline. No receptors were placed along the Benicia Bridge. A total of 333 receptors were modeled. Terrain elevations were obtained from DEM files.

Carcinogenic risks and chronic non-carcinogenic health effects were assessed at each receptor using the dispersion modeling described above and numerical values of toxicity provided by OEHHA. DPM has no risk factor values for acute toxicity. The only exposure pathway modeled was the inhalation pathway, as this is the only pathway for which DPM health risk values have been developed. Risks were calculated at receptor locations using the appropriate exposure assumptions incorporated into HARP, as described above for stationary sources.

Table 3.1.8-3 presents the risk assessment results for truck transport. The predicted cancer risk does not exceed ten in one million, and the predicted chronic non-carcinogenic HI does not exceed 1.0 at any receptor. Therefore, incremental effect of the VIP Amendments will result in a less-than-significant impact with respect to expose of sensitive receptors to substantial TAC pollutant concentrations.

Table 3.1.8-3 Maximum Predicted Risks Due to Mobile Sources

Receptor	Cancer Risk (Per Million)	Chronic Hazard Index
VIP Amendments – Maximum Impact	0.024	0.000016
CEQA Significance Threshold	10.0	1.0
Significant? (Yes/No)	***No***	***No***

8. Public Health					
VIP EIR Impact	**VIP EIR Pre-Mitigation Significance**	**Condition of Approval/ VIP EIR Mitigation Measure**	**VIP EIR Post-Mitigation Significance**	**Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?**	**Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?**
Impact 4.7-1: Public exposure to toxic air contaminant (TAC) emissions from VIP would result in an increase in health risks. The increases in health risks are the result of exposure to both carcinogenic and non-carcinogenic substances. However, the increases would be less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. Public exposure to TACs from the VIP Amendments would increase beyond that analyzed in VIP. The increases in health risks are the result of exposure to both carcinogenic and non-carcinogenic substances. However, the incremental increases and cumulative impacts would be less than significant.	No significant impacts previously identified.
Impact 4.7-2: The proposed project, along with other ongoing and approved projects would lead to a net reduction in emissions of TACs when compared to TAC emissions from the Refinery under existing conditions. These TACs are responsible for public health impacts. The reduction in TAC emissions would constitute a net improvement in health risks and the impact would be less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments would cause a slight incremental increase in emissions of TACs. However, this incremental increase would not result in significant effects by itself, and would not result in a cumulative significant impact.	No significant impacts previously identified.

References:

Bay Area Air Quality Management District, Air Toxics NSR Program Health Risk Screening Analysis Guidelines, June 2005.

Bay Area Air Quality Management District, BACT/TBACT Workbook, located at http://www.baaqmd.gov/pmt/bactworkbook/default.htm.

Best Environmental, Inc., Exxon Benicia Refinery Source Test Report, F-4460 Hot Oil Furnace, Toxics Emission Test Program, 1996.

California Air Resources Board, EMFAC 2001, EMFAC 2002 User's Guide, 2002.

California Air Resources Board, HARP User Guide, December 2003.

California Office of Environmental Health Hazard Assessment, Air Toxics Hot Spots Program Risk Assessment Guidelines, August 2003.

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Environmental Analysis: Valero Benicia Refinery, New Crude Oil Storage Tank Project, September 2006.

Interviews, Valero personnel, January 2007.

United States Environmental Protection Agency, User's Guide for the Industrial Source Complex (ISC3) Dispersion Models (EPA-454/B-95-003b), September 1995.

3.1.9 Public Safety

a. Would the project create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials? No

As with the analysis presented in the Certified EIR (Section 4.8.4.1), construction of the components of the proposed VIP Amendments would employ hazardous materials normally associated with construction of such facilities, including fuels, oils, lubricants, and paint. All use of hazardous materials during construction would have to comply with applicable local, state, and federal regulations, as would any waste products associated with such use. The operation of the FCCU/CKR Scrubber will use an amine-based reagent similar to that currently used at the refinery. It does not represent a new or significantly increased safety hazard. The FCCU/CKR Scrubber will cause a relatively small increase in hazardous waste generation. This waste will be managed and disposed using the refinery's existing waste management systems, and will not result in a substantial increased risk to the public. The SCR units for the H2U furnace and new CO furnaces will use aqueous ammonia. Currently, the Benicia Refinery uses approximately 12.8 million pounds per year of aqueous ammonia in the SNCRs for Furnaces F-101 and F-102 and various SCRs throughout the facility. The new SCR for the new PS furnaces F-105 and F-106 will replace the SNCRs for F-101 and F-102. Ammonia use for this SCR may be lower than the existing SNCRs due to the better efficiency of the SCR technology, but Valero is not including this potential reduction in this analysis. The SCR for the new H2U will use about 1.7 million pounds per year of aqueous ammonia, representing roughly a 13 percent increase.

The refinery's existing aqueous ammonia storage and delivery systems are adequate for the increased ammonia usage, so ammonia storage capacity (the largest vessel containing ammonia) will not increase. The additional deliveries of aqueous ammonia could slightly increase the possibility of an ammonia release, such as the failure of a transfer hose. This release scenario was evaluated in the Benicia Refinery's Risk Management Plan (RMP), completed in accordance with the California Accidental Release Prevention (CalARP) Program. The RMP estimates that the release would result in a loss of 1,566 lb of aqueous ammonia, with a distance to toxic endpoint of 0.1 miles. There is no population within the impact area. Accordingly, the increase in ammonia usage will not substantially increase hazards to the public. Other equipment associated with the VIP Amendments would not use significant quantities of hazardous materials.

The new H2U, including the HPU, would contain combustible materials such as hydrogen and hydrocarbons that could potentially produce an explosion. Valero conducted a review of the explosion potential of the new H2U during the initial siting process for this process unit. This study determined that the impact from a worst-case explosion would extend no farther than 0.2 miles from the H2U site. This impact radius is within Valero's property and would not result in an off-site impact.

b. Would the project 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? No

The new equipment could pose a risk to public safety because of the potential fire hazards. However, refinery fires generally pose little risk to the public because they are confined to a limited area and refineries have extensive fire water systems. All equipment associated with the VIP Amendments is buffered from surrounding uses and has fire water systems to address the possibility of fire.

The VIP Amendments will increase the Benicia Refinery's use of aqueous ammonia. This material will be centrally stored in an existing aqueous ammonia tank. The VIP Amendments will not require additional storage vessels for aqueous ammonia and therefore will not increase the potential for tank failure. Ammonia will be received through the Benicia Refinery's existing aqueous ammonia delivery system.

c. Would the project emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school? No

The equipment associated with the VIP Amendments will be sources of hazardous emissions. These impacts were addressed for potential public health impacts (see **Section 3.1.8**.). No equipment in the VIP Amendments is located within one-quarter mile of an existing or proposed school.

d. Would the project be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment? No

The project would not create a significant hazard to the public or the environment by being located on a site which is listed under Government Code section 65962.5 list (the Cortese List), because the project site is not included on the Section 65962.5 list. For the purpose of this analysis, the Cortese list, maintained by the DTSC, was searched on-line.

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 result in a safety hazard for people residing or working in the project area? No

The equipment associated with the proposed VIP Amendments is not located within an airport land use plan or within two miles of a public airport or public use airport.

f. For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area? No

The new equipment for the proposed VIP Amendments is not located within the vicinity of a private airport.

g. Would the project impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan? No

The existing Benicia Refinery has standard operating procedures for emergency response and emergency evacuation. The construction and operation of the proposed VIP Amendments would occur with those procedures in place and would not impair implementation of those procedures or physically interfere with adopted emergency response and evacuation plans.

h. Would the project 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? No

The new H2U area will be managed to remove vegetation that could fuel wildland fires. The refinery also has extensive fire water systems that can be used to suppress wildland fires from adjacent areas if they pose a threat. All other equipment associated with the VIP Amendments will be located in fully developed areas, away from substantial vegetation.

9. Public Safety

VIP EIR Impact	VIP EIR Pre-Mitigation Significance	Condition of Approval/ VIP EIR Mitigation Measure	VIP EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.8-1: Possible accidental releases of acutely hazardous substances that might result from VIP were evaluated, and none were found to cause an unhealthful offsite impact or would not occur within the expected 30-year life of the plant. The impacts would therefore be less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments represent a negligible additional source of accidental releases of hazardous substances which would not cause a significant impact.	No significant impacts previously identified.
Impact 4.8-2: Other industrial projects in the region are located too far away from the refinery to cause potential cumulative public safety impacts. In most cases, impacts from fires, explosions, or toxic gas releases are limited to the property fenceline or near the fenceline. Also, the probability of an accidental release occurring from a cumulative project at the same time that an accident would occur at VIP would be extremely low. Therefore, cumulative impacts would be less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The VIP Amendments would not result in significant cumulative public safety impacts, for the reasons described in the Certified EIR.	No significant impacts previously identified.
Impact 4.8-3: As stated in the transportation impacts section above, the methyl tert butyl ether (MTBE) phase-out project will result in the elimination of two marine visits per month, thus resulting in a reduction of marine visits per month, thus resulting in a reduction of marine vessel trips to the refinery. Therefore cumulative public safety impacts related to marine transportation will be less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The VIP Amendments will have no effect on refinery marine traffic.	No significant impacts previously identified.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

URS Corporation, *Health Risk Assessment, Valero Improvement Project, Benicia, California Refinery,* June 2002.

Valero Refining Company – California, Risk Management Plan, June 2004.

3.1.10 Hydrology and Water Quality

a. Would the project violate any water quality standards or waste discharge requirements? ***No***

The VIP Amendments project components that generate wastewater will be located within and adjacent to the Refinery Process Block. As described in the Certified EIR, wastewater from the Refinery Process Block is directed to the WWTP where it is treated to comply with the National Pollutant Discharge Elimination System (NPDES) permit prior to discharge to Suisun Bay. The Benicia Refinery currently operates under NPDES Permit Number CA0005550 issued in 2002 and expires on November 30, 2007. In May 2007, Valero submitted a NPDES permit renewal application.

Wastewater loadings to the Benicia Refinery WWTP are discussed in further detail in **Section 3.1.15**. Qualitative and quantitative descriptions of the estimated incremental wastewater load from the VIP Amendments are summarized in **Table 3.1.10-1**.

Table 3.1.10-1 VIP Amendments Wastewater Discharge Summary to Benicia Refinery WWTP

Operating Unit	Incremental Increase to WWTP (gallons/day)	Description of Water Quality
VIP Amendments		
Pre-Scrubber Evaporative Losses	None	No water to WWTP
Pre-Scrubber Purge	57,600	Stream expected to contain 138 lb/year of nickel and vanadium and aluminum.
Amine Purification Purge	8,640	This stream included in Certified EIR to be recycled. Will contain heat stable salts similar to other refinery amine streams.
Caustic Polisher	14,400	Stream expected to contain sulfates
Unfired Waste Heat Boiler Blowdown	7,200	Blowdown from purified boiler feed water; negligible contaminant loading.
Incremental Steam for Soot Blowing	None	No water to WWTP
Incremental Blowdown from SGU for Amine Regeneration	2,880	Same as Above
Desalter Vessel Wash Water (maximum)	93,600	Low organic concentration; no mass increase of metals and salts
VIP Amendments Subtotal	184,320	
Cumulative Projects		
Naphtha Reformer Unit (NRU) Catalyst Regeneration Facility Project	-100,800	Reduced refinery process stream with significant organic loadings
TOTAL	83,520	Increased overall rate to WWTP; increase of nickel, vanadium, and aluminum; reduction in organics.

The WWTP, through planned modifications addressed in the Certified EIR, would treat additional wastewater loading from the FCCU/CKR Scrubber's blowdown from unfired waste heat boiler and other steam generation blowdown streams, and increased desalter wash water if recycled water is not used. These streams will have typical characteristics of other refinery wastewater streams and thus will be effectively treated by the WWTP. The pre-scrubber purge and caustic polisher purge may alter the WWTP discharge characteristics due to the increases of nickel, vanadium, aluminum, and sulfates.

As required by its current NPDES permit and consistent with the Certified EIR in implementing VIP and the VIP Amendments, the Benicia Refinery will, in consultation with the San Francisco Bay Regional Water Quality Control Board (RWQCB), determine whether a technical study of potential loading impacts will be required to address the mass increase of pollutants proposed to be discharged and propose new treatment process units, if necessary, to maintain water quality in Suisun Bay. Therefore, no degradation of water quality will occur and the Benicia Refinery will not violate any water quality standards or waste discharge requirements due to implementation of the VIP Amendments.

Although WWTP modifications may be made as part of the VIP project elements, the WWTP modifications will increase the margin for achieving compliance, but are not necessary to achieve compliance with permitted discharge conditions. When combined with the 100,700 gpd WWTP flow reductions from the NRU Catalyst Regeneration Project which commenced operation in April 2007, the operation of the FCCU/CKR Scrubber will increase WWTP flows by only 13,520 gpd. This will not have a significant affect on the WWTP's capacity.

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)? No***

As with the project components of VIP, the construction of the proposed VIP Amendments will not intercept or impact groundwater. The operation of the proposed VIP Amendments will not require the use of groundwater and their location will not interfere substantially with groundwater recharge.

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? No***

The total area at the Benicia Refinery subject to storm water management either via the WWTP or direct discharge via Valero outfalls will not change. Refinery process areas are directed to the WWTP, while storm water from other areas such as parking lots and un-improved areas are directed to storm water outfalls regulated under Valero's NPDES permit. Currently the employee parking lot is a paved area and will directly discharge to Outfalls 004 and 005. Since the VIP Amendments will create a process area in the current employee parking lot area, this will result in a slight additional amount of storm water being treated in the WWTP and a similar reduction in water that is discharged without treatment via Outfalls 004 and 005. The runoff from the FCCU/CKR area is currently discharged to the WWTP and no change is expected after the project installation. Both the new employee parking lot and firehouse areas are currently in areas that are also diverted to existing direct discharge Outfalls 004 and 005. This will not be changed post construction, so there will be no changes from these project elements. Therefore, no alteration of the existing drainage pattern from the Benicia Refinery property would occur and the projects would not result in substantial erosion or siltation on site or off site.

Construction of the VIP Amendments will utilize Best Management Practices (BMPs) required by the state general permit for construction to minimize erosion and siltation on site or off site and to avoid impacts to biological resources.

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? No

As described above, the storm water from the proposed locations of the VIP Amendments in and adjacent to the Refinery Process Block and north of the Refinery Process Block will be collected and will continue to be conveyed to the Benicia Refinery's WWTP. Therefore, there will be no net increase of storm water from these areas to the WWTP and no alteration of the existing drainage pattern of the Refinery Process Block would occur.

Storm water from the new employee parking lot and relocated firehouse will be designed so that post-construction runoff rates equal pre-construction rates and storm water is routed to existing outfalls.

Based on these design features, the VIP Amendments will not alter the existing drainage pattern in a manner that could result in flooding on site or off site.

e. Would the project create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff? No

As described in 3.1.10.c above, there will be a very slight increase in storm water managed at the WWTP and a very slight decrease in storm water discharged directly to Suisun Bay via existing Valero outfalls. The capacity of the WWTP is sufficient to accommodate the current storm water runoff and for the slight increase from the improvements associated with the VIP Amendments.

Storm water from the VIP Amendments in and adjacent to the Refinery Process Block and north of the Refinery Process Block will be collected and conveyed to the Benicia Refinery WWTP. As described in the Certified EIR, the WWTP after VIP would treat and discharge an average rate of 1,775 gpm or 2.56 million gallons per day (MGD). With VIP Amendments, the load to the WWTP would increase by approximately 184,320 gpd (128 gpm). However, the NRU Catalyst Regeneration Facility Project, independently implemented in April 2007, reduced load to the WWTP by about 100,800 gpd (70 gpm). Cumulatively, the NRU Catalyst Regeneration Facility Project when taken with the VIP Amendments represents an increase of 83,520 gpd (58 gpm) of flow to the WWTP. Total maximum flow to the WWTP after the VIP Amendments will be 1,833 gpm (2.64 MGD). The WWTP has a hydraulic capacity of 2,500 gpm (3.6 MGD) and the VIP Amendments will provide a negligible increase in storm water flow to the WWTP. As described in the Certified EIR, the Benicia Refinery also has the ability to regulate storm water flows to the WWTP by controlling the discharge of storm water that accumulates within the tank dikes. Therefore, although wastewater flow to the WWTP after the VIP Amendments will increase compared to the wastewater flow provided in the Certified EIR, the Benicia Refinery WWTP has sufficient capacity to manage both storm water and wastewater flows from the VIP Amendments.

Storm water collected from the new employee parking lot and the relocated firehouse site will continue being routed to existing direct discharge Outfalls 004 and 005 so that post-construction runoff rates will be about the same as pre-construction rates. Runoff from these areas is not expected to contain additional pollutants.

f. Would the project otherwise substantially degrade water quality? No

As with the construction and operation of VIP project components, all of the runoff and other wastewater resulting from construction and operation of facilities associated with the VIP Amendments will be managed to comply with federal, state, and local regulations including the Refinery's NPDES permit and the construction and industrial storm water general permit. Furthermore, as required by its current NPDES permit and consistent with the Certified EIR in implementing VIP and the VIP Amendments, the Benicia Refinery will in consultation with the San Francisco Bay RWQCB determine whether a technical study of potential loading impacts will be required to address the mass increase of pollutants proposed to be discharged and propose new treatment process units, if necessary, to maintain water quality in Suisun Bay. Therefore, no degradation of water quality will occur.

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? <u>No</u>

As with VIP project components, no housing will be constructed as part of the proposed VIP Amendments.

h. Would the project place within a 100-year flood hazard area structures which would impede or redirect flood flows? <u>No</u>

As described in the Certified EIR, the Benicia Refinery WWTP is located within a 100-year flood zone. Modifications to the Benicia Refinery WWTP were evaluated in the Certified EIR and these modifications will not change as a result of the VIP Amendments. As stated under Impact 4.9-6 of the Certified EIR, additions to the facilities at the WWTP are subject to the Benicia Municipal Code Chapter 15.40, Flood Damage Prevention. Therefore, floodplain mitigation measures in accordance with the policy will be required to be included in VIP design basis. Adherence to these same mitigation measures for the VIP Amendments will also ensure that any potential impacts remain less than significant for any structures located within the 100-year flood hazard area.

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? <u>No</u>

As discussed above, the WWTP is located within a 100-year flood zone. The mitigation measures referenced in Section 4.9 of the Certified EIR, for VIP modifications within the WWTP, will be adhered to for modifications in the area of the WWTP. These measures indicate that if additions to the facilities at the WWTP are determined to be necessary, flood hazard mitigation measures in accordance with the Benicia Municipal Code Chapter 15.40, Flood Damage Prevention are required to be included in the design criteria. The design criteria will comply with construction standards established by the California Building Code. The remainder of the proposed project components associated with the VIP Amendments are located outside of the 100-year flood zone. Therefore, the project is not expected to expose people or structures to a significant risk of loss, injury, or death involving flooding.

j. Would the project inundation by seiche, tsunami, or mudflow? <u>No</u>

As described in the Certified EIR, the area within the vicinity of the Benicia Refinery boundary is not subject to inundation by seiche, tsunami, or mudflow. Therefore, the proposed VIP Amendments will not be located in any areas that are subject to seiche, tsunami, or mudflow hazards.

10. Hydrology and Water Quality

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.9-1: In combination, additional processed wastewater and storm water runoff resulting from components of the project could potentially exceed the maximum hydraulic capacity of the system and exceed the capacity of the wastewater treatment retention area. This impact would be less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments when taken with the NRU Catalyst Regeneration Facility Project represent at most a 3% increase in flow of process water to the WWTP and does not change storm water flows. Thus there would not be a significant impact to the WWTP.	No significant impacts were previously identified.
Impact 4.9-2: The proposed additional throughput and the additional wastewater associated with new and modified process units would increase the mass loading in the wastewater stream. The WWTP is required to adequately treat the increase in the mass loading so as not to exceed the limits required in the NPDES permit for the refinery's discharge. This impact is less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. As required by its current NPDES permit and consistent with the Certified EIR in implementing VIP and the VIP Amendments, the Benicia Refinery will in consultation with the San Francisco Bay Regional Water Quality Control Board determine whether a technical study of potential loading impacts will be required to address the mass increase of pollutants proposed to be discharged and propose new treatment process units, if necessary, to maintain water quality in Suisun Bay. The Benicia Refinery will continue to be required not to exceed the limits set forth in the NPDES permit. Therefore, this impact will be made less than significant.	No significant impacts were previously identified.

10. Hydrology and Water Quality

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.9-3: The increase of crude throughput and the potential processing of a lower grade of crude would result in increased solids loading to the wastewater system. A portion of these solids are treated on site within the CKR and a portion is accumulated as a processed sludge that is disposed off site. This impact is less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. As required by its current NPDES permit and consistent with the Certified EIR in implementing VIP components and the VIP Amendments, the Benicia Refinery will in consultation with the San Francisco Bay Regional Water Quality Control Board determine whether a technical study of potential loading impacts will be required to address the mass increase of pollutants proposed to be discharged and propose new treatment process units, if necessary, to maintain water quality in Suisun Bay. The Benicia Refinery will continue to be required not to exceed the limits set forth in the NPDES permit. Therefore, this impact will be made less than significant.	No significant impacts were previously identified.

10. Hydrology and Water Quality

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.9-4: Depletion of groundwater supplies due to the increased impervious surface area could potentially decrease groundwater resources. This impact is less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments project elements represent a negligible additional source of storm water runoff and potential use of groundwater in the area is restricted due to existing groundwater contamination at the site. There fore, this impact is less than significant.	No significant impacts were previously identified.
Impact 4.9-5: Depending on the particular component of the proposed project, varying amounts of wastewater would be generated by construction activities. This wastewater could contain entrained sediment, petroleum constituents, or other contaminants generated during the construction operations. Provided the applicant adheres to the grading and construction plan and city policies and programs this impact is less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. Compliance with the grading and construction plan and city policies and programs will ensure that wastewater associated with construction of the proposed VIP Amendments elements would not cause a significant impact.	No significant impacts were previously identified.

10. Hydrology and Water Quality

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.9-6: Wastewater treatment facilities are located in the 100-year floodplain and new facilities would be subject to flooding. This impact is less than significant.	Less than Significant.	No Mitigation Required. Use Permit Condition 16: Valero shall submit Storm Water Pollution Prevention Plans to the City of Benicia when required under the City's Grading Ordinance for any component or group of components of the Valero Improvement Project. If wastewater plant improvements are to be constructed in a 100-year flood zone, Valero shall comply with the Benicia Municipal Code Chapter 15.40, Flood Damage Prevention in designing the improvements and shall document such compliance when it applies for associated building and grading permits.	No Mitigation Required. Less than Significant.	No. Compliance with the Benicia Municipal Code Chapter 15.40, Flood Damage Prevention will ensure that wastewater associated with construction of the proposed VIP Amendments elements would not cause a significant impact.	No significant impacts were previously identified.
Impact 4.9-7: The accumulative wastewater and storm water flows from the project and other refinery and non-refinery projects would increase pollutant discharges to the Bay. This would be a less than significant impact.	Less than Significant.	No Mitigation Required. Use Permit Condition 15: Valero shall provide the City with copies of its Anti-Degradation Report and, when requested, monthly self-monitoring reports when those reports are submitted to the Regional Water Quality Control Board (RWQCB). The documents shall be provided at no cost to the City. Also See Use Permit Condition 16-discussed above.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments when taken with the NRU Catalyst Regeneration Facility Project represent a small increase (3%) in flow to the WWTP and subsequently in the discharge to Suisun Bay. Adherence to Use Permit Condition 15 would continue to maintain this impact to less than significant.	No significant impacts were previously identified.

10. Hydrology and Water Quality

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.9-8: Cumulatively, the storm water generated from VIP, together with other refinery projects and the storm water generated from other non-refinery projects may potentially have a downstream flooding effect. This would be less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments project elements represent a negligible additional source of storm water flow. Therefore, storm water flow would not cause the cumulative impact to be significant.	No significant impacts were previously identified.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Environmental Analysis: Valero Benicia Refinery, New Crude Oil Storage Tank Project, September 2006.

Interview, Valero personnel, January 2007.

Technical memorandum entitled Amendment to the Water Supply Evaluation for the Valero Improvement Project, October 2002, prepared by Sierra Processing Systems, Inc., Daniel E. Glaze, Vice President for Environmental Affairs, dated January 22, 2007,,Revised May 2008.

City of Benicia Water Study prepared by Environmental Science Associates (ESA), dated October 2002.

Federal Emergency Management Agency Flood Insurance Rate Map, Community Panel Number 0603680004C, dated 8/3/1989.

3.1.11 Land Use, Plans and Policies

Since certification of the Certified EIR in April 2003, Valero is not aware of changes in surrounding land uses or General Plan and zoning designations, or any other changes in plans, policies, or ordinances in Benicia that would be relevant to the proposed VIP Amendments project elements. One change of note is the City's adjustment of the Land Use Diagram, which was updated in November 2003, to reflect Measure K amendments; however, this adjustment has no impact on the land use designations at or surrounding the Benicia Refinery.

a. Would the project physically divide an established community? No

The proposed VIP Amendments will occur within the bounds of the existing Benicia Refinery. Areas designated for proposed VIP Amendments are located within the existing industrial area (EIR Figure 2-1). No development related to the VIP Amendments project elements would occur within existing open space buffers and there are no public roads that pass through the facility. Therefore, the new and modified equipment for the proposed VIP Amendments would not physically divide an established community.

b. Would the project 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? No

The project does not conflict with any applicable plans, policies, or ordinances. The Benicia Refinery exists within the geographic area named in the City of Benicia General Plan as the Benicia Industrial Park. The land use designation for the area to be utilized for the VIP Amendments is designated General Industrial (IG) by the Benicia Zoning Ordinance and the City of Benicia General Plan, as shown in the Certified EIR Figure 4.10-1. The project elements of the VIP Amendments are allowed uses in the IG zone.

c. Would the project conflict with any applicable habitat conservation plan or natural community conservation plan? No

As discussed in the Certified EIR (EIR Section 4.10.4.4), VIP would not conflict with any habitat conservation plan or natural community plan. Locations of project elements of the VIP Amendments outside of the area discussed in the Certified EIR are within the boundary of the Benicia Refinery. All of the project elements are located within the Benicia Refinery boundaries and, except for the new employee parking lot which is in an area containing ice plants, are within disturbed areas. Proposed VIP Amendments in the areas described, as with the areas identified in the Certified EIR, are located in a developed and industrial area and will not conflict with any habitat conservation plans or natural community conservation plan.

As stated under impact 4.10-4 of the Certified EIR, the VIP project area is located outside the Marsh Protection Area identified in the Suisun Marsh Local Protection Program (SMLP Program); therefore, the Program is not directly applicable to VIP. Areas identified for the VIP Amendments are also located outside of the Marsh Protection Area. The SMLP Program does, however, contain policies that focus on the construction of new utilities within the marsh protection zone. One of the Benicia Refinery's effluent outfalls, which will not be physically altered or otherwise modified, discharges at a point approximately 1,100 feet into Suisun Bay, within the marsh protected zone. The SMLP Program requires that disposal of wastewater from the existing outfall follow requirements of the RWQCB and Solano County Health Department. As required by its current NPDES permit and consistent with the Certified EIR in implementing VIP and the VIP Amendments, the Benicia Refinery will, in consultation with the San Francisco Bay Regional Water Quality Control Board (RWQCB), determine whether a technical study of potential loading impacts will be required to address the mass increase of pollutants proposed to be discharged and propose new treatment process units, if necessary, to maintain water quality in Suisun Bay. Adherence to these requirements will ensure that potential impacts to the Suisun Marsh remain less than significant. Therefore, the VIP Amendments would continue to have no impact on a habitat conservation plan or a natural community plan.

11. Land Use, Plans and Policies					
Certified EIR Impact	**Certified EIR Pre-Mitigation Significance**	**Condition of Approval/ Certified EIR Mitigation Measure**	**Certified EIR Post-Mitigation Significance**	**Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?**	**Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?**
Impact 4.10-1: Construction of new refinery components and on-site improvements may result in intermittent impacts to adjacent industrial uses and nearby residences due to traffic congestion, air emissions, noise increases, view disruptions, and public safety. This impact is less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. No Impact.	No. Construction associated with the proposed VIP Amendments represents a short-term and negligible source of impacts to adjacent uses, which are not significantly different than what was evaluated for construction impacts in the Certified EIR. The underlying circumstances regarding adjacent industrial uses and nearby residences have not materially changed since the Certified EIR.	No previously significant impacts identified.
Impact 4.10-2: The project would not conflict with established plans, policies, and ordinances in Benicia. No impact would occur.	No Impact.	No Mitigation Required.	No Mitigation Required. No Impact.	No. The proposed VIP Amendments will not conflict with any established plans, policies, or ordinances in the City of Benicia, and there have been no relevant changes in such plans, policies, or ordinances since the Certified EIR.	No previously significant impacts identified.
Impact 4.10-3: The project would not potentially divide an established community. No impact would occur.	No Impact.	No Mitigation Required.	No Mitigation Required. No Impact.	No. The proposed VIP Amendments would not divide an established community.	No previously significant impacts identified.
Impact 4.10-4: The project would not affect a habitat conservation plan or natural community plan. No impact would occur.	No Impact.	No Mitigation Required.	No Mitigation Required. No Impact.	No. The proposed VIP Amendments would have no effect on a habitat conservation plan or a natural community plan.	No previously significant impacts identified.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Environmental Analysis: Valero Benicia Refinery, New Crude Oil Storage Tank Project, September 2006.

City of Benicia General Plan and Land Use website viewed at http://www.ci.benicia.ca.us/benicia-generalplan.php

3.1.12 Noise

a. ***Would the project result in 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? No***

It is expected that the construction of the proposed VIP Amendments (i.e., the site grading and construction of the H2U, the relocated parking lot and firehouse, and FCCU/CKR Scrubber) will be performed without the need for pile drivers. For all other construction equipment, the analysis of Impact 4.11-1 of the Certified EIR found that noise levels would not exceed performance standards in the City's General Plan or applicable noise regulations in the City Municipal Code. However, if pile driving proves necessary, implementation of Mitigation Measure 4.11-1 will ensure that noise impacts remain less than significant as discussed below. The equipment changes associated with the VIP Amendments will not result in a significant incremental increase in sound levels within the Benicia Refinery property compared to the noise generated by VIP previously evaluated for the Certified EIR. In addition, the incremental increase associated with the VIP Amendments sound levels will not exceed the standards at the property line for off-site receptors established in the local general plan or noise ordinance. The VIP Amendments would add the following potential noise-generating equipment:

1. The FCCU.CKR Scrubber arrangement utilizes some equipment as was previously analyzed in the Certified EIR (EIR Section 4.11). The noise-generating equipment potentially added by the VIP Amendments is listed in **Table 3.1.12-1**.

Table 3.1.12-1 Additional Noise Generating Equipment

Equipment Type	Quantity	Power Rating (HP)
Forced Draft Fan - F-105	11	2,000
Forced Draft Fan - F-106	1	1,500
Waste Heat Boiler Circulation Pump	1	500
Dilution Air Blower	1	500
Quench Subcooling System	1	700
Scrubber System Pumps	3	1,100

2. The Certified EIR planned modifications to the H2U will not be done. Instead, one of the two existing trains will be shut down and a new H2U will be built. This new equipment is expected to have the noise generating equipment listed in **Table 3.1.12-2**.

Table 3.1.12-2 New Hydrogen Unit Equipment

Equipment Type	Quantity	Power Rating (HP)
Centrifugal Forced Draft Fan	1	1,000
Centrifugal Induced Draft Fan	1	2,000
Horizontal Forced Draft Process Gas Air Cooler	2	200
Gas Compressors	1	700
Centrifugal Forced Draft Fan	1	1,000

The equipment specified in the VIP Amendments will be situated generally in the same area of the Benicia Refinery as the existing and/or the previously proposed VIP equipment. Based on the same conservative approach to the analysis as was used in the original analysis of the Certified EIR (Valero Improvement Project Noise Assessment, Benicia, California, May 30, 2002, prepared by Illingworth & Rodkin, Inc.), the average noise level produced by the VIP Amendments at the Administration Building will be 43 dBA. Combined with the noise levels at the Administration Building from the Certified EIR of 50 dBA, the combined noise level would be 50.5 dBA. This conservative analysis does not include the reduction of the noise from the Certified EIR for equipment that will not be installed or equipment (such as scrubber fans) that may also be included with the VIP Amendment equipment lists.

However, noise from the VIP Amendments must be considered with regards to other noise on the site, which was measured at 64 to 66 dBA day and night at the administration building. Thus, the average noise level produced by the VIP equipment and the VIP Amendments is 13.55 to 155.5 dBA less than those levels at the Administration Building without the new equipment operating. Since these sound levels are significantly lower than the existing noise levels at the Administration Building, using standard noise equations there will be no discernible change in predicted average sound levels with the VIP Amendments operating. Therefore, the operation of the VIP Amendments will have a less than significant effect on noise levels.

As described in the Certified EIR, the noise level contribution at the residential receptors with all of the equipment operating simultaneously would be between 38 and 39 dBA. This would add 0.5 dBA to a residential receptor noise level of 45 dBA. The noise contribution from VIP Amendments project equipment at the residential receptors is 31.2 dBA, and therefore, will not increase the residential noise level above that in the Certified EIR. This incremental noise level will not be a discernible increase and will allow noise levels to continue to be below Benicia’s General Plan performance standards of 55 dBA daytime and 50 dBA nighttime for stationary noise sources. Therefore, the VIP Amendments will not expose persons to noise levels in excess of standards established in the local general plan or noise ordinance and do not represent a significant increase.

b. Would the project result in exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels*? *No

The construction and operation of the new equipment not previously analyzed in the Certified EIR (listed above) will not expose people to excessive groundborne vibration or groundborne noise levels. The vibratory and acoustical energy imparted by these activities to the ground plane would be significantly attenuated through the substantial concrete foundations upon which the equipment will be placed. Furthermore, the locations of the new equipment for the VIP Amendments are within or adjacent to the Refinery Process Block and are at least one-half mile from the nearest residential receptors. The visual and acoustical path to these residential receptors is obscured by topographical features. Therefore, the effect of groundborne vibration or groundborne noise levels at sensitive land uses due to the attenuation produced by ground surface geometric spreading and material damping over the large distances to these uses will be less than significant.

c. Would the project result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project? No

The operation of the new equipment proposed by the VIP Amendments, in addition to the equipment previously analyzed in the Certified EIR, will not introduce new noise sources that would result in the permanent significant increase in ambient noise levels. The new H2U replaces one of the two existing H2U trains within the Benicia Refinery and the equipment within the existing H2U will be shutdown. The new FCCU/CKR Scrubber replaces the Main Stack Scrubber described in the Certified EIR. The noise generated by the additional equipment associated with the FCCU/CKR Scrubber will not significantly increase ambient noise levels above those analyzed in the Certified EIR. Other process modifications will not result in significant noise generating equipment.

d. Would the project result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project? No

Construction of the proposed VIP Amendments will last approximately three to five years. Sensitive land uses are located more than 3,000 feet away. Based on typical construction noise levels for industrial projects with all pertinent equipment on site (Source: USEPA, Legal Compilation on Noise, Vol. 1, p. 2-104, 1973) and the effect of spherical sound propagation, non-pile driving related construction noise from the construction of the facilities proposed in the VIP Amendments (including the new H2U) at these receptors would not exceed 55 dBA at these noise sensitive uses. Therefore, if pile driving is not required, construction will not create a significant noise impact at residential locations and other sensitive land uses in the project vicinity, compared to the local standard of 55 dBA daytime and 50 dBA nighttime for stationary noise sources. However, if pile driving proves necessary, implementation of Mitigation Measure 4.11-1 from the Certified EIR which limits the times of day piles may be driven will ensure that noise impacts remain less than significant.

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? No

The new equipment proposed for the VIP Amendments is not located within an area covered by an airport land use plan or within two miles of a public airport or public use airport.

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? No

The new equipment proposed for the VIP Amendments is not within the vicinity of a private airstrip.

12. Noise

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
4.11-1: Construction activities would intermittently and temporarily generate noise levels above existing ambient levels in the project vicinity over the duration of the construction period.	Significant.	4.11-1: Over the duration of pile driving activities, Valero shall require the construction contractor to implement the following mitigation measures: To reduce the potential for noise impacts from pile driving, alternate methods of driving shall be used, if feasible. Alternate measures may include pre-drilling of piles, the use of more than one pile driver to lessen the total time required for driving piles, and other measures. Pile driving activities shall be limited to daytime hours between 7 a.m. and 7 p.m., on weekdays. Pile driving shall be prohibited during weekends, state and federal holidays. Valero shall also designate a construction complaint manager for the project for the duration of the construction activities.	Less than Significant with Mitigation.	Construction associated with the VIP Amendments is not expected to require pile driving. If pile driving is necessary, Mitigation Measure 4.11-1 will ensure noise impacts will be less than significant.	No. Implementation of previously identified mitigation measures will ensure that impacts will be less than significant.
Impact 4.11-2: Operational noise associated with VIP could increase noise at nearby noise receptors. This impact would be less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. Operation of the VIP equipment and the new VIP Amendments equipment are not expected to result in a discernible increase in ambient noise.	No significant impacts identified.
Impact 4.11-3: The proposed VIP Amendments together with proposed and planned future development at the Valero refinery could result in cumulative increase in noise levels. This impact is less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. Operation of the VIP equipment and the new VIP Amendments equipment are not expected to result in a discernible increase in ambient noise.	No significant impacts identified.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Environmental Analysis: Valero Benicia Refinery, New Crude Oil Storage Tank Project, September 2006.

3.1.13 Public Services

a. ***Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:***

- ***Fire protection? No***
- ***Police protection? No***
- ***Schools? No***
- ***Parks? No***
- ***Other public facilities? No***

The VIP Amendments will not result in the need for additional public services related to fire protection, police protection, schools, parks and recreation, or other public facilities.

As with VIP, the VIP Amendments will be served by an on-site fire brigade at the Benicia Refinery, which provides first-response fire, medical, hazardous materials and rescue services for the Benicia Refinery. As backup, the Valero Fire Department is a full-service industrial fire department licensed by the State Fire Marshall, (Certified EIR, Section 4.12.2.1). The Certified EIR (Section 4.12) found that VIP would not adversely affect the ability of the Benicia Fire Department to provide fire suppression and emergency response services to the Benicia Refinery or other parts of the City. The proposed VIP Amendments will occur within the bounds of the existing Benicia Refinery with the on-site private fire brigade providing first response without additional demands on the City of Benicia. In order to construct the new H2U, the firehouse will be demolished and the equipment and staff will be relocated to a new location to be constructed within the Benicia Refinery at one of three alternate locations being considered. This demolition and relocation of staff and equipment will occur such that no disruption or interruption to service will occur. Therefore, fire suppression and emergency response times will not be incrementally greater than VIP.

As with VIP (Certified EIR, Section 4.12.2.2), the VIP Amendments will not adversely affect the Benicia Police Department's ability to provide police protection services to the Project site and City as a whole. Police protection for the Project area is provided by the Benicia Police Department, which shares the responsibility for policing the Benicia Industrial Park, where the Project site is located, with private security officers employed by the individual industries in the park. City response time to the area is 3.5 minutes and security at the Benicia Refinery is provided 24 hours per day by a private security contractor. The proposed VIP Amendments will occur within the bounds of the existing Benicia Refinery and will be served by a private security force. Therefore, demands for City police services will not increase as a result of the VIP Amendments.

Section 4.12.4.3 of the Certified EIR found that implementation of VIP would not affect the ability of the Benicia Unified School District to adequately provide educational services to residents of Benicia. Incrementally, the VIP Amendments will contribute School Impact Fees as required by SB 50 and, as with VIP, there will be no substantial population migration into the area which would increase the student population. The VIP Amendments will add only 30 additional workers who will likely come from the surrounding region. Incrementally, the VIP Amendments will have no impact on schools.

The VIP Amendments will not add additional construction workers compared to VIP. The Certified EIR (Section 4.12.4.4) found that the construction workforce, which would likely come from the region, would likely use parks and other recreational facilities within their own communities. Since there is no increase in construction workforce from the VIP Amendments, there will be no impact on City of Benicia public parks and facilities.

13. Public Services

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.12-1: Implementation of the proposed VIP Amendments would not affect the Benicia Fire Department's ability to provide adequate fire suppression and emergency medical services to the project site and City as a whole. No impact.	No Impact.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments represent a negligible incremental increase in demand for fire and emergency medical services which would not cause a significant impact.	No significant impacts previously identified.
Impact 4.12-2: Implementation of the proposed VIP Amendments would not affect the ability of the Benicia Police Department to provide police protection services to the project site and City as a whole. No impact.	No Impact.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments represent a negligible incremental increase in demand for police services which would not cause a significant impact.	No significant impacts previously identified.
Impact 4.12-3: Implementation of the proposed VIP Amendments would not affect the ability of the BUSD to adequately provide educational services to residents of Benicia. No impact.	No Impact.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments represent a negligible incremental increase in demand for educational services.	No significant impacts previously identified.
Impact 4.12-4: The proposed VIP Amendments would not degrade the quality of existing park and recreation facilities or require the provision of new or expanded facilities. No impact.	No Impact.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments represent a negligible incremental increase in demand for recreational services.	No significant impacts previously identified.
Impact 4.12-5: The project would not affect other public facilities. No impact would occur.	No Impact.	No Mitigation Required.	No Mitigation Required. Less Than Significant.	No. The proposed VIP Amendments represent a negligible incremental increase in demand for or otherwise affect other public facilities.	No significant impacts previously identified.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Environmental Analysis: Valero Benicia Refinery, New Crude Oil Storage Tank Project, September 2006.

3.1.14 Transportation/Traffic

a. ***Would the project cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)? No***

The proposed VIP Amendments will have a minimal incremental effect on traffic when compared to the volumes and types of traffic previously analyzed in the Certified EIR (EIR Section 4.13). VIP Project Components that have already been completed or have been either reduced in scope or removed from VIP scope mostly offset the VIP Amendments, including the new H2U.

Compared to the Certified EIR Project Description (EIR Section 4.13), the VIP Amendments incrementally adds 30 permanent operations staff to the existing workforce. This new staff will generate 30 new trips arriving at and 30 new trips departing from the Benicia Refinery each day. However, this new commute activity will be distributed over three work shifts minimizing the potential for peak hour impacts above that identified in the Certified EIR. The three work shifts per day are 8 AM to 4 PM, 4 PM to Midnight, and Midnight to 8 AM. On average, only 10 new workers will arrive around 8 AM while 10 new workers will depart around 8 AM; similarly, only 10 new workers will arrive around 4 PM while 10 new workers will depart around 4 PM. Therefore, the VIP Amendments will generate approximately 10 new trips arriving and 10 new trips departing the Refinery during AM peak and 10 new trips arriving and 10 new trips departing the refinery during PM peak. These effects would not be significantly different from those estimated in the Certified EIR.

Also, under the VIP Amendments, approximately one new delivery truck per week is anticipated to arrive at the Benicia Refinery, which will represent one truck trip in and one truck trip out per week. One additional truck per week may be required to carry hazardous waste (wet pre-scrubber solids) generated for disposal at Buttonwillow Landfill. Therefore, the maximum impact will be an additional two truck trips in and two truck trips out of the refinery during the day. These are not anticipated to occur during peak hours. These truck trips represent only a nominal incremental increase in operational phase truck trips which would not cause a significant impact. The proposed VIP Amendments would add no peak hour truck trips, and the effects would not be significantly different from those projected in the Certified EIR.

Incrementally during construction, the VIP Amendments includes the installation of the FCCU/CKR Scrubber of which one option would require an additional 175,000 cubic yards of clean fill, over and above that which was identified in the Certified EIR. About 100,000 cubic yards will be obtained from the North Canyon clean fill storage area at the Benicia Refinery. The remaining amount would be imported and would result in about 3,750 additional truck trips (each carrying 20 cubic yards of fill), over that identified in the Certified EIR. This would be delivered at the rate of 30 to 40 trucks per day (60 to 80 truck trips as each vehicle makes one trip in and one trip out). As identified in the Certified EIR, these truck trips would be restricted to non-commute hours (truck trips could not occur between 7 and 9 AM and between 4 and 6 PM. This number of truck trips would not be expected to generate a new significant adverse impact to surrounding transportation facilities. Furthermore, this activity will be of temporary duration lasting only about three months.

For construction trips associated with vehicular traffic of construction workers, the “worst case” scenario remains the same as that which was previously analyzed (EIR Section 4.13). As many as 2,000 construction workers may be on site during an approximate 45-day period when construction coincides with a major turnaround. During this 6-week duration, the up to 2,000 construction workers will be split into two shifts (one day shift, one night shift), reporting in accordance with the staggered arrival and departure times as per the Certified EIR (EIR Section 4.13). This is the same “worst case” scenario as analyzed in the Certified EIR, where half the workers arrive in staggered fashion between 7 AM and 9 AM and depart similarly in staggered fashion between 4 PM and 6 PM, and the other half arrive (also in staggered fashion) between 7 PM and 9 PM, then depart between 4 AM and 6 AM. This impact would be temporary and only occur for up to 45 days, and the same Mitigation Measure 4.13-1 provided in the Certified EIR will be applied for the VIP Amendments, to ensure that the impact would remain less than significant.

b. Would the project exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways? No

The Solano Transportation Authority (STA) is the designated Congestion Management Agency for Solano County. The STA develops the countywide Congestion Management Program (CMP) and updates it every two years. The latest revision was completed in 2005. The CMP identifies a system of state highways and regionally significant principal arterials (known as the CMP system) and specifies the PM peak hour level of service (LOS) standards for those roadways. The minimum standard throughout the Solano County system is LOS 'E'.

There are four CMP facilities within the City, including I-680, I-780, Military West Street and Military East Street. The PM peak hour LOS standard for each is 'E'; however, the 2005 measured levels of service on these facilities in the City are in the LOS 'A' to LOS 'C' range.[1] Cumulative plus project conditions for another very recent project[1] indicate that only one segment of CMP highway would experience a LOS worse than 'E', and that is westbound I-780 west of East 2nd Street. However, the mitigation – widening of I-780 – ascribed from Solano County's Capital Improvement Program to this other project[1] will substantially improve the LOS on this portion of I-780 from 'F' to 'B'. Whether or not that mitigation is constructed, the VIP Amendments with their relatively few 20 AM and 20 PM peak trips during operational phase will not significantly affect the LOS on the regional roadway system serving the site.

These 20 new AM and 20 new PM auto trips approaching and departing the Benicia Refinery site will be distributed throughout the region. The Certified EIR (Section 4.13.3.2) based the trip distribution analysis on the following percentages: 60 percent to/from South on I-680; 17 percent to/from North on I-680; 20 percent to/from West on I-780; and three percent of the new trips were assumed to/from within the City of Benicia. Applying this methodology to the VIP Amendments, 24 new peak hour trips (12 in the AM and 12 in the PM) would arrive from/depart South on 1-680; 7 new peak hour trips (3 to 4 in the AM and 3 to 4 in the PM) would arrive from /depart North on I-680; eight new peak hour trips (4 in the AM and 4 in the PM) would arrive from/depart West on I-780; and 1 new peak hour trip (1 or less trip in the AM and 1 or less trip in the PM) would arrive from/depart within the City of Benicia. These incremental trips traveling through the affected intersections during peak hours would be insignificant and would not be expected to result in a change in LOS. The incremental operational traffic generated by the proposed VIP Amendments would therefore not be significantly different from that projected in the Certified EIR.

c. Would the project 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? No

As with the Certified EIR (EIR Section 4.13), there will be no change in air traffic patterns from construction of the VIP Amendments.

d. Would the project substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)? No

Vehicles entering and leaving the Benicia Refinery during construction of the VIP Amendments will be similar to the existing vehicle mix found in the area as previously analyzed in the Certified EIR (EIR Section 4.13). Based on the discussion in the Certified EIR, given the existing vertical and horizontal alignment of area roads, even the peak of construction vehicles occurring during the peak construction plus major turnaround phase will not substantially increase traffic hazards and will not introduce an incompatible use.

e. Would the project result in inadequate emergency access? No

The VIP Amendments will not increase vehicle trips entering and departing the Benicia Refinery during construction from levels previously analyzed in the Certified EIR (EIR Section 4.13). The facility's on-site security force manages the flow of traffic entering and departing the Benicia Refinery currently and this will not change as a result of the implementation of the VIP Amendments. The impact at I-680 northbound off-ramps/Bayshore Road will be mitigated by implementation of Mitigation Measure 4.13-1 which includes the

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1. Benicia Business Park EIR, LSA Associates, Inc., January 2006.

provision of traffic control personnel at the impacted intersection during the a.m. peak hour. These personnel can manage emergency traffic and access. Therefore, the VIP Amendments will not have an impact on emergency access to the project site or the surrounding area.

f. Would the project result in inadequate parking capacity? <u>No</u>

The VIP Amendments are not expected to result in any changes to parking capacity compared to what was analyzed in the Certified EIR (EIR Section 4.13). The VIP Amendments, therefore, would maintain adequate parking capacity. Approximately 850 parking spaces are available for construction workers at the Benicia Refinery. These spaces are split between two contractor parking areas within the Benicia Refinery. The parking lot at Gate 9 (north of the Park Road/Bayshore Road intersection) currently accommodates 350 vehicles, while the parking lot at Gate 7 (along Park Road across from the Crude Tank Farm) can accommodate 500 vehicles. In the event parking becomes filled to near capacity during the short-duration peak construction plus major turnaround phase, the Benicia Refinery will rent off-site parking and shuttle the workers to and from the project site.

To accommodate the location of the proposed H2U, an existing parking lot will be replaced by a parking area situated on the Valero property to the west of the Refinery Process Block. The number of spaces located within the Benicia Refinery boundary will be increased to accommodate both existing and the proposed additional 30 permanent operating personnel associated with the VIP Amendments. Therefore, the project will maintain adequate parking capacity for Valero operations employees.

g. Would the project conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)? <u>No</u>

Similar to VIP, construction of the VIP Amendments even during the peak construction plus major turnaround phase is not expected to conflict with programs supporting alternative transportation modes. As described in Section 4.13.2 of the Certified EIR, there is a designated Class II bikeway on East Second Street south of Rose Drive. Between Rose Drive and Industrial Way, a shoulder is striped but no bikeway signs are provided. North of Industrial Way, the shoulder width is variable and continuous bike lanes are not provided. There are no other bike lanes along roadways in the vicinity of the Benicia Refinery. No pedestrian facilities, such as sidewalks or off-street paths, are provided in the vicinity. Local public transit in Benicia is provided by the City which operates two bus routes; neither of these serve the project vicinity.

14. Transportation/Traffic

VIP EIR Impact	VIP EIR Pre-Mitigation Significance	Condition of Approval/ VIP EIR Mitigation Measure	VIP EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
4.13-1: The proposed construction phase of VIP would result in a potentially significant impact to the a.m. peak hour operations of I-680 northbound off-ramp/Bayshore Road in the 2004 plus project scenario.	Significant.	Mitigation Measure 4.13-1: Since this significant impact would be temporary and only occur for a period of approximately 45 days, there are several measures that can be applied to improve intersection levels of service at the I-680 northbound off-ramp/ Bayshore Boulevard intersection without the installation or construction of additional transportation facilities (e.g., lane widening, traffic signal installation, etc.). These measures include, at a minimum, provision of traffic control personnel at impacted intersection during the peak hours. For this intersection, the refinery and the City of Benicia will be required to apply for a Caltrans Encroachment Permit, since "manual" traffic control was conducted assuming the intersection as a "fixed time" signalized intersection. The signal would simulate a traffic control officer controlling vehicle flow at the intersection during the a.m. peak hour. If the traffic control officer were to allow the off-ramp traffic to enter the intersection unimpeded for 60 seconds, the LOS at the intersection would be LOS 'B' (11.0 seconds of delay). The estimated queue length would almost be reduced in half from 625 feet to 340 feet (or about 14 vehicles). Although not required, the following additional measures would provide further improvements (reductions) to the study area intersection delays:	Less than Significant with Mitigation.	Significant impact previously identified. Less than significant incremental impacts as a result of the amendments.	No. Implementation of the previously identified mitigation measures to construction of the proposed VIP Amendments will prevent any substantial increase in already identified impacts due to changes in the project.

14. Transportation/Traffic

VIP EIR Impact	VIP EIR Pre-Mitigation Significance	Condition of Approval/ VIP EIR Mitigation Measure	VIP EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
		• Stagger work hours and shifts of construction personnel during the AM and PM peak commute periods. • Use alternative and additional gate access locations to disperse traffic from the I-680 northbound off-ramp/ Bayshore Road intersection. • Attendance at monthly traffic meetings between Valero Refinery staff and City of Benicia staff (Police, Traffic Engineering, and Public Works Departments) to review and implement the traffic controls listed above. Use Permit Condition 17: Valero shall notify the Public Works Department and shall meet with designated representatives of the Police and Public Works Departments in advance of construction and monthly during construction to coordinate issues related to construction traffic and determine what traffic control measures need to be implemented by Valero.			

14. Transportation/Traffic					
VIP EIR Impact	**VIP EIR Pre-Mitigation Significance**	**Condition of Approval/ VIP EIR Mitigation Measure**	**VIP EIR Post-Mitigation Significance**	**Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?**	**Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?**
4.13-2: The proposed construction phase of VIP would result in a contribution of construction traffic volumes to one of the I-680 ramp junctions which are already forecast to operate at LOS 'F' in the baseline (i.e., without project) condition. However, when the 2004 baseline and 2004 plus project ramp volumes are compared at the impacted ramps, the project's contribution would be nominal.	Less than Significant.	Implement 4.13-1.	Less than Significant with Mitigation.	Less than significant incremental impacts as a result of the VIP amendments.	No significant impacts previously identified.

14. Transportation/Traffic

VIP EIR Impact	VIP EIR Pre-Mitigation Significance	Condition of Approval/ VIP EIR Mitigation Measure	VIP EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.13-3: According to the Project Description, the minimal build-out operation phase of the Benicia Refinery is anticipated to generate 40 new daily trips from 20 new permanent workers, comprising 20 new AM peak hour trips and 20 new PM peak hour trips.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments provide for 30 more permanent workers than VIP (30 more commute trips in plus 30 more commute trips out than under VIP). This commute activity will however be spread evenly over three work shifts per day, namely 8 AM to 4 PM, 4 PM to Midnight, and Midnight to 8 AM. The VIP Amendments will represent 2 new truck trips in and 2 truck trips out each week. These trucks are not expected to enter or leave the site during peak hours. These trips represent only a nominal increase in operational phase daily trips which would not cause a significant impact.	No significant impacts previously identified.

References

Benicia Business Park EIR, LSA Associates, Inc., January 2006.

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Environmental Analysis: Valero Benicia Refinery, New Crude Oil Storage Tank Project, September 2006.

Interviews, Valero personnel, January 2007.

3.1.15 Utilities and Service Systems

a. *Would the project exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board? <u>No</u>*

As described in the **Section 3.1.10** (Hydrology and Water Quality), storm water from process areas within the Benicia Refinery is collected and routed to the on-site Benicia Refinery WWTP. Also as described in **Section 3.1.4** and **Section 3.1.10**, wastewater from the VIP Amendments project components and a negligible increase in storm water from these areas will be treated, along with other wastewater from the Benicia Refinery, to comply with the NPDES permit regulating the Refinery's discharge to Suisun Bay. **Table 3.1.10-1** provides a qualitative and quantitative description of the estimated incremental wastewater load from the VIP Amendments. Of the approximate 184,320 gpd added to the WWTP flow from the VIP Amendments, 57,600 gpd will be a stream expected to contain nickel, vanadium, and aluminum and 14,400 gpd will be from the caustic polisher which will contain sulfates.

The additional nickel to be discharged is estimated to be 138 pounds per year (0.37 lbs/day), which will still allow the WWTP discharge to remain within both current and future NPDES discharge limits. However, as required by its current NPDES permit and consistent with the Certified EIR in implementing VIP and the VIP Amendments, the Benicia Refinery will in consultation with the San Francisco Bay RWQCB determine whether a technical study of potential loading impacts will be required to address the mass increase of nickel, vanadium, and aluminum. Vanadium and aluminum are of less concern because the RWQCB has not imposed numerical limits for these constituents. However, any technical study required would evaluate if new treatment process units are necessary to maintain water quality in Suisun Bay. Sulfates are ubiquitous in the Suisun Bay environment and based on testing by Valero, the sulfate stream will not adversely increase toxicity of the WWTP effluent. Therefore, compliance with permit requirements and potential consultation with the RWQCB will ensure that wastewater generated as a result of implementation of the VIP Amendments in Parcel 1 will not exceed the wastewater discharge limits of the RWQCB.

The relocated employee parking lot and the relocated firehouse will not generate wastewater. Construction and demolition associated with the VIP Amendments will be managed in accordance with the Benicia Refinery's construction storm water NPDES permit.

Because wastewater generated by the VIP Amendments will be managed in the ways identified above, the VIP Amendments will not impact wastewater treatment at the Benicia Refinery such that RWQCB requirements for wastewater are exceeded.

b. Would the project require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects? <u>No</u>

Potential modifications to the Benicia Refinery WWTP were evaluated in the Certified EIR. As stated in the Certified EIR Section 3.4.3.13 and below, Valero anticipates that it may be necessary to make some modifications to existing wastewater treatment processing, although the extent of the modifications depends on the NPDES permit conditions to be imposed by the RWQCB or the results of any technical studies performed, if required. No modifications to the Benicia Refinery WWTP above and beyond those described in the Certified EIR are expected as a result of the VIP Amendments; therefore, no significant environmental effects associated with the construction of new water or wastewater treatment facilities or expansion of existing facilities are expected as a result of the VIP Amendments. However, the design and installation of the FCCU/CKR Scrubber may include wastewater pretreatment equipment that will reduce metals or metals and sulfates in the waste stream discharged to the Benicia Refinery WWTP as needed to meet Regional Water Board discharge requirements. As described in **Section 3.1.10,** with VIP Amendments, the load to the WWTP would increase by approximately 184,320 gpd (128 gpm). However, the NRU Catalyst Regeneration Facility Project, independently implemented in April 2007, reduced load to the WWTP by about 100,800 gpd (70 gpm). Total maximum flow to the WWTP after the VIP Amendments will therefore be 1,833 gpm (2.64 MGD). The WWTP has a hydraulic capacity of 2,500 gpm (3.6 MGD) and the VIP Amendments will not increase storm water flow to the WWTP. Although wastewater flow to the WWTP after the VIP Amendments will increase compared to the wastewater flow provided in the Certified EIR, the Benicia Refinery WWTP has sufficient capacity to manage storm water and wastewater flows from the VIP Amendments without construction of new facilities other than those in Certified EIR.

c. Would the project require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects? No

As described in **Section 3.1.10**, storm water from Parcel 1 (Refinery Process Block and area to the north of the Refinery Process Block) is collected, combined, and routed to the on-site WWTP. Storm water from the area within the Refinery Process Block, the new FCCU/CKR Scrubber area, and the area to the north of the Refinery Process Block will continue to be collected, combined, and routed to the Benicia Refinery WWTP after the implementation of the VIP Amendments. As discussed in **Section 3.1.10**, no increase in storm water to the refinery WWTP is expected due to the implementation of the VIP Amendments.

d. Would the project have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed? Yes

At the time the VIP EIR was certified, current and future water demands for the City could be met with existing supplies in normal years, but the water supplies would not be sufficient to meet future demands, with or without VIP, in dry years. As described later in this section, the City has since secured additional firm, long-term water supply contracts so that the water demand proposed in the Certified EIR would not exceed available water supply during normal or dry years.

According to Section 4.14.4.1 of the Certified EIR, the original VIP created an increase in raw water demand from the Benicia Refinery in the amount of 242 acre-feet per year (AF/Yr), or 216,000 gpd. **Table 3.1.15-1** below provides the projected water usage of project components presented in the Certified EIR, and the revised projected water usage requirements for the project after the proposed VIP Amendments. The VIP Amendments under current projections will not increase raw water demand over that in the Certified EIR for the original VIP and a slight reduction may be realized. A water study was prepared for the VIP Amendments and is included as **Appendix E** of this application.

Table 3.1.15-1 VIP Amendments Water Demand Projections

	Gallons Per Day [1]		
Operating Unit	**Certified EIR**	**Incremental Increase**	**New Total Water Usage**
VIP Amendments			
FCCU/CKR Scrubber	172,800	-48,380	124,420
Hydrogen Production	21,600	-38,900	-17,300
New Desalter (if recycle water not used)	---	93,600	93,600
Sulfur Recovery Cooling Water	14,400	-14,400	0
Coker Modifications	7,200	0	7,200
Additional 30 Workers	---	450	450
VIP Amendments Subtotal	**216,000**	**-7,630**	**208,370**

1. Acre feet/year = 893 gallons/day = 0.62 gallons/minute

It should be noted that following the certification of the EIR for VIP by the Benicia City Council, on June 4, 2003, Valero and various organizations entered into a Settlement Agreement regarding water supplies to the Benicia Refinery. The Settlement Agreement provided that "Valero shall continue to participate in the planning and development of the City's wastewater reuse project, consistent with its commitment to that project dated October 11, 2002 … ."

Pursuant to the Settlement Agreement, Valero's commitment in this planning and development process continues "as long as the reuse project continues to be economically, regulatorily, and technically feasible." "Economically feasible" is defined in the Settlement Agreement to mean "approximately $15 million of financial support for the water reuse project so long as Valero is anticipated to receive, as agreed by Valero and the City, at least one million gallons of useable water per day from the water reuse project."

To evaluate whether the wastewater reuse would be economically, regulatorily, and technically feasible, the People Using Resources Efficiently (PURE) Committee was formed. Valero has participated with PURE for the last four years to evaluate the wastewater reuse project. However, the Benicia City Council agreed on June 5, 2007, to terminate further work on the wastewater reuse project (the PURE Project) once the Preliminary Design Review and administrative draft CEQA report documents were prepared.

Also following the certification of the VIP EIR, the City of Benicia entered into a Settlement Agreement with the Department of Water Resources to provide an additional 10,500 acre-feet of firm contracted water supply per year. This in essence implemented Certified EIR Mitigation Measure 4.14-1a.

This increased supply was subsequently included in the City's Urban Water Management Plan (UWMP) completed and approved by the Benicia City Council in December 2005. As detailed in the City's 2005 UWMP, this increased supply provides an adequate water supply for both the City of Benicia (through its projected build out) and the Benicia Refinery (assuming a projected increased demand rate) through the year 2030.

Table 3.1.15-2 includes data from Table 3-2 (water demand) and Table 7-4 (water supply in multiple dry years) of the 2005 UWMP, modified to include projected increases post-VIP Amendments (a total of 233 AF/Yr) and subtracting contributions from recycled water projected to be added to the City of Benicia supply beginning in 2010 (a total of 2,240 AF/Yr). In the table, the "City of Benicia Demand" includes demands by residential, commercial, industrial, etc. components of the City. "Other Projected Demands" refers to unaccounted-for water and operations, and emergency water components of demand.

Table 3.1.15-2 Multiple Dry Years Comparison and Demand Projections [1]

	2005	2010	2015	2020	2025	2030
City of Benicia Available Supply	17,354	19,550	19,550	19,550	19,550	19,550
City of Benicia Demand	5,642	5,758	5,874	5,990	5,990	5,990
Refinery Demand (pre-VIP and VIP Amendments)	4,675	5,050	5,425	5,800	5,800	5,800
Refinery Demand (Post-VIP and VIP Amendments including cumulative projects)	4,675	5,283	5,658	6,033	6,033	6,033
Other Refinery Changes [2]	0	(113)	(113)	(113)	(113)	(113)
Other Projected Demands	1,580	1,612	1,644	1,737	1,737	1,737
Total Demand	11,897	12,549	13,063	13,647	13,647	13,647
Surplus of Supply	5,457	7,001	6,487	5,903	5,903	5,903

1. From Tables 3-2 and 7-4 of 2005 UWMP in AF/Yr.
2. NRU Catalyst Regeneration Project which commenced operation April 2007.

This table indicates that a minimum of 5,903 AF/Yr surplus should be available through the year 2030 with no additional supply from recycled water including the additional estimated 233 AF/Yr demand projected for the VIP Amendments. The surplus of water supply in multiple dry years as discussed in the UWMP represents the "worst case" scenario. Based on the supporting background information related to the firm water use contracts for the City of Benicia and planned water usage needs of the VIP Amendments, the water supply, defined in the UWMP, provided by the 2003 Settlement Agreement, would satisfy the projected water use demands related to the VIP Amendments even during a multiple dry years scenario. Accordingly, the proposed VIP Amendments would have sufficient water supplies available and no new or expanded entitlements would be needed as a result of the VIP Amendments. This conclusion remains valid without considering any supplies from recycled water.

Importantly, consistent with CEQA Guidelines, the Certified EIR established "significance criteria" with regard to water supply/demand considerations for VIP. Specifically the project's impact would be considered significant if it would:

> "Result in City water use in excess of water supplies available in normal, dry, and multiple dry years with water from all existing entitlements and sources, or if the project would require new or expanded -water entitlements or resources."

The new long-term, firm water supply provided by the 2003 Water Rights Settlement Agreement, which has been incorporated into the 2005 UWMP, is in essence an implementation of Mitigation Measure 4-14-1.a, impacts due to increased water demand from VIP would not now be considered significant. Moreover, as indicated below, this finding is also true regarding the currently proposed VIP Amendments.

Accordingly, as concluded by the UWMP, the City of Benicia has sufficient water to supply Valero's requirements even during multiple dry year scenarios.

e. Would the project result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments? <u>Yes</u>

As described in the Certified EIR, the City of Benicia WWTP treats only wastewater flow from domestic uses at the Benicia Refinery associated with non-industrial uses, and the on-site Benicia Refinery WWTP treats process wastewater and certain storm water flows from the Benicia Refinery. This distinction in wastewater flows will not change as a result of this project.

The preliminary design criterion for the VIP Amendments indicates a maximum potential increase in wastewater flow of 184,320 gpd (128 gpm) to the Benicia Refinery WWTP. However, the NRU Catalyst Regeneration Facility Project, independently implemented in April 2007, reduced load to the WWTP by about 100,800 gpd (70 gpm). Total maximum flow to the WWTP after the VIP Amendments will therefore increase by 83,520 gpd to 2.64 MGD (1,833 gpm). This increase in flow is incrementally minor compared to the overall Benicia Refinery wastewater stream of 2.56 MGD described in the Certified EIR after VIP and remains well within the WWTP hydraulic capacity of approximately 3.6 MGD.

Also, as described in **Section 4.2.15,** a cumulative project at the Benicia Refinery, the NRU Catalyst Regeneration Facility Project, has decreased wastewater flow to the Benicia Refinery WWTP by 70 gpm or 0.10 MGD, resulting in a total net increase in wastewater flow of 58 gpm (83,520 gpd) for a total post VIP Amendments water flow to the WWTP of 2.64 MGD. As described in **Sections 3.1.4, 3.1.10,** and **subsection a** of this section, as required by its current NPDES permit and consistent with the Certified EIR in implementing VIP and the VIP Amendments, the Benicia Refinery will in consultation with the San Francisco Bay RWQCB determine whether a technical study of potential loading impacts will be required to address the mass increase of pollutants proposed to be discharged and propose new treatment process units, if necessary, to maintain water quality in Suisun Bay.

Similar to what is described in the Certified EIR (EIR Section 4.14.4.2), further increases in wastewater flow to the City of Benicia municipal WWTP associated with non-industrial uses as a result of the VIP Amendments will be a function of the use of the sanitary sewer system and increases in new permanent full-time employees and temporary construction workers. The Certified EIR indicated that the Benicia Refinery generates approximately 0.0075 MGD of domestic wastewater, which is sent to the City of Benicia municipal WWTP. The VIP Amendments will include an additional 30 new permanent full-time employees.

This increase in employee population on site would result in additional sanitary wastewater flows of 400 gpd (see **Section 2.6**). This is a negligible increase in Benicia Refinery wastewater processing requirements at the City of Benicia municipal WWTP. As described in the Certified EIR, the total capacity of the City's WWTP is 4.5 MGD and during dry weather the plant operates at approximately 64 percent capacity. Since the increase in flow associated with the increase in a limited number of personnel will be nominal, the construction workforce will be temporary, and the City of Benicia municipal WWTP has adequate capacity to accept the increase in flow (as described in the Certified EIR Section 4.14.2.2). The City of Benicia municipal WWTP has the capacity to serve the VIP Amendments demand in addition to existing commitments.

f. Would the project be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs? Yes

Solid waste generated at the Benicia Refinery is currently sent to the Keller Canyon Landfill, located in Pittsburg, California, a Class II facility that accepts municipal solid waste, non-liquid industrial waste, contaminated soils, ash, grit, and sludge. According to the Allied Waste website, Keller Canyon Landfill covers 2,600 acres of land, 244 acres of which are permitted for disposal. The site currently handles 2,500 tons of waste per day although the permit allows up to 3,500 tons of waste per day to be managed at the facility. As mentioned in the Certified EIR, the Keller Canyon Landfill has approximately 35 million cubic yards of remaining capacity and has a life of approximately 32 years. The spent catalyst represents the majority of solid waste the Benicia Refinery sends to the Keller Canyon Landfill. The amount of spent catalyst disposed of by Valero historically (1999-2002) at the Benicia Refinery is 609 tons per year.

The construction of the proposed VIP Amendments is anticipated to generate solid construction related waste slightly above the level analyzed in the Certified EIR. The majority of the construction debris has the potential to be recycled. The limited amount of non-recyclable solid waste generated will likely be disposed of at Keller Canyon Landfill. The Keller Canyon Landfill has sufficient permitted capacity to accommodate the proposed VIP Amendments' increase in solid waste disposal needs and would not require the expansion of any disposal facilities to accommodate the waste.

Hazardous waste generated at the Benicia Refinery is currently transported to various recyclers or to the Clean Harbors Buttonwillow, LLC Landfill west of Buttonwillow, California. (At the time that the VIP EIR was certified, the Benicia Refinery was sending hazardous wastes for landfill to the Kettleman Hills facility). The Buttonwillow Landfill is a permitted hazardous waste facility that can accept most types of hazardous waste for treatment, storage, and/or disposal. The Benicia Refinery currently ships one truck of waste sludge from the Benicia Refinery WWTP to the Clean Harbors Buttonwillow Landfill about every three days.

Currently, up to 800 tons per year of dry catalyst solids are generated by the Benicia Refinery, most of which are recycled to a Portland cement kiln with about 10% going for disposal to the Clean Harbors Buttonwillow, LLC Landfill. There will be an increase of 800 tons/year in the amount of waste delivered to the Buttonwillow Landfill associated with the new wet waste stream generated by the pre-scrubber. The incremental weight increase is due solely to weight of water associated with the wet rather than dry waste stream. The increase in weight does not represent an increase in the amount of hazardous waste solid generated within the waste stream. The Buttonwillow active hazardous waste management unit has a total design capacity of 10.7 million cubic yards or about 9.1 million tons. In addition, there are land use and air permits that further limit Clean Harbors to accept 352,105 tons per year with up to 4,050 tons in any one day.

The 800 incremental tons per year estimated to be generated by the VIP Amendments reflects only 0.2 percent of the annual operating limit for the landfill hazardous waste unit. Furthermore, over the last three years (2004 – 2006) the Buttonwillow landfill has averaged annual waste receipts of 322,684 tons per year. The additional 800 tons per year from the proposed VIP Amendments represents 2.7 percent of the allowable increase from the three-year average waste receipts to the permit limit. Also in each of the last three years, the Buttonwillow landfill could have accepted an additional 800 tons of hazardous waste and remained within permitted daily and annual capacity limits. Therefore, the VIP Amendments would have an insignificant effect on hazardous waste generation and disposal at the Buttonwillow Landfill and would not require the expansion of the Buttonwillow Landfill.

Should any asbestos containing waste be generated as a result of F-102 demolition, it could be managed in the Buttonwillow landfill or other properly licensed landfill. Thus the VIP Amendments would be served by non-hazardous waste and hazardous waste landfills with sufficiently permitted capacities to accommodate the project's solid waste disposal needs and neither would require expansion. Therefore, the effects of the VIP Amendments would be less than significant.

g. Would the project comply with federal, state, and local statutes and regulations related to solid waste? Yes

Valero complies with and will continue to comply with all existing solid waste regulations during the construction and operation of the proposed VIP Amendments. There is nothing anticipated in association with the construction and operation of the proposed VIP Amendments that will result in conditions that would violate any local, state, or federal requirements related to solid waste management. Therefore, the proposed VIP Amendments' impacts would be incrementally insignificant.

15. Utilities and Service Systems

Certified EIR Impact	Certified EIR Pre-Mitigation Significance	Condition of Approval/ Certified EIR Mitigation Measure	Certified EIR Post-Mitigation Significance	Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?	Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?
Impact 4.14-1: The Valero Improvement Project would increase demand for raw, untreated water from the City of Benicia in excess of the baseline refinery demand anticipated in the UWMP. In the future, the City's overall water demand may exceed available supplies from current sources in dry years. This impact would be significant. This impact could be altered to be less than significant if the City were to obtain additional water supplies or if the City were able to implement planned future water supply programs and projects. Some of these measures are beyond City control and some are within the control of the City and Valero.	Significant.	Mitigation Measure 4.14-1a: The City will continue to move forward with obtaining the future water supplies as identified in the Water Study, the UWMP, and the 1996 Water System Master Plan.	Less than Significant with Mitigation.	No. The proposed VIP Amendments will not increase the demand for raw water from the City of Benicia over the Certified EIR. In 2003 the City of Benicia entered a Settlement Agreement with the California Department of Water Resources also involving the cities of Fairfield and Vacaville. This agreement provides an additional 10,500 acre-feet per year for the City of Benicia. This additional water supply is projected to result in a surplus of water supply, even in the "worst case" multiple dry years scenario, of 3,541 AF/Yr.	No. Previous significant impacts have been made less than significant due to obtaining additional long-term firm water supplies through the Settlement Agreement in 2003.

15. Utilities and Service Systems					
Impact 4.14-1: see above	Significant.	Mitigation Measure 4.14-1b: The City of Benicia and Valero will continue to implement General Plan Program 2.36A to pursue reuse of reclaimed wastewater where feasible, and the Benicia Refinery will accept and use reclaimed water from a City reclamation project.	Less than Significant with Mitigation.	No. The proposed VIP Amendments will not increase the demand for raw water from the City of Benicia over that previously analyzed in the Certified EIR. The 2005 UWMP includes a premise of 2,240 acre-feet per year to be available for Valero use from recycled water. To date though, the City of Benicia's plans to pursue reuse of reclaimed water anticipated by mitigation measure 14.14-1b have not been shown to be feasible. However, removing this 2,240 acre-feet from the total water supply will continue to result in a greater than 3,500 acre-feet per year surplus even under multiple dry year scenario calculations. Also, the City of Benicia has provided additional water supply through firm contracts since the EIR was Certified.	No. Previous significant impacts have been made less than significant due to obtaining additional long-term firm water supplies through the Settlement Agreement in 2003.

15. Utilities and Service Systems					
Impact 4.14-1: see above	Significant	Mitigation Measure 4.14-1c: Drought Contingency. If a "water shortage" (as defined below) occurs, then Valero shall take the steps necessary to reduce water consumption at the refinery by an amount equal to or greater than the amount of raw water that is being consumed due to implementation of VIP during the period the water shortage. This reduction shall be in addition to any amount of reduction required by Condition WATER RES-2, approved by the California Energy Commission on October 31, 2001, for the Valero Cogeneration Project. Upon notification that a water shortage exists for any given year, Valero shall provide prompt documentation to the City of: the amount of water expected to be consumed by VIP during the year of the shortage; a description of the steps planned to reduce consumption; the amounts to be saved by the steps; and the timing of implementation. Valero shall notify the City as the steps are implemented and will provide an annual report at the end of the year, verifying the amounts of water saved by the steps taken. For purposes of this mitigation, "water shortage" means that all of the following conditions have occurred: a. The City is unable to secure, pursuant to Supplemental Water Rights Application 30681, rights to the amount of water projected to accommodate City demand for the year of the water shortage, as shown in Table 4.14-3 of the Certified EIR, plus the amount of water needed for VIP;	Less than Significant with Mitigation.	No. As described above, in 2003, the City of Benicia entered a Settlement Agreement with the California Department of Water Resources to provide an additional 10,500 acre-feet per year for the City of Benicia. This additional water supply is projected be sufficient to supply the VIP Amendments and provide for continued surplus, even in a multiple dry years scenario. However, despite this, as part of the VIP Amendments, the Benicia Refinery will implement Mitigation Measure 4.14.1c.	No. Previous significant effects have been made less than significant due to obtaining additional long-term firm water supplies through the Settlement Agreement in 2003.

15. Utilities and Service Systems					
		b. The City is unable to secure other water entitlements to the amount of water projected to accommodate City demand for the year of the water shortage, as shown in Table 4.14-3 of the Certified EIR, plus the amount of water needed for VIP; c. Valero has not secured a separate water entitlement, valid for the year of the water shortage, adequate for the amount of water needed for VIP; d. The City has not implemented the wastewater reuse project; and e. The City has announced a water alert, as defined by Benicia Municipal Code Title 13, Chapter 13.35, section 13.35.060(B0, and has ordered implementation of conservation stage two pursuant to the City Code.			
Impact 4.14-2: The Valero Improvement Project would increase the amount of wastewater and the pollutant loading of the wastewater processed at the refinery's WWTP. This would be reduced to a less than significant impact by the wastewater treatment processes that meet the discharge limitations of the NPDES permit.	Less than Significant.	No Mitigation Required. Use Permit Condition 15: Valero shall provide the City with copies of its Anti-Degradation Report and, when requested, monthly self-monitoring reports when those reports are submitted to the RWQCB. The documents shall be provided at no cost to the City.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments represent an increase in wastewater to the Benicia Refinery WWTP. However, the Benicia Refinery will comply with the refinery's NPDES permit and if necessary consult with the RWQCB to ensure the water quality of Suisun Bay is not impacted by the VIP Amendments. Therefore, this would not cause a significant impact.	No significant impact previously identified.
Impact 4.14-3: The Valero Improvement Project could increase the amount of wastewater treated at the City of Benicia's WWTP. This impact would be less than significant.	Less than Significant.	No Mitigation Required	Less than Significant with Mitigation.	No. The proposed VIP Amendments represent a negligible increase in wastewater volume to the Benicia WWTP and would not cause a significant impact.	No significant Impact previously identified.

15. Utilities and Service Systems					
Impact 4.14-4: The Valero Improvement Project would increase routine disposal of spent catalyst and of sludge from the refinery WWTP. This impact would be less than significant.	Less than Significant.	No Mitigation Required.	No Mitigation Required. Less than Significant.	No. The proposed VIP Amendments are not expected to increase throughput, and thus not expected to increase disposal of spent catalyst and sludge from the refinery WWTP.	No significant impact previously identified.
Impact 4.14-5a: The Valero Improvement Project, together with the Cogeneration Project and other refinery projects would increase demand for raw, untreated water from the City of Benicia in excess of the baseline refinery demand anticipated in the UWMP. Together with other future, non-refinery projects, VIP would make a significant contribution to the cumulative shortfall in City water supply in dry years.	Significant.	Implement 4.14-1a through e.	Less than Significant With Mitigation.	No. As described above, in 2003, the City of Benicia entered a Settlement Agreement with the California Department of Water Resources to provide an additional 10,500 acre-feet per year for the City of Benicia. This additional water supply is projected be sufficient to supply the VIP Amendments and provide for continued surplus, even in a multiple dry years scenario. However, despite this, as part of the VIP Amendments, the Benicia Refinery will implement Mitigation Measure 4.14.1c.	No. Previous significant impacts have been made less than significant due to development of a Settlement Agreement in 2003, as described.
Impact 4.14-5b: VIP, together with other refinery projects, would increase the quantity of pollutants and the amount of wastewater processed at the refinery WWTP. This would be a less than significant impact due to NPDES discharge limitations.	Less than Significant.	No Mitigation Required.	Less than Significant With Mitigation.	No. The proposed VIP Amendments represent a negligible incremental increase in wastewater pollutant loading, and compliance with the refinery's NPDES permit and consultation with the RWQCB will ensure that this would not cause the cumulative impact to become significant. Cumulative impacts are further discussed in Section 4.	No significant impact previously identified.

15. Utilities and Service Systems					
Impact 4.14-5c: VIP, together with other refinery and non-refinery projects within Benicia, could increase the amount of wastewater treated at the City WWTP. This would be a less than significant because the refinery contribution would be less than significant.	Less than Significant.	No Mitigation Required.	Less than Significant. No Mitigation Required.	No. The proposed VIP Amendments represent a negligible incremental increase in wastewater discharged to the City of Benicia from sanitary sources. Cumulative impacts are further discussed in Section 4.	No significant impact previously identified.
Impact 4.14-5d: VIP would increase the refinery's routine disposal of spent catalyst and sludge from the refinery WWTP at the Keller Canyon landfill. VIP contribution to the cumulative waste disposed at the landfill would be less than significant.	Less than Significant.	No Mitigation Required.	Less than Significant. No Mitigation Required.	No. The proposed VIP Amendments represent a negligible Incremental increase in waste disposed at the landfill. Cumulative impacts are further discussed in Section 4.	No. The proposed VIP Amendments represent a negligible incremental increase in waste disposed at the landfill.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Environmental Analysis: Valero Benicia Refinery, New Crude Oil Storage Tank Project, September 2006.

Interview, Valero personnel, January 2007.

3.1.16 Agricultural Resources

a. Would the project convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use? ***No***

The construction and operation of the proposed VIP Amendments, as with VIP, will be constructed within the existing footprint of the Benicia Refinery boundaries. None of these areas are designated Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland) under the Farmland Mapping and Monitoring Program of the California Resources Agency. Therefore, the proposed VIP Amendments will not convert any Farmland, to non-agricultural use.

b. Would the project conflict with existing zoning for agricultural use, or a Williamson Act contract? ***No***

No Farmland exists within the boundary of the Benicia Refinery. Therefore, the construction and operation of the planned improvements under the proposed VIP Amendments will not conflict with existing zoning for agricultural use, or a Williamson Act contract.

c. Would the project involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use? ***No***

No Farmland exists within or in the vicinity of the boundary of the Benicia Refinery. Therefore, the construction and operation of the planned improvements under the proposed VIP Amendments could not result in conversion of Farmland to non-agricultural use.

16. Agricultural Resources					
Certified EIR Impact	**Certified EIR Pre-Mitigation Significance**	**Condition of Approval/Certified EIR Mitigation Measure**	**Certified EIR Post-Mitigation Significance**	**Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?**	**Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?**
Impact 4.15-1: VIP would not Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland) to non-agricultural use. No impact.	No Impact.	No Mitigation Required.	No Mitigation Required. No Impact.	No. The proposed VIP Amendments would not Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland) to non-agricultural use.	No significant impact previously identified.
Impact 4.15-2: VIP would not conflict with existing zoning for agricultural use, or a Williamson Act contract. No impact.	No Impact.	No Mitigation Required.	No Mitigation Required. No Impact.	No. The proposed VIP Amendments would not conflict with existing zoning for agricultural use, or a Williamson Act contract.	No significant impact previously identified.
Impact 4.15-3: VIP would not involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use. No impact.	No Impact.	No Mitigation Required.	No Mitigation Required. No Impact.	No. The proposed VIP Amendments would not involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use.	No significant impact previously identified.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Environmental Analysis: Valero Benicia Refinery, New Crude Oil Storage Tank Project, September 2006.

Map of Farmland, Farmland Mapping & Monitoring Program, viewed on-line at http://www.consrv.ca.gov/DLRP/fmmp/images/fmmp2004_11_17.pdf, January 2007.

Map of agricultural zoning information City of Benicia Zoning Map, viewed on-line at http://www.ci.benicia.ca.us/pdf/BeniciaZoningMap-c-July06.pdf, January 2007.

Williamson Act information, viewed on-line at http://www.ceres.ca.gov/wetlands/introduction/williamson.html, January 2007.

3.1.17 Mineral Resources

a. Would the project result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state? ***No***

The construction and operation of the VIP Amendments will be situated within the existing footprint of the Benicia Refinery boundaries. No known mineral resources of value to the region or residents of the state were identified in the Certified EIR within the vicinity of the Benicia Refinery; therefore, the construction and operation of the VIP Amendments is not expected to result in the loss of availability of a known mineral resource. While there are no known mineral resources at the project locations that are of value to the region and the residents of the state, placing the equipment and structures in either location will not preclude mineral retrieval in the future.

b. Would the project result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan? ***No***

As with VIP, the site of the proposed VIP Amendments is within the existing Benicia Refinery boundaries. The area within the existing Benicia Refinery boundaries is zoned for General Industrial uses. As described in the Certified EIR (EIR Section 5.2.3), no locally important mineral resources, such as sand and gravel, were identified on any local plans as occurring within the vicinity of the Benicia Refinery. Therefore, the proposed VIP Amendments will not result in the loss of availability of any locally important mineral resource recovery site.

17. Mineral Resources					
Certified EIR Impact	**Certified EIR Pre-Mitigation Significance**	**Condition of Approval/ Certified EIR Mitigation Measure**	**Certified EIR Post-Mitigation Significance**	**Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?**	**Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?**
Impact 4.16-1: While there are no known mineral resources at the project site that are of value to the region and the residents of the state, VIP would not preclude mineral retrieval in the future. No impact.	No Impact.	No Mitigation Required.	No Mitigation Required. No Impact.	No. The proposed VIP Amendments will not affect any mineral resources, as no such resources are present at the existing site.	No significant impact previously identified.
Impact 4.16-2: The site of VIP is zoned for General Industrial uses. No locally important mineral resources, such as sand and gravel, are identified on any local plans as occurring at the project site.	No Impact.	No Mitigation Required.	No Mitigation Required. No Impact.	No. The proposed VIP Amendments will not affect any mineral resources, as no such resources are present at the existing site.	No significant impact previously identified.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

Environmental Analysis: Valero Benicia Refinery, New Crude Oil Storage Tank Project, September 2006.

Interview, Valero personnel, January 2007.

3.1.18 Population and Housing

a. Would the project induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)? ***No***

With the exception of the new employee parking lot, the construction and operation of the VIP Amendments, as with VIP project components described in the Certified EIR, will be situated within the existing footprint of the developed and disturbed areas within the Benicia Refinery boundaries. Construction activities related to the proposed VIP Amendments will take approximately three to five years and will use the existing workforce in the area. The operation of the proposed VIP Amendments will not directly or indirectly induce population growth because the construction workforce will only temporarily utilize a construction workforce and will use the existing workforce in the area. Valero anticipates that the VIP Amendments may require up to 30 additional permanent personnel, beyond the 20 permanent personnel envisioned in the Certified EIR, to operate the new and modified facilities. The proposed VIP Amendments will not result in an increase in process capacity at the Benicia Refinery that would translate into fuel production above the levels evaluated in the Certified EIR (EIR Section 3.1.1), and thereby indirectly increase vehicle use that would require new roads. Therefore, the proposed VIP Amendments will not directly or indirectly induce substantial population growth in the area.

b. Would the project displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere? ***No***

The proposed project components of the VIP Amendments, as with VIP project components described in the Certified EIR, will be located within the existing footprint of the Benicia Refinery. There is no existing housing within the Benicia Refinery boundaries; therefore, the proposed VIP Amendments will not result in the displacement of any housing.

c. Would the project displace substantial numbers of people, necessitating the construction of replacement housing elsewhere? ***No***

The proposed project components of the VIP Amendments, as with VIP project components described in the Certified EIR, will be located within the existing footprint of the Benicia Refinery. There is no existing housing within the Benicia Refinery boundaries. Adequate measures are taken to ensure health and safety to the population living in the housing areas surrounding the Benicia Refinery. Therefore, the proposed VIP Amendments will not result in the displacement of any people and will not result in the construction of replacement housing elsewhere.

18. Population and Housing					
Certified EIR Impact	**Certified EIR Pre-Mitigation Significance**	**Condition of Approval/ Certified EIR Mitigation Measure**	**Certified EIR Post-Mitigation Significance**	**Would proposed VIP Amendments cause new significant effects due to changes in project, underlying circumstances, or new information of substantial importance?**	**Would proposed VIP Amendments cause substantial increase in already identified significant effects due to changes in project, underlying circumstances, or new information of substantial importance?**
Impact 4.17-1: VIP would not induce substantial population growth in the area, either directly or indirectly. No impact.	No Impact.	No Mitigation Required.	No Mitigation Required. No Impact.	No. The proposed VIP Amendments will not induce substantial population growth in the area, either directly or indirectly.	No significant impact previously identified.
Impact 4.17-2: VIP would not result in the displacement of any housing. No impact.	No Impact.	No Mitigation Required.	No Mitigation Required. No Impact.	No. The proposed VIP Amendments would not result in the displacement of any housing.	No significant impact previously identified.
Impact 4.17.3: The construction and operation of VIP would not result in the displacement of any people and would not result in the construction of replacement housing elsewhere.	No Impact.	No Mitigation Required.	No Mitigation Required. No Impact.	No. The proposed VIP Amendments would not result in the displacement of any people and would not result in the construction of replacement housing elsewhere.	No significant impact previously identified.

References:

Environmental Science Associates, Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project, October 2002.

4.0 Other CEQA Considerations

4.1 Cumulative Projects

4.1.1 Overview

The CEQA Guidelines define a cumulative impact as one resulting from the combined effect of the proposed project plus other past, present and reasonably foreseeable future projects. CEQA requires that:

- cumulative impacts be discussed when they may be significant;
- the discussion may be more general than that for the individual project impacts, but should reflect the potential extent, severity, and probability of the impact;
- the cumulative impact analysis be based either on a list of past, present and probable future projects producing related or cumulative impacts, or on projections from a General Plan or regional planning agency; and
- reasonable options for mitigating or avoiding the project's contribution to significant cumulative impacts be proposed, noting that for some cumulative impacts the only feasible mitigation may involve the adoption of ordinances or regulations rather than the imposition of conditions on a project-by-project basis.

This section has been developed to provide the City a cumulative impact analysis for use in reviewing the overall impacts of the VIP Amendments. The analysis considers the range of potential impacts addressed in **Section 3.1.1** through **3.1.18**, evaluated in the context of other projects which, taken together with the VIP Amendments, could contribute to cumulative impacts.

The key characteristics of a cumulative impact analysis are:

- A project impact (significant or not), plus
- Impacts from other projects of the same type as that of the project. This is especially important where the cumulative projects include other ongoing refinery projects, as well as projects with similar impacts.
- The interaction of these impacts to create a cumulative impact affecting the same geographic area as that of the proposed project.

4.1.2 Cumulative Projects Considered

A cumulative impact analysis was conducted for VIP and is included in Section 5.0 of the Certified EIR. Certain projects that were considered in Section 5.0 of the Certified EIR have either been completed or are no longer under consideration for implementation. Therefore, the list of projects considered for the cumulative impact assessment of the VIP Amendments is incrementally different than that considered for the original VIP. Also a number of other projects are currently undergoing permit review by the City of Benicia and merit inclusion in the VIP Amendments analysis presented below.

The following is an updated list of the activities and projects considered in evaluating cumulative impacts of the VIP Amendments, followed by a list of the projects no longer relevant or applicable to the analysis.

Benicia Refinery Projects Independent of VIP and VIP Amendments

Benicia Refinery-associated projects under consideration for the VIP Amendments cumulative impact analysis include the following:

- Operation (construction is completed) of the Cogeneration Plant;
- Treatment of wastewater from the Valero Benicia Asphalt Plant (formerly referred to as the Huntway Asphalt Refinery);
- Operation of the NRU Catalyst Regeneration Facility Project;
- On-going Benicia Refinery maintenance, including future refinery-wide turnarounds.

Cogeneration Project

Details of the Cogeneration Project are provided in Section 3.6.1.2 of the Certified EIR. The Cogeneration Plant, with a maximum rated electrical power output of 51 MW was constructed and is now in operation. The unit is expected to operate continuously to provide electricity to the refinery or export electricity to the state power grid. This project is an independent project and is not related to VIP or the VIP Amendments.

Treatment of Wastewater from the Valero Benicia Asphalt Plant

Details of the Treatment of Wastewater from the Valero Benicia Asphalt Plant (formerly the Huntway Asphalt Plant) are also provided in Section 3.6.1.2 of the Certified EIR. As previously described in the Certified EIR, it has not yet been determined if changes would be required at the Valero wastewater treatment plant to handle the additional (40,000 gallons per day) wastewater flows from this project. The operational details have not changed and the analyses provided in the Certified EIR are still valid. This project is an independent project and is not related to VIP or the VIP Amendments.

New Projects Not Previously Included in the Certified EIR

The NRU Catalyst Regeneration Facility Project involved the installation of a new caustic recirculation and air cooling system to eliminate the once-through water cooling. As a result, the project has eliminated an average of 70 gpm (100,800 gpd) of raw water consumption as well as the same amount of hydraulic loading at the Benicia Refinery WWTP. This project is an independent project and is not related to VIP or the VIP Amendments. This project has been constructed and has been operational since April 2007.

Ongoing Benicia Refinery Maintenance and Turnaround

As discussed in Section 3.6 of the Certified EIR, operation of the Benicia Refinery requires substantive ongoing maintenance activities. In addition to the ongoing activities, scheduled maintenance actions, called turnarounds, are also necessary. Major maintenance activities are conducted during turnarounds. Additionally, turnarounds provide an opportunity to modify refinery processes and tie-in new and modified equipment during a scheduled downtime. Thus, the turnaround schedule becomes the controlling factor when planning and scheduling upgrades or other major changes to the process equipment. These activities are part of the normal, ongoing maintenance program and do not require City permits or environmental review.

Valero plans to implement pre-construction measures and most of the major equipment construction prior to commencement of turnaround so that remaining connections and final construction elements can be completed during turnaround.

Benicia Refinery Projects No Longer Applicable to Cumulative Impact Assessment

Several other Benicia Refinery projects evaluated in the cumulative impacts analysis in the Certified EIR are no longer applicable to the cumulative impacts assessment. The projects listed below, described in Section

3.6 of the Certified EIR, are either completed or are no longer planned for implementation. Projects which have already been completed are included in the analysis as current operations at the site. The Selective Hydrogenation Facilities project, as listed below, will no longer to be implemented and is not included in this cumulative analysis.

- MBTE Phase Out Project (EIR Section 3.6.1.2) is complete.
- Alkylation Unit Modifications (EIR Section 3.6.1.3) are complete.
- Selective Hydrogenation Facilities (EIR Section 3.6.1.3) will no longer be implemented.
- Light Ends Rail Rack Arm Drains project (EIR Section 3.6.1.3) is completed.
- BAAQMD Reg. 9 Rule 10 NO_X Alternate Compliance Plan (EIR Section 3.6.1.3) is completed.

Outside (Non-Refinery) Projects

Other large projects by other project proponents also could be underway in the vicinity of the Benicia Refinery and their construction could overlap that of the proposed VIP Amendments. The following projects were included in the cumulative impact analysis included in the Certified EIR. As updated, these include:

- Caltrans Benicia-Martinez Bridge – Construction of this project is nearing completion with the new eastbound span open to traffic. However, other minor project elements were estimated to be completed by late 2007, but work is still ongoing.
- Seeno Benicia Business Park – The draft EIR has undergone public review. A Response to Comments document was released in July 2007.
- Southampton Tourtelot Residential Development –This project is partially constructed, with the remaining units to be constructed in the next two years.
- Construction and operation of the proposed Air Liquide Hydrogen Pipeline or the competing Air Products Hydrogen Pipeline.

Within the City of Benicia, the Benicia-Martinez Bridge construction includes reconstruction of the I-680 interchanges at I-780 in Benicia and restoration of a 22.8-acre parcel of tidal marsh in the City of Benicia. The Seeno Benicia Business Park was proposed to occupy 527.5 acres of undeveloped land in the eastern part of the city, to the northeast of the Benicia Refinery. The project would include four million square feet of industrial buildings on 285 acres of land and 490,000 square feet of commercial development on 45.0 acres of land, near the intersection of Lake Herman Road and East Second Street. Construction of residential dwellings associated with the Southampton Tourtelot development began in 2003, and the Water's End neighborhood, part of the Southampton Tourtelot Residential Development, is expected to have 417 homes upon completion. The Water's End project is currently under construction and scheduled for completion in 2009.

The above projects were considered relevant to this analysis as they fall within the geographic scope of the area affected by the VIP Amendments from a cumulative impact perspective.

The Air Liquide Hydrogen Pipeline project is a potential hydrogen production project proposed by Air Liquide as a third-party supplier to the Shell Martinez Refinery (in Contra Costa County) and the Valero Benicia Refinery (in Solano County). The project includes the proposed installation of an approximately two-mile-long, 12- to 20-inch diameter pipeline extending from the Shell Martinez Refinery to the Valero Benicia Refinery (in Solano County). Air Liquide is proposing to build the pipeline speculatively without commitments from either refinery. The proposed project would enable Air Liquide to deliver hydrogen gas to refineries during periods of peak hydrogen needs, or during hydrogen producing outages.

The Air Products Hydrogen Pipeline project is a competing hydrogen production project proposed by Air Products and Chemicals, Inc. at the Tesoro and Shell, Martinez refineries, and the Valero Benicia Refinery. The project includes the proposed installation of two approximately 6.7-mile-long, 8-inch diameter pipelines running side by side containing hydrogen and holding fuel gas. The pipeline would begin at Tesoro Refinery, run linearly to Shell Martinez Refinery, run approximately one mile back along the same path, and terminate at the Valero Benicia Refinery. The pipeline would connect the Air Products hydrogen plant at the Tesoro Refinery, the Air Products hydrogen plant at the Shell Martinez Refinery, and the Valero Benicia Refinery. The application by Air Products was submitted to Contra Costa County on May 1, 2007. Air Products is proposing to build the pipeline specutively without commitments from the Valero Benicia Refinery.

Planned to serve generally the same facilities, it is anticipated that as competing pipelines only one of the Air Liquide or Air Products projects would be constructed, but not both. The Benicia Refinery is implementing components of VIP and the VIP Amendments relating to increased hydrogen production for the purpose of meeting the internal hydrogen needs of the Benicia Refinery independent of Air Liquide's or Air Products' plans. Valero's engineering design basis for installation of the new hydrogen production unit is based on supplying the on-site needs of the Benicia Refinery without increasing capacity. Moreover, the Benicia Refinery may utilize hydrogen deliveries via the Air Liquide or Air Products pipeline during hydrogen production outages, whether or not the VIP Amendments are approved. Accordingly, the VIP Amendments and the Air Liquide and/or Air Products projects are separate and functionally independent projects.

Certain other projects (listed below) have been identified by the City of Benicia as possible projects underway in the vicinity of the Benicia Refinery. These projects are:

- The Lower Arsenal Mixed Use Specific Plan
- Downtown Mixed Use Master Plan
- The Marina Area Storm Drain Project

The Lower Arsenal Mixed Use Specific Plan covers the Lower Arsenal/Arsenal Historic District, a 50-acre parcel located to the south of the Benicia Refinery. The goal of this Specific Plan coincides with the City of Benicia's General Plan and proposes mixed use development in the Lower Arsenal/Arsenal Historic District. At present, an EIR is being prepared.

In concert with the Lower Arsenal Mixed Use Specific Plan, the Downtown Mixed Use Master Plan is under preparation and a Mitigated Negative Declaration is being prepared by the City.

The goal of the Marina Area Storm Drain Project is to remediate an existing flooding problem and provide adequate storm drainage in the East 2nd Street drainage basin. The project is located in the vicinity of the Benicia Marina, near East E Street and East 2nd Street, to the west of the Benicia Refinery. The EIR prepared for this project was certified by the Benicia City Council on November 20, 2003, and construction has been completed.

4.2 Cumulative Projects Analysis

4.2.1 Aesthetics

The construction of the projects listed above at the Benicia Refinery would expand the industrial appearance of the overall complex. However, as explained below, none of the changes associated with individual projects together with those of the VIP Amendments are expected to substantially impact visual resources. As such, the VIP Amendments and the other refinery projects are expected to produce a less than significant cumulative overall visual quality impact. **Section 3.1.1, Aesthetics** presents a detailed analysis of VIP Amendments related visual impacts.

Other planned projects at the Benicia Refinery include new construction, modifications of processing activities, and routine maintenance activities. These projects would be located within the existing refinery complex and would not expand industrial operations outside the processing, tank storage, and wastewater processing areas. New processing facilities would be painted the same color scheme of the existing refinery and would not represent any overall significant changes in the industrial appearance of the complex. Some staging and laydown areas used temporarily for the construction of other refinery projects would be visible, and would incrementally add to the overall extent of disturbed and graded areas surrounding the project locations. However, this impact is temporary and minimal. Thus, the visual impact of other refinery projects together with the VIP Amendments on views from Lake Herman Road, Gallagher Drive, Rose Drive, and Addison Court would be less than significant.

The development closest to Lake Herman Road would be the Benicia Business Park. As described in the Certified EIR, although the Business Park would be visible from some of the same points on Lake Herman Road as the Benicia Refinery, the contribution of the other refinery projects to the cumulative impact would be less than significant. The incremental contribution of the VIP Amendments does not change this conclusion.

As described in the Certified EIR, construction and operation of the Caltrans Benicia-Martinez Bridge, the Benicia Business Park and/or other large-scale industrial developments within the City, and the City of Benicia Water Reuse Project each would alter the visual character of their sites and the visual character of the entire area. While noticeable, these visual changes have a limited total effect in changing the existing visual context of the region; therefore, the total visual impact of the cumulative projects combined with the VIP Amendments are less than cumulatively significant.

4.2.2 Air Quality

According to the BAAQMD CEQA Guidelines, any proposed project that would individually have a significant air quality impact would also be considered to have a significant cumulative air quality impact. For any project that does not individually have significant operational air quality impacts, the determination of significant cumulative impact is based on an evaluation of the consistency of the project with the local general plan and of the general plan with the regional air quality plan. As discussed in **Section 3.1.2**, the proposed VIP Amendments would have a less-than-significant impact on air quality. Furthermore, as discussed in the same section, the VIP Amendments are consistent with the City of Benicia General Plan, which in turn is consistent with the BAAQMD's current air quality plan (2005 Ozone Strategy). As a result, the VIP Amendments satisfy the BAAQMD CEQA Guidelines conditions and therefore would not contribute to significant cumulative effects to air quality.

4.2.3 Greenhouse Gases

As demonstrated in **Section 3.1.3**, the VIP Amendments will result in a net reduction in GHG emissions from project operations. Since there will be no impact on global climate change from the proposed project, the VIP Amendments will not have a cumulative impact on this resource.

4.2.4 Biological Resources

Construction and operation of the VIP Amendments will avoid direct impacts to Sulphur Springs Creek and potential habitats for special-status plants and wildlife. In addition, the VIP Amendments avoid important terrestrial habitat and wetland resources. Impacts associated with ground disturbance activities such as those planned for the construction and operation of cumulative projects, especially industrial and highway development, may result in indirect, cumulative impacts to biological resources from incremental changes in storm water streams discharging to the same bodies of receiving water as the VIP Amendments. While the incremental loss of biological resources over time has and does occur from both natural and human-caused activities, the combined effects of the implementation of City, County, State and Federal level laws and regulations (including the CWA, the Endangered Species Act, and the Fish & Wildlife Coordination Act as well as comparable California laws) that require identification and evaluation of biological resources as part of environmental review and requires avoidance or reduction of impacts to biological resources effectively reduces the cumulative impacts that could occur due to cumulative projects. However, the VIP Amendments are designed to avoid impacts on biological resources.

As described in **Section 3.1.15**, the increased 184,320 gpd wastewater flow from VIP Amendments project components will be treated, along with other wastewater from the Benicia Refinery, to comply with the NPDES permit governing the refinery's discharge to Suisun Bay. In addition, when considered cumulatively with other projects at the Benicia Refinery, most notably the NRU Catalyst Regeneration Facility Project, the total increase in flow to the WWTP will be 83,520 gpd. If the Benicia Asphalt Plant project is implemented, the net flow to the WWTP will increase to 123,520 gpd (86 gpm). This is not significant compared to the post VIP WWTP flows of 2.56 MGD and a hydraulic capacity of 3.6 MGD. Compliance with permit requirements will ensure that wastewater generated as a result of implementation of the VIP Amendments will not exceed the wastewater discharge limits of the RWQCB.

Therefore, to the extent that any other projects would have cumulative impacts to biological resources, the VIP Amendments would not contribute to these impacts because the VIP Amendments avoid such impacts entirely.

Potential increases in pollutant discharge and impacts to special status fisheries could occur due to accumulative wastewater and/or storm water discharges from other non-refinery industrial projects. As explained in **Sections 3.1.10** and **3.1.15**, the VIP Amendments will generate no net increases in storm water volumes and a small increase in wastewater flow. As previously described, the FCCU/CKR Scrubber may contribute about 138 pounds per year (without assumed removal) to the final wastewater effluent. None of the other identified cumulative projects are expected to contribute nickel to receiving waters. As demonstrated in **Section 3.1.15 (a)** compliance with permit requirements and potential consultation with the RWQCB will ensure that wastewater generated as a result of implementation of the VIP Amendments will not exceed the wastewater discharge limits of the RWQCB. The less than significant impact from the VIP Amendments would similarly be expected to have a less than significant cumulative impact when considered in conjunction with other projects each with an insignificant volume contribution and no specific compounds where mass loadings would overlap with the VIP Amendments projects. Therefore, both the wastewater volume or water quality potential increases in pollutants from cumulative projects would essentially be the same whether or not VIP is implemented. Refinery projects other than the NRU Catalyst Regeneration Facility Project and the Benicia Asphalt Plant are not expected to decrease or increase wastewater or storm water flows above or below that which was described for the VIP in the Certified EIR. The NRU Catalyst Regeneration Facility Project, which is now operating, is estimated to have decreased the wastewater sent to the Benicia Refinery WWTP by 100,800 gpd. The Benicia Asphalt Plant is projected to increase the amount of wastewater sent to the refinery WWTP by about 40,000 gpd. These additional refinery projects, when combined with the increase of wastewater of approximately 83,520 gpd from the FCCU/CKR Scrubber elements and other projects in the VIP Amendments, will result in an increase in flow to the WWTP of about 123,520 gpd (86 gpm). This is not significant compared to the post VIP WWTP flows of 2.56 MGD and a hydraulic capacity of 3.6 MGD.

Potential increases in pollutant discharge and impacts to special status fisheries could occur due to accumulative wastewater and/or storm water discharges from other non-refinery industrial projects. However, no net increases in wastewater or storm water will be generated as a result of the VIP Amendments. Therefore, potential increases in pollutants from other cumulative projects would essentially be the same whether or not VIP is implemented because the VIP Amendments do not contribute to such impacts.

4.2.5 Cultural Resources

Because construction and operation of the VIP Amendments would not affect known significant cultural resources, the VIP Amendments would not be expected to contribute to significant cumulative impacts.

However, it remains possible that ground-disturbing activities such as those planned for construction of the VIP Amendments and other cumulative projects, especially industrial and highway development, may uncover unknown resources with cultural significance. While the incremental loss of cultural resources over time has and does occur from both natural and human-caused activities, the combined effects of the implementation of both County and State level regulations that require identification and evaluation of cultural resources as part of environmental review effectively reduces the cumulative impacts that occur to cultural resources. These requirements are designed to reduce direct impacts on cultural resources to a less-than-significant level on a site-specific basis. Mitigation Measures for discovery of unknown resources required by other projects, as well as for the VIP Amendments as described in **Section 3.1.5**, will result in less than cumulative significant impacts to cultural resources.

4.2.6 Energy

The construction and operation of the VIP Amendments, in addition to other cumulative refinery and non-refinery cumulative development in the project area would not result in any known cumulative impacts to energy resources. The VIP Amendments will not increase the Benicia Refinery's electrical demand over that projected in the Certified EIR. However, the Cogeneration Plant has been constructed and is in operation at the Benicia Refinery. The Cogeneration Plant reduces the Benicia Refinery's electrical demand by 5151 MW, which exceeds the combined 232 MW net increase for VIP and the VIP Amendments. Therefore, there will be a net reduction in electrical demand, resulting cumulatively from other refinery projects, which would not contribute to cumulative impacts.

The VIP Amendments will result in a net decrease in the Benicia Refinery's consumption of natural gas as described in **Section 3.1.6**. Therefore, the VIP Amendments will not contribute to cumulative impacts to gas consumption.

The cumulative electrical and natural gas demands of the other, non-refinery cumulative projects would be served by PG&E. Those projects represent planned development under the Benicia General Plan, and it is PG&E's responsibility to plan for and construct the energy distribution structure and to deliver natural gas and electricity to those developments. Within this context, the net reduction of the Benicia Refinery's cumulative electricity and gas use would not contribute to any cumulative impact to the energy demand within Benicia from non-refinery projects.

4.2.7 Geology and Seismicity

As discussed in **Section 3.1.7**, the construction and operation of the VIP Amendments would be designed and carried out in conformance to codes and standards to ensure a less than significant impact related to geology and seismicity. Soil disturbance will occur during construction but will be minimized through implementation of Best Management Practices. Appropriate grading and design and structural considerations and specifications will comply with California Building Code requirements or a more stringent standard as described in Mitigation Measures 4.6-1a through 4.6-1e and 4.6-3 in the Certified EIR. New construction associated with the other refinery and non-refinery projects will be subject to the same stringent standards which will cumulatively ensure less than significant impacts and will provide an overall benefit in resistance to potential expansive soil and adverse effects from ground shaking.

Therefore, the VIP Amendments would not contribute to significant cumulative effects relative to geology and seismicity resulting from the cumulative projects, including the industrial and highway developments considered in this analysis.

4.2.8 Public Health

Cumulative effects to public health could occur if TAC emissions from the VIP Amendments were to combine with TAC emissions from one or more cumulative projects in the region to cause a significant cumulative health impact. Cumulative projects that may occur in the future include those at the Benicia Refinery, the reconstruction of the Benicia Bridge, and residential and commercial projects expected to occur nearby.

Future projects at the Benicia Refinery that involve construction concurrent with the VIP Amendments, including the Benicia Asphalt Wastewater Project, would not emit TACs above BAAQMD thresholds that trigger the need for an HRA. The trigger levels were established to represent an emission rate that, when modeled using very conservative assumptions, would result in a health risk no greater than one in one million for cancer risk, or an HI of 0.2 for non-cancer risk. This represents the upper bound for risk impact for each of the two projects. Therefore, the combined health risk from the cumulative refinery projects would not be expected to exceed two in one million for cancer or a HI of 0.4 for non-cancer risk. As presented in **Section 3.1.8**, the estimated health risk from refinery sources associated with the VIP Amendments is less than 0.6 in one million for cancer risk and a HI less than 0.01 for both chronic and acute non-cancer risk. Conservatively, assuming that the point of greatest impact is the same location for all three projects, the combined risk would be substantially below the significant impact level. Thus, these two cumulative projects, when added to the risk associated with the VIP Amendments, would result in a health impact below the significant impact level and would not pose a cumulative public health concern.

Cumulatively, the residential and commercial projects will not be routine sources of TACs during their operation and, therefore, would not cumulatively contribute to TAC emissions from the VIP Amendments. TACs would be emitted during the construction of these projects. However, the construction will be short-term in duration, and therefore will not represent a cumulative health concern for carcinogenic and non-cancer chronic exposure. Impacts from TACs representing acute health risks would be from such sources as construction machinery, which tend to have localized impacts. Acute health risks associated with the VIP Amendments are also limited to the area near the Benicia Refinery and would not combine with health risks from the construction projects to create a significant impact. In addition, the construction schedules for these cumulative projects may not overlap with the construction of the VIP Amendments. Therefore, there would be no cumulative public health concern associated with the residential and commercial projects.

Construction activities associated with the reconstructed Benicia Bridge would also not result in a cumulative health risk for the same reasons. Post-construction, the bridge project is not expected to result in an increase in TAC emissions over current conditions. Therefore, this project would not result in a chronic cumulative health impact.

Based upon this analysis, exposure levels of TACs from cumulative projects would be less than significant.

4.2.9 Public Safety

Other refinery projects are not expected to result in significant cumulative impacts to public safety. Refinery accidents with off-site consequences are low-probability events and it is not expected that multiple events would occur simultaneously to cause a cumulative impact. In addition, the replacement of an existing H2U train with a new H2U featuring modern safety technology would result in an overall reduction in safety risks.

The VIP Amendments are unlikely to cause a chain reaction accident due to interaction with other cumulative refinery projects. Fires would likely be confined to a limited area by the refinery's fire suppression system, and would not affect other Refinery projects such as the NRU Catalyst Regeneration Facility Project and the Benicia Asphalt Plant Wastewater Project. Since the VIP Amendments will not require additional ammonia storage, the probability of a catastrophic release of aqueous ammonia is not increased. Therefore, the probability of such an event interacting with other accidents is unchanged. The VIP Amendments slightly increase the risk of a smaller ammonia release due to the increase in deliveries. However, a release, such as from a ruptured delivery hose, is not expected to be of sufficient magnitude to trigger additional releases from other projects. Similarly, refinery explosions are low-probability events, and an on-site explosion would not be expected to combine with impacts from any other on-site cumulative projects.

Other planned projects in the region are located too far away from the Benicia Refinery to cause potential cumulative impacts to public safety. As noted above, all of the potentially injurious effects of fires, explosions, or from toxic gas releases from new equipment associated with the VIP Amendments would be limited to the interior of the property. Also, the probability of an independent accidental release occurring from another cumulative project at the same time that an accident would occur at the Benicia Refinery would be extremely low. However, in the event of a release due to earthquake-induced simultaneous accidents at industries in Benicia and throughout the Bay Area, the limited geographic extent of the accident effects from the proposed VIP Amendments elements would make that contribution inconsequential. Therefore, the VIP Amendments do not contribute to a significant cumulative public safety impact together with non-Refinery projects.

4.2.10 Hydrology and Water Quality

As described in the **Hydrology and Water Quality Section 3.1.10**, storm water from within the Benicia Refinery is collected and routed to the on-site Benicia Refinery WWTP or is directly discharged through various outfalls which ultimately discharge into Suisun Bay. The separate drainage parcels within the Benicia Refinery boundaries are depicted in Figure 4.9-1 of the Certified EIR. Only those areas such as undeveloped parcels and parking lots that have low potential to impact storm water are directly discharged, The proposed VIP Amendments components will be placed in and adjacent to the Refinery Process Block and the area north of the Refinery Process Block. As described in **Section 3.1.4** and **3.1.10,** wastewater from these VIP Amendments project components will be directed to the Benicia Refinery WWTP and will be treated, along with other wastewater from the Benicia Refinery, to comply with the NPDES permit governing the refinery's discharge to Suisun Bay. Of the approximate 184,320 gpd added to the WWTP flow from the VIP amendments, 57,600 gpd will be a stream expected to contain nickel, vanadium, and aluminum and 14,400 gpd will be from the caustic polisher which will contain sulfates. These additional wastewater streams, when combined with the decrease in wastewater to the Benicia Refinery WWTP due to the NRU Catalyst Regeneration Facility Project of 100,800 gpd and the increase in wastewater to the Benicia Refinery WWTP from the Benicia Asphalt Plant of approximately 40,000 gpd, will result in an increase in the rate of wastewater flow to the Benicia Refinery WWTP by about 123,520 gpd (86 gpm). These combined additional wastewater streams estimated to be generated are not significant compared to the post VIP WWTP flow of 2.56 MGD and 3.6 MGD hydraulic capacity of the WWTP. As demonstrated in **Section 3.1.15 (a)** compliance with permit requirements and potential consultation with the RWQCB will ensure that additional wastewater and wastewater load generated as a result of implementation of the VIP Amendments will not exceed the wastewater discharge limits of the RWQCB.

As discussed in **Section 3.1.10**, the VIP Amendments will slightly increase the size of Process Areas where storm water is discharged by the WWTP. Also as discussed, this increase in area is small and the increased flows can be compensated for by delaying drainage of water from tank farm dikes. Storm water from the area of the new employee parking lot and the relocated firehouse will continue to be directed to existing Outfalls 004 and 005 and will be designed so that post-construction runoff rates equal pre-construction rates. Runoff from these areas is not expected to contain additional pollutants. Therefore, taken together the VIP Amendments will not increase the flow rates of discharge from the WWTP or flow rates of runoff.

The VIP Amendments taken cumulatively with other refinery projects and the non-refinery projects may contribute controlled amounts of pollutants to Suisun and San Pablo Bay due to wastewater or storm water discharges during construction and/or operation. Cumulatively, these discharges and emissions are assimilated into the surface waters. Discharges to the waters of the United States are regulated under the RWQCB's implementation of the NPDES that establishes waste discharge requirements and provisions to dischargers to manage effluent concentrations of contaminants. Within this regulatory context, the Benicia Refinery's contribution and the contribution of other non-refinery projects are controlled by the discharge limits in the Benicia Refinery NPDES permit and the general NPDES permit. As discussed above, there will be a net decrease in the refinery's cumulative wastewater discharge and no net increase in the Benicia Refinery's storm water discharge due to the VIP Amendments. Therefore, the VIP Amendments would provide a less than significant increase in the amount of pollutants discharged to Suisun or San Pablo Bay and would not change the discharges from other projects.

Treatment of an additional 40,000 gallons per day of wastewater from the Valero Benicia Asphalt Plant (formerly the Huntway Asphalt Plant) in the Benicia Refinery WWTP would only be done if the additional wastewater can be added without causing any violations of the current Benicia Refinery NPDES discharge permit. If modifications of the Refinery WWTP are required, they would be implemented such that compliance with the NPDES permit can be maintained at all times. Therefore incremental effects form implementation of this project would not be cumulatively considerable.

As described in the Certified EIR, the Seeno Benicia Business Park and Southampton Tourtelot Development projects located northeast and northwest of the Benicia Refinery, respectively, could considerably change runoff conditions and cause downstream flooding effects to the Lower Sulphur Springs Creek drainage area. The incremental impacts of the VIP Amendments are not cumulatively considerable because storm water from the VIP Amendments will not run off to the Lower Sulphur Springs Creek. Therefore, the VIP Amendments would not contribute to any increase in pollutants discharged to Lower Sulphur Springs Creek by other projects.

4.2.11 Land Use, Plans and Policies

The VIP Amendments will occur within the area designated the Benicia Industrial Park in the City's General Plan. The land use designation for the area to be utilized for the VIP Amendments is designated General Industrial (IG) by the Benicia Zoning Ordinance and the City of Benicia General Plan, as shown in the Certified EIR Figure 4.10-1. The project elements of the VIP Amendments are allowed uses in the IG zone.

The construction and operation of the VIP Amendments, in addition to other cumulative refinery and non-refinery cumulative developments, would not result in any known cumulative impacts to land use plans and policies. The impact of each project, if any, would be specific to its site and land use changes and overall effects were considered in the development of the Benicia General Plan.

4.2.12 Noise

The methodology for noise analysis as presented in the Certified EIR and further evaluated in **Section 3.1.12** takes cumulative noise into account. As discussed in the Certified EIR, the cumulative impact of the VIP and other refinery projects operating simultaneously at the Benicia Refinery would at most cause a 3 dBA increase in background equivalent noise level (L_{eq}) at the nearest residential receptors (i.e.136 Carlisle Way and 37 La Cruz) which are situated approximately 3,300 feet from the Process Block. No measurable change is predicted in day/night noise level (DNL) at the residential receptors. Since operation of the VIP Amendments would not contribute additional noise above that identified in the Certified EIR, the total increase in ambient noise level due to the cumulative projects in conjunction with the noise generated by the VIP Amendments would be less than the significance thresholds identified for this project, and would constitute an imperceptible increase over existing levels and will comply with noise standards of the City of Benicia. Accordingly, the VIP Amendments would not contribute to a significant cumulative impact.

As discussed in **Section 3.1.12**, noise from construction of the VIP Amendments would not exceed 55 dBA during the day or 50 dBA nighttime at sensitive receptors. Therefore, construction of the VIP Amendments will not create a significant noise impact at residential locations and/or other sensitive land uses in the project vicinity. Noise levels during construction of the VIP Amendments will not exceed performance standards in the City of Benicia's General Plan or applicable noise regulations in the City of Benicia Municipal Code. Construction activities associated with the Benicia Refinery maintenance turnarounds, treatment of wastewater from the Benicia Asphalt Plant, and the VIP Amendments would not be expected to occur at the same time. Based on the expected construction schedules, the VIP Amendments would not contribute to a significant cumulative impact.

In addition to the other refinery projects, the Seeno Benicia Business Park project, the Benicia-Martinez Bridge project, the Southampton Tourtelot Development and the City of Benicia Wastewater Reuse project would add to cumulative noise levels in the area. Construction of these projects may contribute to construction noise levels during the construction of the VIP Amendments. However, these developments are sufficiently far away from the refinery that acoustical energy imparted by these activities would be significantly attenuated at sensitive land uses near the refinery. Similarly, the VIP Amendments would not contribute to any cumulative impacts of other projects on sensitive receptors near those projects, due to the attenuation of noise originating from the VIP Amendments.

Noise from either the Air Liquide or Air Products pipelines will be short term and arise from construction activities. Although no information on estimated noise levels was provided, the short-term, noise-related impacts resulting from construction of the Air Liquide or Air Products pipeline projects may occur adjacent to sensitive receptors (e.g., residences near the refinery). These sensitive receptors are approximately one mile from the Refinery Process Block. This is sufficiently far away such that acoustical energy resulting from construction within the Benicia Refinery would be significantly attenuated at sensitive land use areas and would not contribute to the construction noise from either the Air Liquide or Air Products pipeline projects. (The noise from the Benicia Refinery would be more than 10 dBA less than pipeline construction equipment).

Construction associated with the either the Air Liquide or Air Products pipeline projects near the refinery would not be expected to occur at the same time as construction of the VIP Amendments and would be unlikely to involve pile driving. Based on the distance of the construction of the VIP Amendments from the majority of the noise generating construction of the Air Liquide or Air Products pipelines and the expected staggering of construction, the VIP Amendments are not expected to contribute a significant cumulative impact.

The construction and operation of the new equipment not previously analyzed in the Certified EIR (listed in **Section 3.1.12**) will not expose people to excessive groundborne vibration or groundborne noise levels. The vibratory and acoustical energy imparted by these activities to the ground plane would be significantly attenuated at sensitive land uses due to ground surface geometric spreading and material damping over the large distances to these uses. As described above, construction of other refinery projects will either not be constructed at the same time as the VIP Amendments or the construction of the projects will be sufficiently far away from the VIP Amendments that acoustical energy imparted by these activities would be significantly attenuated before reaching the VIP Amendments' construction locations or sensitive land uses. Therefore, the other refinery projects will not contribute to significant vibration at sensitive land uses or expose people to excessive vibration.

Other non-refinery projects may contribute to vibration at sensitive land uses. However, these projects will be constructed sufficiently far from the refinery that any vibratory and acoustical energy imparted by these activities to the ground plane would be significantly attenuated prior to reaching the refinery. Therefore, vibration produced by construction of these activities would not be amplified by Refinery construction.

4.2.13 Public Services

As described in **Section 3.1.13**, the VIP Amendments will not result in the need for additional public services related to fire protection, police protection, schools, parks and recreation, or other public facilities. Therefore, the construction and operation of the VIP Amendments would not result in any impacts to public services in the vicinity of the Benicia Refinery.

Other refinery projects would utilize the services described in **Section 3.1.13**. The VIP Amendments would not result in a significant expansion of long-term employment at the Benicia Refinery. Therefore, the other refinery projects combined with the VIP Amendments would not require additional public services related to fire protection, police protection, schools, parks and recreation, or other public facilities. Other non-refinery cumulative development, including the Seeno Benicia Business Park or other industrial development within the City, could adversely affect the provision of certain of these City services if these projects increase the number of Benicia residents or increase the demand on City fire and police protection services. However, the VIP Amendments would not contribute to these cumulative impacts.

4.2.14 Transportation/Traffic

The methodology for traffic analysis as described in the Certified EIR and applied in **Section 3.1.14** takes cumulative traffic into account. As described in **Section 3.1.14**, the incremental impacts associated with operation of the VIP Amendments represent only a nominal incremental increase in traffic and would not cause a significant impact. Construction traffic generated by the VIP Amendments would add relatively few marginal peak hour trips, and the effects would not be significantly different from those projected in the Certified EIR. Cumulatively, the locations and sizes of the major development projects envisioned in the County and Cities' General Plans have been programmed into the Countywide Year 2025 Travel Demand Model, which was developed by the Solano Transportation Authority's County wide Congestion Management Program travel demand model, and the long-term traffic impacts associated with the build out of the Solano County and City of Benicia General Plans.

As described in **Section 3.1.14**, there are four CMP facilities within the City of Benicia, including I-680, I-780, Military West Street, and Military East Street. Cumulative plus project conditions for another recent project indicate that only one segment of a CMP highway (westbound I-780 west of East 2nd Street) would experience a LOS worse than 'E'. However, the mitigation – widening of I-780 – ascribed from Solano County's Capital Improvement Program to this other project (Benicia Business Park EIR, LSA Associates, Inc., January 2006) will substantially improve the LOS from 'F' to 'B'. The VIP Amendments with their relatively few marginal trips during the operational phase will not contribute to a significant cumulative effect at the mitigated I-780 segment. At other locations, the VIP Amendments will not contribute to a significant impact because LOS will remain at acceptable levels without need for mitigation.

As stated in Section 2.6, operation of the facilities following implementation of the VIP Amendments construction would add 30 additional new permanent employees, generating about 60 new one-way commute trips (30 in and 30 out). With total employment at the Benicia Refinery estimated at 500, the incremental employment resulting from the VIP Amendments represents a six percent increase.

In addition, there would be about two new truck deliveries or pick-ups per week (i.e., about four new one-way truck trips) mainly to deliver additional process chemicals (such as aqueous ammonia or caustic) and carry solid waste out for disposal to Clean Harbors Buttonwillow Landfill. These truck trips would be spread throughout the day and are expected to occur primarily during off-peak traffic hours. The VIP Amendments would not significantly cumulatively affect the LOS.

4.2.15 Utilities and Service Systems

<u>Water Supply</u>

As described in the Certified EIR, VIP together with the Cogeneration Project and other refinery projects would increase demand for raw, untreated water from the City of Benicia in excess of the baseline Benicia Refinery demand anticipated in the UWMP. However the VIP Amendments do not increase water demand above that identified in the Certified EIR. Also, the NRU Catalyst Regeneration Facility Project, now under operation, represents a reduction in water demand, as described in **Section 3.1.10** of 100,800 gpd. Other non-refinery projects may require an increased amount of raw water from the City of Benicia. Since the combination of the VIP Amendments and other refinery projects results in no net increase in raw water demand over the Certified EIR, the VIP Amendments would not contribute to an impact from the increase in raw water demand due to other non-refinery projects. Therefore, there are no cumulative impacts to the water supply due to the VIP Amendments.

As described in the Certified EIR, water conservation measures instituted under the City Ordinance would reduce water demand in times of water shortages. To the extent that new development within the City also would be governed by the use limitations of the ordinance, water demand would be reduced for new developments as well as for existing users and cumulative impacts would be less than significant.

Wastewater Treatment

As described in the Certified EIR, VIP together with other refinery projects would increase the quantity of pollutants and the amount of wastewater processed at the Benicia Refinery WWTP. This increase was evaluated in the Certified EIR and would be a less than significant impact due to NPDES discharge limitations.

As described in the **Hydrology and Water Quality Section 3.1.10**, storm water from within the Benicia Refinery is collected and routed to the on-site Benicia Refinery WWTP or is direct discharged through various outfalls which ultimately discharge into Suisun Bay. The separate drainage parcels within the Benicia Refinery boundaries are depicted in Figure 4.9-1 of the Certified EIR. Only those areas such as undeveloped parcels and parking lots that have low potential to impact storm water are direct discharged, The proposed VIP Amendments components will be placed in and adjacent to the Refinery Process Block and the area north of the Refinery Process Block. As discussed in **Section 3.1.10**, the VIP Amendments will slightly increase the size of Process Areas where storm water is discharged by the WWTP. Also as discussed, this increase in area is small and the increased flows can be compensated for by delaying drainage of water from tank farm dikes. Storm water from the area of the new employee parking lot and the relocated firehouse will continue to be directed to existing Outfalls 004 and 005 and will be designed so that post-construction runoff rates equal pre-construction rates. Runoff from these areas is not expected to contain additional pollutants. Therefore, taken together the VIP Amendments will not increase the storm water flow rates handled by the Benicia Refinery WWTP.

As described in **Section 3.1.4** and **3.1.10,** wastewater from the VIP Amendments project components will be directed to the Benicia Refinery WWTP and will be treated, along with other wastewater from the Benicia Refinery, to comply with the NPDES permit governing the refinery's discharge to Suisun Bay. Of the approximate 184,320 gpd added to the WWTP flow from the VIP amendments, 57,600 gpd will be a stream expected to contain nickel, vanadium, and aluminum and 14,400 gpd will be from the caustic polisher which will contain sulfates. However, as described in **Sections 3.1.10** and **3.1.15**, the Benicia Refinery will be able to remain within its NPDES discharge limits. Therefore compliance with permit requirements will ensure that wastewater generated as a result of implementation of the VIP Amendments will not exceed the wastewater discharge limits of the RWQCB.

The VIP Amendments represent a 184,320 gpd increase in wastewater flow to the Benicia Refinery WWTP and limited increases in flow (about 400 gpd) to the municipal WWTP associated with the nominal increase in full time employees at the refinery. The NRU Catalyst Regeneration Facility Project represents a decrease in wastewater flow to the Benicia Refinery WWTP of 100,800 gpd. The Benicia Asphalt Plant represents an increase in wastewater flow to the Benicia Refinery WWTP of about 40,000 gpd. Therefore, the VIP Amendments combined with the cumulative refinery projects result in an increase of about 123,520 gpd (86 gpm) at the Benicia Refinery WWTP. As described in **Section 3.1.10 and 3.1.15**, the WWTP has a maximum capacity of 2,500 gpm (3.6 MGD) and the VIP Amendments and other cumulative projects identified above will increase wastewater flow to 2.68 MGD and will not change storm water flow to the WWTP. Therefore, the WWTP has sufficient capacity to manage storm water and wastewater flows at the refinery.

The VIP Amendments, together with other refinery and non-refinery projects within Benicia, could increase the amount of wastewater treated at the City WWTP. As described in **Section 3.1.15**, the amount of wastewater generated by the VIP Amendments, associated with the increase in a limited number of personnel, will be about 400 gpd and increases from the construction workforce will be temporary. As described in the Certified EIR, the total capacity of the city's WWTP is 4.5 MGD and during dry weather the plant operates at approximately 64 percent capacity; therefore, the city of Benicia's municipal WWTP has adequate capacity to serve the VIP Amendments demand in addition to existing commitments. Also, as described in the Certified EIR, the rerouting of the Benicia Asphalt Plant wastewater flow from the city of Benicia's municipal WWTP to the Benicia Refinery WWTP would result in a decrease in flow of approximately 0.03 MGD to the City plant. Other non-refinery projects could potentially increase wastewater flow to the City of Benicia WWTP. However, the increased flow from the refinery would be negligible in relation to the WWTP's available capacity to accommodate existing uses and planned growth. Accordingly, the contributions to the sanitary sewer from the Benicia Refinery would not represent a cumulatively considerable increase in flow to the City of Benicia WWTP.

Solid and Hazardous Waste Disposal

The VIP Amendments would not increase the Benicia Refinery's disposal of non-hazardous materials from what was previously analyzed in the Certified EIR. Therefore, the VIP Amendments would not contribute any cumulative impacts from increases in non-hazardous waste generation and disposal at landfills in the region from any other sources.

As described in **Section 3.1.15**, the VIP Amendments will increase the amount of hazardous waste landfilled at the Clean Harbors Buttonwillow facility LLC landfill by up to 800 tons per year. The Buttonwillow active hazardous waste management unit has a total design capacity of 10.7 million cubic yards or about 9.1 million tons. In addition, there are land use and air permits that further limit Clean Harbors to accept 352,105 tons per year with up to 4,050 tons in any one day. Over the last three years (2004 – 2006) the Buttonwillow landfill has averaged annual waste receipts of 322,684 tons per year. The additional 800 tons per year from the proposed VIP Amendments represents only 2.7 percent of the allowable increase from the three-year average waste receipts to the permit limit. Additional landfill capacity remains for increases from other projects, if needed. Therefore, the VIP Amendments would have a cumulatively inconsiderable effect on hazardous waste generation and disposal at the Buttonwillow facility along with that from other sources.

4.2.16 Agricultural Resources

The construction and operation of the VIP Amendments would not result in any impacts to agricultural resources or lands designated for such use. The other Benicia Refinery and non-refinery projects generally also will not result in impacts to agricultural resources since they are not located in areas requiring conversion of existing agricultural resources or lands designated for such use. Therefore, the VIP Amendments will not contribute to any cumulative impacts from other projects in the region affecting agricultural resources or lands designated for such use.

4.2.17 Mineral Resources

The construction and operation of the VIP Amendments would not result in the loss of availability or preclude the retrieval of mineral resources. Soils excavated for site construction will remain onsite for use as grading material. Although other cumulative projects, such as the highway and industrial developments, may require retrieval of mineral resources for their construction, the VIP Amendments will not contribute to these cumulative effects.

4.2.18 Population and Housing

The construction and operation of the VIP Amendments would not result in a substantial population growth or need for housing. Construction activities related to the proposed VIP Amendments will take approximately three years and will use the existing workforce in the area. Construction of the VIP Amendments will not directly or indirectly induce population growth because the construction workforce will be drawn from the existing workforce in the area. The proposed VIP Amendments will require approximately 30 new fulltime operations staff. This is a minor increase in the total operational workforce of about 500 at the Benicia Refinery. The other refinery and non-refinery projects are likely to result in regional population growth and a subsequent need for housing. Regional population growth was estimated by the Association of Bay Area Governments to grow from 7,096,100 in 2005 to 7,730,000 in 2015. This represents a planned growth increase of approximately 9 percent in the region during the construction of the VIP Amendments and the cumulative projects. The additional new workers associated with the VIP Amendments are negligible in comparison when taken within the context of this planned regional population growth. Therefore, the VIP Amendments do not represent a cumulatively significant impact on population and housing in the region.

4.3 Unavoidable Impacts

There are no significant unavoidable impacts from VIP (EIR Section 5.1) and, incrementally, there are no significant unavoidable impacts resulting from the VIP Amendments.

4.4 Project Alternatives

Since the VIP Amendments represent minor revisions to VIP, the CEQA required analysis of project alternatives reflected in Section 6.2 of the Certified EIR are still appropriate and additional analysis is not required.

Appendix A
Visible Plume Modeling

Prepared for:
Valero Refining Company – California
Benicia Refinery

Technical Report

Assessment of Visible Water Vapor Plume Formation – VIP Amendments

ENSR Corporation
Rev. 2 February 2008
Document No.: 06993-023-900

ENSR | AECOM

Prepared for:
Valero Refining Company – California
Benicia Refinery

Technical Report

Assessment of Visible Water Vapor Plume Formation – VIP Amendments

Prepared By: Brian Stormwind

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ENSR Corporation
Rev. 2 February 2008
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1.0 Introduction

This report prepared for the Valero Refining Company – California (Valero) serves as an addendum to the June 2002 report entitled "Assessment of Visible Steam Plume Formation" (URS, 2002), which documented the visible water vapor plume analysis conducted in support of the Valero Improvement Project (VIP).

Originally, VIP included the use of a Main Stack scrubber to control sulfur dioxide (SO_2) emissions from the Fluid Coking Unit (CKR). Based on recent detailed engineering and design work, Valero is currently proposing amendments to VIP (VIP Amendments) which include using a scrubber to control SO_2 emissions from both the CKR and the Fluid Catalytic Cracking Unit (FCCU).

With the VIP Amendments, the new FCCU/CKR scrubber will be designed to process about three times more flue gas than analyzed in the VIP and will discharge from a new stack on top of the scrubber. Since the new FCCU/CKR will also use quench subcooling and heated dilution air as described in **Section 2.4.2** of the February 2008 Environmental Assessment Document, the stack discharge profile differs from that previously assessed. As a consequence, this requires a reanalysis of the effect on the potential for the FCCU/CKR scrubber stack to have a visible water vapor plume. This report summarizes that analysis to support the VIP Amendments.

2.0 Modeling Methodology and Input Data

Stack plume visibility modeling was conducted for the water vapor emissions from the main stack to determine the potential frequency of formation (hours/year), length and potential for ground-level impingement of visible plumes associated with the process changes proposed as part of the VIP Amendments.

The potential for water vapor emissions to form visible plumes depends on the amount of water vapor in the exhaust gas, the temperature and volume of the exhaust gas, and the temperature and moisture content of the ambient air. Any additional water vapor introduced to saturated air (i.e., relative humidity of 100 percent) will condense into small water droplets.

The exhaust plume exiting a stack mixes with ambient air and is diluted. For a given volume of stack exhaust mixed with ambient air, the following steps are used to determine whether or not the resultant vapor plume will be visible:

- The resultant temperature and water vapor density of the diluted plume are determined by use of temperature and mass balance equations.
- The saturation vapor pressure of water is calculated for the resultant temperature of the diluted plume.
- The saturation vapor density of the diluted plume is calculated from the saturation vapor pressure.
- If the vapor density of the diluted plume is greater than the saturation vapor density, then condensation is assumed to occur and the plume is considered to be visible.

The steps described above were performed on an hourly basis for an array of model receptors (i.e., 20-meter spacing from the stack out to 5-kilometers and 40-meter spacing beyond 5-kilometers out to 10-kilometers) to estimate frequency and length of visible plumes. This was accomplished utilizing dispersion modeling results from AERMOD in the form of hourly water vapor concentrations (at each receptor evaluated) and concurrent hourly values of ambient dry bulb and dew point temperature. AERMOD, also used for the air quality dispersion modeling, is a state-of-the-art dispersion model and is preferred by U.S. Environmental Protection Agency (USEPA) and Bay Area Air Quality Management District (BAAQMD) for dispersion modeling applications where representative or onsite meteorological data are available.

The modeled water vapor concentration data obtained from AERMOD were input to a Fortran program, VIZDET, developed by ENSR which performs the calculations described above. Specifically, VIZDET determines if the modeled water vapor concentrations result in visible plumes (i.e., condensation of water vapor occurs) based on the plume conditions coupled with the ambient conditions (e.g., temperature and relative humidity). The plume is defined to be visible at a given downwind distance if the liquid water content of the plume exceeds 10^{-5} kg water (condensed)/kg dry air. VIZDET has been used in regulatory applications to support power plant permitting in New York and California. Refer to Appendix A for details on the VIZDET program equations.

The analysis for the VIP Amendments was conducted with 1-year of onsite meteorological data (2005) collected at the Valero Refinery administration building. The data were provided by the BAAQMD for the air quality impact analysis. The on-site data measurements included the wind speed, wind direction, temperature and relative humidity (RH) required for the analysis. The analysis also utilized weather and fog observations recorded at nearby Buchanan Field Airport in Concord, California (obtained from the National Climatic Data Center). In addition to the AERMOD model output and meteorological data, source data including the water vapor emission rate, stack exhaust flow rate and exhaust temperature were also input to VIZDET. These data are summarized in **Table 2-1**.

Table 2-1 Stack Data Required for Vapor Plume Analysis

Parameter	Summer Value	Winter Value (1)
Stack Height (ft)	185 (2)	185 (2)
Stack Diameter (ft)	15	15
Water vapor emission rate (lb/hr)	158,038	94,410
Exhaust flow rate (ACFM)	905,885 (3)	872,132 (3)
Exhaust temperature (^oF)	226	222

Notes:

1, Winter value represents maximum quench subcooling case due to lower ambient temperatures. See **Section 2.4.2** of the Environmental Assessment Document.

2. Stack height used in the modeling was 40 feet which is 185 feet above the FCCU/CKR Scrubber base and 146 feet above the floor of the Refinery Process Block. The actual stack height will be 245 feet above the scrubber base and 206 feet above the Refinery Process Block.

3. Includes up to an equimolar quantity of heated ambient air added to base of stack.

3.0 Model Results

The modeling analysis was conducted to determine the frequency and length of visible plumes based on two meteorological data sets: 1) the full year of meteorology and 2) for daytime hours only that were not associated with either precipitation, fog or 100 percent RH. The night time, precipitation, fog, and 100 percent RH hours were excluded because a plume would either not be visible or difficult to distinguish against the background conditions. The model was run for both summer and winter conditions as shown in **Table 2-1**. **Table 3-1** summarizes the predicted frequency of occurrence of a visible water vapor plume based on model output data.

Table 3-1 Vapor Plume Modeling Results - Frequency

Case	Maximum Hours per Year with Visible Plume	Days per Year with Visible Plume
All Hours (summer process conditions)	66	19
All Hours (winter process conditions)	0	0
Daytime Only, excluding hours of precipitation, fog and 100 percent RH (summer and winter process conditions)	0	0

Since there were no hours with predicted visible plume formation during daytime hours that were not associated with either precipitation, fog or 100 percent RH, the maximum, median, and 90th percentile predicted visible plume lengths were not determined. The 66 hours where visible plumes may occur will be during times of fog, rain, or 100% RH which will obscure the visibility of the plumes against the background.

A modeling analysis was also performed to determine if visible water vapor plumes would touch ground. The model was first run on the full year of meteorological data using the summer stack parameters in **Table 2-1**. This analysis predicted that the visible vapor plume would touch ground for three daytime hours during the year. Since these hours all occurred during the winter, the analysis was repeated using the winter stack parameters in **Table 2-1**. This analysis predicted that visible plumes would not touch ground during the winter months as well. Therefore, visible plumes were not predicted to touch ground at any time during the year.

Appendix A
VIZDET Technical Appendix

Appendix A

VIZDET Technical Appendix

The following provides documentation of the methodology used to estimate the extent of vapor plumes.

The potential for water vapor emissions to form visible plumes depends on the amount of water vapor in the exhaust gas, the temperature and volume of the exhaust gas, and the temperature and moisture content of the ambient air. Any additional water vapor introduced to saturated air (i.e., relative humidity of 100 percent) will condense into small water droplets.

The exhaust plume exiting a stack mixes with ambient air and is diluted. For a given volume of stack exhaust mixed with ambient air, the following steps are used to determine whether or not the resultant vapor plume will be visible:

- The resultant temperature and water vapor density of the diluted plume are determined by use of temperature and mass balance equations.
- The saturation vapor pressure of water is calculated for the resultant temperature of the diluted plume.
- The saturation vapor density of the diluted plume is calculated from the saturation vapor pressure.
- If the vapor density of the diluted plume is greater than the saturation vapor density, then condensation is assumed to occur and the plume is considered to be visible.

The steps described are performed on an hourly basis for an array of model receptors to estimate frequency and length of visible plumes. This is accomplished utilizing dispersion modeling results from a Gaussian dispersion model (e.g., AERMOD) in the form of hourly water vapor concentrations (at each receptor evaluated) and concurrent hourly values of ambient dry bulb and dew point temperature. The modeled water vapor concentration data obtained from AERMOD are input to a Fortran program, VIZDET, developed by ENSR which performs the calculations described above. Specifically, VIZDET determines if the modeled water vapor concentrations result in visible plumes (i.e., condensation of water vapor occurs) based on the plume conditions coupled with the ambient conditions (e.g., temperature and relative humidity). The plume is defined to be visible at a given downwind distance if the liquid water content of the plume exceeds 10^{-5} kg H_2O (condensed)/kg dry air, consistent with fog and cloud visibility thresholds.

The following provides details on the VIZDET program and equations.

Consider a source that emits exhaust gases containing water vapor. The key parameters for this source are given below:

Q_{wv} = water vapor release rate (kg/s)

V_F = volume flux from source (m^3/s)

T_s = source temperature (^oK)

Assume that by application of an air quality dispersion model the normalized concentration (X/Q) has been calculated for a receptor location (either at ground level or on a "flagpole"). The heat balance requirement at this receptor is given by the following equation:

$$\rho_a c_a (T_p - T_a) = Q_s \left(\frac{X}{Q} \right) + H_v (C_{wv} - C_{wvsat}) \qquad \textbf{(1)}$$

where

T_a = ambient temperature (^oK)

T_p = plume temperature (^oK)

ρ_a = density of air at T_a (kg/m^3)

c_a = specific heat of air (0.238 kcal/(kg ^oK))

C_{wv} = water vapor concentration due to both the plume and ambient air (kg/m^3)

C_{wvsat} = saturated water vapor concentration at temperature T_p (kg/m^3)

X/Q = normalized concentration at the receptor (s/m^3)

Q_s = source heat release rate relative to ambient air (kcal/s)

H_v = heat of vaporization of water at T_a (kcal/kg)
= 597.3 + (0.441 - 1.007)(T_a - 273.15)

The density of air as a function of ambient temperature is given by:

$$\rho_a = \frac{P_{atm} MW_{air}}{R\, T_a} \qquad \textbf{(2)}$$

where

P_{atm} = atmospheric pressure (pascals) (101325 pascals at sea level)

MW_{air} = molecular weight of air (28.966)

R = gas constant (8314.39 N-m/(kg-mole ^oK))

The water vapor concentration, C_{wv}, at the receptor is given by:

$$C_{wv} = \left(1 - V_F\left(\frac{X}{Q}\right)\right)C_{wvamb} + Q_{wv}\left(\frac{X}{Q}\right) \quad \textbf{(3)}$$

The ambient water vapor concentration, C_{wvamb}, is given by:

$$C_{wvamb} = \frac{P_{sat}(T_{dp})\, MW_{wv}}{R\, T_a} \quad \textbf{(4)}$$

where

T_{dp} = ambient dewpoint temperature (^oK)

MW_{wv} = molecular weight of water vapor (18.016)

The saturation vapor pressure function $P_{sat}(T)$ gives the saturation vapor pressure (pascals) as a function of absolute temperature T(^oK):

$$P_{sat} = 611\left(\frac{T}{273.15}\right)^{-5.13139} \exp\left(6816.8\left(\frac{1}{273.15} - \frac{1}{T}\right)\right) \quad \textbf{(5)}$$

The following approximations have been made in Equations (1) and (2):

- Air density and specific heat are calculated for dry air.
- Dry air specific heat is assumed not to vary with temperature.
- Heat of vaporization is calculated for the ambient temperature rather than the plume temperature.

Sensitivity analyses have shown that these approximations do not significantly affect the determination of whether the plume is visible at a given receptor due to condensation of water vapor.

Assuming that the exhaust molecular weight and specific heat are close to those of air, Equation (1) may be simplified as follows:

$$T_p - T_a = V_F\left(\frac{T_a}{T_s}\right)(T_s - T_a)\left(\frac{X}{Q}\right) + \frac{H_v\left(C_{wv} - C_{wvsat}\right)}{\rho_a\, c_a} \quad \textbf{(6)}$$

For convenience Equation (6) is non-dimensionalized as follows:

$$\frac{T_p - T_a - \Delta T_{nc}}{\Delta T_{nc}} = \frac{H_v\left(C_{wv} - C_{wvsat}\right)}{\rho_a\, c_a\, \Delta T_{nc}} \qquad \textbf{(7)}$$

where

$\Delta T_{nc} = V_F\,(T_a/T_s)(T_s - T_a)(X/Q)$

= temperature increase at receptor without condensation reheat (^oK)

The plume temperature, T_p, is varied between T_1 and T_2 until the absolute value of the difference between the left and right hand sides of Equation (7) is less than some specified tolerance level (e.g. 10^{-5}). The lower bound, T_1, for T_p is given by:

$$T_1 = T_a + \Delta T_{nc} \qquad \textbf{(8)}$$

The upper bound, T_2, is given by:

$$T_2 = T_1 + \frac{H_v\left(C_{wv} - C_{wvsat}\left(T_1\right)\right)}{\rho_a\, c_a} \qquad \textbf{(9)}$$

where

$C_{wvsat}(T_1)$ = saturation water vapor concentration (kg/m^3) at temperature T_1

The concentration of condensed droplets, C_{drop}, at the receptor is given by:

$$C_{drop} = C_{wv} - C_{wvsat}\left(T_{pfinal}\right) \qquad \textbf{(10)}$$

where

T_{pfinal} = value of T_p which minimizes the difference between the left and right hand sides of Equation (7)

The calculations described above are performed by a DOUBLE PRECISION FORTRAN SUBROUTINE named VIZDET.

Appendix B
Air Emission Calculations

Prepared for:
Valero Refining Company – California
Benicia Refinery

VIP Amendments
Air Emission Calculations
Project Emissions Compared to VIP

ENSR Corporation
February 2008
Document No.: 06993-023-300

ENSR | AECOM

Prepared for:
Valero Refining Company – California
Benicia Refinery

VIP Amendments
Air Emission Calculations
Project Emissions Compared to VIP

Prepared By

Reviewed By

ENSR Corporation
February 20008
Document No.: 06993-023-300

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LIST OF ABBREVIATIONS AND ACRONYMS

% Cont	Percent Control
API	American Petroleum Institute
ATC	Authority to Construct
AVW	Average Vehicle Weight
BAAQMD	Bay Area Air Quality Management District
BACT	Best Available Control Technology
Bbl	Barrel
Btu	British Thermal Unit
CARB	California Air Resources Board
CEQA	California Environmental Quality Act
CKR	Fluid Coker
CH_4	Methane
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO2-e	GHG Emissions (CO_2 Equivalent)
DPM	Diesel Particulate Matter
dscf	Dry standard cubic feet
dscfm	Dry standard cubic feet per minute
EF	Emission Factor
EIR	Environmental Impact Report
EMFAC	California Air Resources Board EMission FACtors model for vehicle emissions
ERD	Entrained Road Dust
ESP	Electrostatic Precipitator
°F	Degrees Fahrenheit
FCCU	Fluid Catalytic Cracking Unit
gal	Gallon
GHG	Greenhouse Gases
GWP	Global Warming Potential
H2U	Hydrogen Unit
H_2SO_4	Sulfuric Acid
HHV	Higher Heating Value
I	Interstate
lb	Pound
lb/MMBtu	Pound per million Btu
MMBtu	Million British Thermal Unit
MMBtu/hr	Million British Thermal Units per hour
MMscfd	Million standard cubic feet per day
MSEL	Main Stack Emission Limitation
MW	Molecular Weight or Megawatt
MV	Molecular Volume
N_2O	Nitrous Oxide
NH_3	Ammonia

LIST OF ABBREVIATIONS AND ACRONYMS

NO_2	Nitrogen Dioxide
NO_X	Nitrogen Oxides
NSPS	New Source Performance Standards
O_2	Oxygen
O_2 Corr	Oxygen Correction
PM	Particulate Matter
PM10	Particulate Matter with an aerodynamic diameter less than 10 microns
PM2.5	Particulate Matter with an aerodynamic diameter less than 2.5 microns
POC	Precursor Organic Compounds
ppmv	Parts per million by volume
ppmvd	Parts per million by volume, dry
PS	Pipestill
RFG	Refinery Fuel Gas
SAM	Sulfuric Acid Mist
scf	Standard cubic feet
scfm	Standard cubic feet per minute
SCR	Selective Catalytic Reduction
SNCR	Selective Non Catalytic Reduction
SL	Silt Loading
SO_2	Sulfur Dioxide
SO_3	Sulfur Trioxide
TAC	Toxic Air Contaminant
Tonnes	Metric Tons
TPY	Ton per year
URS	URS Corporation
Valero	Valero Refining Company – California
VIP	Valero Improvement Project
VMT	Vehicle Miles Traveled

1.0 Introduction

1.1 Project Summary

The Valero Refining Company – California (Valero) has prepared this document to support the application to amend its current Use Permit application submitted to the City of Benicia (City) for amendments to Use Permit PLN 2002-00022 for the Valero Improvement Project (VIP) at the Valero Benicia Refinery (Benicia Refinery). Use Permit PLN 2002-00022 was previously issued in April 2003, and is being amended to reflect certain changes in VIP that result in environmental and technological enhancements. The VIP proposed to implement a series of modifications and additions to the Benicia Refinery to update refinery equipment and to better align it to current market demands.

These amendments include the following changes to the VIP project scope:

(1) Further reductions to air emissions;

(2) Improved energy efficiency and reductions in emissions of greenhouse gases (GHGs);

(3) Measures to minimize flaring; and

(4) Minor clarifications to certain technical details of the VIP scope.

For the purposes of this emission calculation document, the collective amendments to the project, as outlined above, will be referred to as “VIP Amendments”. The VIP Amendments allow Valero to implement project refinements that will better achieve operational efficiency, air emissions reductions, and minimizations of flaring. The VIP Amendments will not increase the permitted capacities of the Benicia Refinery’s process units beyond the levels permitted in the Certified EIR.

1.2 Project Overview

Valero is submitting an application for a modification to the Use Permit issued for the VIP to allow the construction of new or modified project elements as necessary to allow for operation of the VIP and VIP Amendments. The specific modifications covered by the application include:

- Use of the FCCU/CKR Scrubber to control sulfur dioxide (SO_2) emissions from the Fluid Catalytic Cracking Unit (FCCU) in addition to the Fluid Coking Unit (CKR) which was proposed under VIP;
- Two new carbon monoxide (CO) furnaces, F-105 and F-106, to combust the CO gas from the FCCU and CKR. These furnaces will replace the existing CO furnaces F-101 and F-102. The refinery fuel gas (RFG)-fired Pipestill (PS) Helper furnace proposed in the Certified EIR will not be built;
- New Hydrogen Unit (H2U);
- Shutdown of one of the two trains of the existing H2U; and
- Additional fugitive components (e.g., valves, flanges, pumps, connectors) associated with a new H2U, desalter, and other process components.

2.0 Scope of this Document

The VIP Amendments will cause a change in the level of air emissions from the Benicia Refinery from those proposed in the Certified EIR. This document provides a summary of the emissions estimated for the VIP Amendments relative to the predicted VIP emissions.

Emissions are estimated for the sources affected by the VIP Amendments. Stationary sources and mobile sources are included in the incremental emission estimates. Because the VIP Amendments are clarifications and refinements to those projects proposed and approved in the Certified EIR, the emissions projected for the VIP Amendments are compared to the emission estimates presented in the Certified EIR.

The analysis indicates that the incremental emissions of NO_X, PM10/PM2.5, and SO_2 will decrease relative to the Certified EIR following implementation of the VIP Amendments. Emissions of POC may increase slightly (3 tons/year) relative to VIP, and emissions of CO may increase by about 63 tons/year from VIP levels. As demonstrated in **Section 3.1.2** of the Environmental Analysis for the VIP Amendments, the VIP Amendments will not cause a significant impact to air quality.

In addition, emissions of GHGs will decrease relative to the Certified EIR. Thus, as demonstrated in **Section 3.1.3** of the Environmental Analysis for the VIP Amendments, GHG emissions associated with the VIP Amendments will not cause a significant impact.

3.0 VIP Emissions

Estimated emissions from the Benicia Refinery after implementation of VIP were calculated by URS (URS 2002) and presented in the Certified EIR. References to VIP emissions in this analysis are taken from the Certified EIR. Emissions from VIP are summarized in **Table 2.**

4.0 VIP Amendments Emissions

The impact on emissions at the Benicia Refinery due to the VIP Amendments project elements is discussed in this section. Detailed emission calculations for new or modified sources are presented in **Attachment A**.

4.1 FCCU/CKR Scrubber and Furnace F-103 Emissions

The Certified EIR anticipated the installation of a Scrubber to control SO_2 emissions from the CKR. The CO gas from the CKR would be combusted in F-102 and routed through the scrubber. The CO gas from the FCCU would have continued to furnace F-101 and would then have been commingled with the treated gas from the proposed Main Stack Scrubber prior to entering the Main Stack. Respirable particulate (PM10) emissions control would have continued to be provided by the existing electrostatic precipitators (ESPs).

The process design proposed under VIP Amendments will differ from what was anticipated in VIP. The design proposed for VIP Amendments will route the combined CKR and FCCU CO gas into two new PS furnaces F-105 and F-106, which will replace existing furnaces F-101 and F-102. The PS Helper Furnace proposed in the Certified EIR (designated F-102A in the Certified EIR) is not needed and will not be constructed.

The combined exhaust gas from F-105 and F-106 will first pass through a Selective Catalytic Reduction (SCR) system to remove NO_X. The combined exhaust gas then will pass through an unfired waste heat boiler to cool the exhaust gas while recovering heat via steam generation. The combined exhaust gas will then enter a pre-scrubber to remove particulates, and finally pass through the new FCCU/CKR Scrubber Stack amine scrubber to remove SO_2. A small existing RFG-fired furnace, F-103, will not be modified and will continue to exhaust through the Main Stack. A simplified flow diagram of the existing and proposed Main Stack Scrubber configuration is shown in **Figure 2.4.2-1** in the Environmental Analysis for the VIP Amendments.

The emission changes are calculated as the post-VIP Amendments emissions minus the emissions calculated for VIP as shown in the Certified EIR. The VIP Amendments emissions from the FCCU/CKR Scrubber Stack, including furnace F-105 and F-106 firing RFG and CO gas from the CKR and FCCU, and F-103 firing RFG, are compared to VIP emissions in **Table 3**. For the purpose of this air quality analysis, emissions of fine particulate matter (PM2.5) are assumed to be equivalent to PM10 emissions.

4.2 Other Combustion Source Emissions

The VIP Amendments include the installation of a new H2U and the decommissioning of one of the two process trains of the existing H2U. The new H2U has a higher overall efficiency which is realized primarily as increased steam production as a byproduct from the new H2U. Due to the production of steam in the new H2U, the incremental increase in firing of one steam generator projected in VIP will not be necessary to meet the steam requirements following the installation of the new H2U.

As noted, the new H2U will have a larger hydrogen production capacity and larger reformer furnace than the plant it replaces; however, the Benicia Refinery's hydrogen production capacity will not increase above the 190 million standard cubic feet per day (MMscfd) proposed for VIP, and the average fuel consumption for the production of hydrogen will be at the level proposed for VIP, approximately 1,010 Million British thermal units per hour (MMBtu/hr). For this air quality analysis, Valero has evaluated emissions from H2U furnaces based on a likely scenario for actual operation of the units. The following basis is used to develop this emission estimate:

1. One existing H2U furnace is shut down, a net reduction in load of 450 MMBtu/hr (historic average firing rate).

2. The remaining existing H2U furnace operates at 50 percent of maximum load (equal to 302.5 MMBtu/hr), a net reduction of 147.5 MMBtu/hr when compared to historic usage of 450 MMBtu/hr.
3. New H2U furnace operates to supply balance of 1,010 MMBtu/hr H2U furnace load – it will operate at 707.5 MMBtu/hr (approximately 70 percent of maximum rated capacity).
4. 100 MMBtu/hr increase in firing demand from SG-1032 (or another boiler) identified in VIP not required.

The VIP projected an incremental increase in fuel use and associated combustion emissions from several process units at the refinery, including one gas turbine, one steam generator, and three furnaces, identified in the refinery as GT-1031, SG-1032, F-4460, F-104, and F-2901-4. Relative to VIP, the VIP Amendments will not cause an additional increase in fired duty for GT-1031, F-4460, F-104, and F-2901-4. Therefore, the incremental firing does not change compared to VIP. The VIP Amendments will require an increase in firing in GT-702 of 70 MMBtu/hr to provide additional air to the FCCU that was not identified in the Certified EIR. In addition, the VIP Amendments will require approximately 9 MMBtu/hr in additional firing at refinery boilers to generate additional steam for soot blowing.

For the anticipated operating scenario, the 110 MMBtu/hr increase in firing of H2U furnaces F-301 and F-351 that was projected for VIP is assumed not to occur (one will be shut down and the other will operate at reduced load under the VIP Amendments). Overall, the VIP Amendments will result in a net decrease in fuel gas firing of 21 MMBtu/hr compared to the Certified EIR.

Table 4 presents the incremental firing of combustion equipment under the VIP Amendments as it differs from the fired duty analyzed for the Certified EIR. For illustration purposes, F-301 is shown as the unit to be shut down. However, Valero will decide which train of the existing H2U to shut down in the future, based on Valero's process optimization needs. The two existing trains are identical, and decommissioning either furnace would result in the same emissions scenario.

4.3 Storage Tank Emissions

The VIP Amendments have no impact on storage tank throughput or emissions relative to VIP.

4.4 Fugitive Source Emissions

Valero has estimated that the VIP Amendments will result in up to an additional three (3) tons per year of fugitive POC emissions relative to VIP. The annual emission rate is divided by 365 days per year to determine daily project emissions, and the daily emission rate is divided by 24 hours per day to determine hourly emissions. Fugitive emissions are summarized in **Table 5**.

4.5 Transportation (Mobile Source) Emissions

The VIP Amendments project elements will result in up to two (2) additional truck trips per week on average beyond that which was analyzed by URS and presented in the Certified EIR due to the transportation of additional wet solid waste from the scrubber and small amounts of additional chemcals. The VIP Amendments will not require additional ship or rail trips in excess of what was proposed in VIP.

Solid waste is expected to be transported to the Clean Harbors Landfill in Buttonwillow, California. Emission estimates are based on the distance from the Benicia Refinery to the boundary of the BAAQMD along the route to Buttonwillow. For simplicity, all trucks associated with the VIP Amendments are assumed to follow this route to the BAAQMD boundary.

Truck exhaust emission factors are developed based on EMFAC 2007 for the BAAQMD airshed (CARB 2002). Entrained road dust emission factors are derived from California Air Resources Board (CARB) Methodology 7.9 (CARB 1997). Emissions are calculated based on these emission factors and the predicted travel distance. Transportation emissions are summarized in **Table 6**.

4.6 Greenhouse Gas Emissions

Direct and indirect emissions of GHGs from the Benicia Refinery will change as a result of the VIP Amendments. As described in **Section 4.2**, combustion of gaseous fuels will decrease due to the increased efficiency of the H2U furnace. Electrical demand will be the same as that predicted in the Certified EIR. Thus the VIP Amendments will not cause a change in indirect emissions of GHGs from off-site power plants. Finally, as described in **Section 4.5**, there will be an increase in truck traffic associated with the VIP Amendments compared to VIP. These trucks will emit GHGs in addition to criteria pollutants.

The changes to the Benicia Refinery's GHG emissions as a result of the VIP Amendments were estimated using emission factors developed by the California Climate Action Registry (CCAR). CCAR is a non-profit, voluntary registry for GHG emissions. Under this analysis, emission changes due to fuel combustion were estimated using emission factors presented in the CCAR General Reporting Protocol Version 2.2 (CCAR 2007). The CO_2 emissions from mobile sources were estimated using EMFAC2007 model (CARB 2002). Mobile source N_2O and CH_4 emissions were estimated using CCAR emission factors and protocols.

GHG emissions are presented in **Table 7**. The VIP Amendments will result in a decrease in GHG emissions relative to the project described in the Certified EIR.

5.0 References

BAAQMD 2007. Bay Area Air Quality Management District, BACT/TBACT Workbook, located at http://www.baaqmd.gov/pmt/bactworkbook/default.htm.

CARB 2002. California Air Resources Board, EMFAC 2001, *EMFAC 2002 User's Guide*, 2002.

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Valero 2007. Interview, Valero personnel, January 2007.

SCAQMD 2005. South Coast Air Quality Management District, Rule 1156, Further Reductions of Particulate Emissions from Cement Manufacturing Facilities, November 2005.

URS 2002. URS Corporation, *Valero Improvement Project Air Emission Calculations: Baseline and Project Emissions Benicia, California, Refinery*, 2002

Tables

VIP Amendments
Air Emission Calculations

Table 1
VIP Amendments Emission Summary

	Emissions (tons per year)					
Source Type	**NOx**	**SO2**	**PM10/PM2.5**	**POC**	**CO**	**Reference**
Certified EIR (ref. Table 4.2-12)						
Post-VIP Emissions	1,939.1	2,799.3	235.5	303.7	761.2	*EIR Table 4.2-12*
VIP Amendments - Change from VIP						
FCCU/CKR and F-103	-155.2	-2,311.3	2.1	0.0	10.7	*Table 3*
Combustion Sources	-123.6	3.3	-10.8	-0.1	52.3	*Table 4*
Storage Tanks	0.0	0.0	0.0	0.0	0.0	*Project Description*
Fugitive Emissions	0.0	0.0	0.0	3.0	0.0	*Table 5*
VIP Amendments Mobile Source Emissions	0.2	0.0	0.0	0.0	0.1	*Table 6*
Post-VIP Amendments Emissions	1,660.4	491.3	226.8	306.7	824.3	*Calculated*
CEQA Evaluation						
VIP Amendments - Net Increase Over VIP	-278.7	-2,308.0	-8.7	3.0	63.1	*Calculated*
CEQA Significance Threshold	***15***	***NA***	***15***	***15***	***NA***	
Significant?	**No**	**No**	**No**	**No**	**No**	

VIP Amendments
Air Emission Calculations

Table 2
Valero Benicia Refinery VIP Certified EIR Emissions Summary
Stationary Sources Only

	Emissions (tpy)				
Source Type	**NOx**	**SO_2**	**PM10/PM2.5**	**POC**	**CO**
FCCU/CKR and F-103	734.1	2,706.0	104.4	6.5 [(a)]	277.3
Combustion	1,272.8	76.8	132.4	55.8	686.3
Storage Tanks	---	---	---	192.5	---
Fugitives	---	---	---	76.2	---
Total	2,007	2,783	237	331	964

(a) Main Stack POC Emissions underestimated in Certified EIR due to limited source testing; new limit of 16.1 tpy proposed by Valero

Source: URS 2002 Table 9

Table 3
Valero Benicia Refinery VIP Main Stack Emissions vs. VIP Amendments FCCU/CKR and F-103 Emissions

	Main Stack Emissions (Tons/Year)					
Scenario	**NO_X**	**SO_2**	**PM10/ PM2.5**	**POC(a)**	**CO**	**Reference**
VIP Certified EIR	734.1	2,706	104.4	16.1	277.3	*URS Table 9*
VIP Amendments	578.9	395	106.5	16.1	288	*Table A-2*
Change from VIP EIR	-155.2	-2,311.3	2.1	0.0	10.7	*Calculated*

(a) POC Main Stack Emissions Limitation proposed by Valero in October 2006

Table 4
Valero Benicia Refinery VIP Amendments Combustion Emissions

Source	Firing (MMBtu/hr)	NO_x tpy	SO_2 tpy	PM10/PM2.5 tpy	POC tpy	CO tpy
GT-702 (a)	70	5.1	1.6	3.4	1.9	33.4
SG-1032	-91	-1.5	-2.1	-1.0	-1.0	-1.7
F-301(b)	-450	-98.9	-10.8	-18.0	-5.4	-41.2
F-351(b)	-257.5	-54.0	-6.0	-2.9	-2.7	-4.9
New H2U(c)	707.5	25.6	20.5	7.7	7.1	66.7
Total Project (d)	**-21**	**-123.6**	**3.3**	**-10.8**	**-0.1**	**52.3**

(a) NOx emission factor taken from 1-year baseline, factors for remaining pollutants are assumed to be the same as GT-1031.

(b) Either F-301 or F-351may be shut down. F-301 displayed as decommissioned unit for illustrative purposes; emission reduction is 1-year VIP Baseline

(c) Emission factors and calculation methods taken from Attachment A, however, emissions calculated based on a lower firing rate than assumed in Attachment A.

(d) Firing increase includes 5 MMBtu/hr to F-103 and a new 240 MMBtu/hr PS Helper Furnace. These emissions are captured in the FCCU/CKR stack estimate and not included in this table.

The above changes to fuel firing do not include the PS Helper Furnace proposed in VIP; this source was included in MSEL

VIP Amendments
Air Emission Calculations

Table 5
Valero Benicia Refinery VIP Amendments Fugitive POC Emissions

Component	POC Emissions (tpy)	Reference
VIP Amendments	3.0	*Project Description*
Total	**3.0**	*Calculated*

Table 6
Valero Benicia Refinery VIP Amendments Mobile Source Emissions

Category	Emissions (tpy)					Reference
	NOx	SO_2	PM10/PM2.5	POC	CO	
Additional Trucks	0.2	0.0	0.0	0.0	0.1	*Table A-6*
Additional Ships	0.0	0.0	0.0	0.0	0.0	*Project Description*
Additional Railcars	0.0	0.0	0.0	0.0	0.0	*Project Description*
Total Post-VIP Amendments	**0.2**	**0.0**	**0.0**	**0.0**	**0.1**	*Calculated*

Table 7
Valero Benicia Refinery VIP Amendments Greenhouse Gas Emissions

Source	GHG Emissions Tonnes/year CO_2-e
Fuel Combustion (21 MMBtu/hr reduction)	-11,780
Electrical Consumption (No change)	0
Mobile Sources (Heavy-Duty Trucks, 52,624 mi/yr)	101
Total change from VIP	**-11,679**

Attachment A

VIP Amendments Emission Calculations

Attachment A
VIP Amendments Emission Calculations

Emissions of criteria pollutants, toxic air contaminants (TAC), and Greenhouse Gases (GHG) are expected from the various project elements of the VIP Amendments. Emission estimation methodology and sample calculations are provided in this attachment. Emission calculation worksheets are included as tables at the end of this attachment.

Existing Furnace F-103

The small gas fired furnace, F-103 will not be changed as a result of the VIP Amendments. The furnace has a maximum heat duty of 53 MMBtu/hr and will continue to exhaust gas through the Main Stack.

NO_X and CO Emission Calculations

Estimated emissions of NO_X and CO from F-103 are based on the projected stack gas concentration in the stack discharge. The volumetric stack flow rate is determined using an F-factor of 8,446 scf/MMBtu derived by Valero during a recent source test of a RFG-fueled device (URS 2002), with the appropriate correction for O_2 content. Emissions of these pollutants are calculated using **Equation 1**.

Emissions (lbs/hr) = (ppmv/10^6) x (flow) x (60 min/hr) x (O_2 Corr) x (MW/MV) (Eq. 1)

Where: ppmv = concentration of the pollutant in the stack, in units of parts per million by volume

flow = volumetric flow of exhaust gas, standard cubic feet per minute, dry basis (dscfm)

O_2 Corr = Correction for excess O_2 content: (20.9/[20.9 - %O_2])

MW = molecular weight of the species; SO_2 = 64 lbs/mole; CO = 28 lbs/mole

MV = molar volume of gas (385 dscf/mole)

For this calculation, flow is calculated as the F-factor multiplied by the heat rate of the furnace.

Based upon best engineering judgment and Valero's past experience with similar sources, the estimated stack gas concentrations are 50 parts per million by volume, dry (ppmvd) corrected to three (3) percent excess oxygen (O_2) for NO_X, and 30 ppmvd corrected to 3 percent excess O_2 for CO. These concentrations are used for both short-term and annual average emissions.

Calculations for NO_X

Emissions$_{NOx}$ (lbs/hr) = (50 ppmv/10^6) x (8,446 dscf/MMBtu) x (20.9/(20.9 – 3.0)) x (46 lbs/mol / 385 dscf) x (53 MMBtu/hr) = 3.1 lbs/hr

Emissions$_{NOx}$ (lbs/day) = (3.1 lbs/hr) x (24 hrs/day) = 74.4 lbs/day

Emissions$_{NOx}$ (tons/yr) = (3.1 lbs/hr) x (1 ton/2,000 lb) x (8,760 hr/yr) = 13.7 tons/yr

Calculations for CO

Emissions$_{CO}$ (lbs/hr) = (30 ppmv/10^6) x (8,446 dscf/MMBtu) x (20.9/(20.9 – 3.0)) x (28 lbs/mol / 385 dscf) x (53 MMBtu/hr) = 1.1 lbs/hr

Emissions$_{CO}$ (lbs/day) = (1.1 lbs/hr) x (24 hrs/day) = 27.4 lbs/day

Emissions$_{CO}$ (tons/yr) = (1.1 lbs/hr) x (1 ton/2,000 lb) x (8,760 hr/yr) = 5.0 tons/yr

POC and PM10/PM2.5 Emission Calculations

Estimated emissions for POC and PM10/PM2.5 are based on emission factors expressed in units of lb/MMBtu heat input at the higher heating value (HHV) of the fuel, which were determined from source tests at similar sources at the Benicia Refinery. Hourly emissions are calculated according to **Equation 2**.

Emissions (lbs/hr) = (EF) x (heat rate of furnace [MMBtu/hr]) (Eq. 2)

Calculations for POC

Basis: EF = 0.0023 lb POC/MMBtu

Emissions$_{POC}$ (lbs/hr) = (0.0023 lb POC/MMBtu) x (53 MMBtu/hr) = 0.1 lbs/hr

Emissions$_{POC}$ (lbs/day) = (0.1 lbs/hr) x (24 hrs/day) = 2.9 lbs/day

Emissions$_{POC}$ (tons/yr) = (0.1 lbs/hr) x (1 ton/2,000 lb) x (8,760 hr/yr) = 0.5tons/yr

Calculations for PM10/PM2.5

Basis: EF = 0.0025 lb PM/MMBtu

Emissions$_{PM}$ (lbs/hr) = (0.0025 lb PM/MMBtu) x (53 MMBtu/hr) = 0.1 lbs/hr

Emissions$_{PM}$ (lbs/day) = (0.1 lbs/hr) x (24 hrs/day) = 3.2 lbs/day

Emissions$_{PM}$ (tons/yr) = (0.1 lbs/hr) x (1 ton/2,000 lb) x (8,760 hr/yr) = 0.6 tons/yr

SO_2 Emission Calculations

Emissions of SO_2 are based on the sulfur content of the fuel gas, assuming all the sulfur in the fuel is converted to SO_2. The average heating value of the fuel gas, in Btu/scf, is used to calculate an emission factor (EF) in units of lb/MMBtu, according to **Equation 3**. Emissions are calculated using **Equation 2**.

EF (lb/MMBtu) = (ppmv/10^6) x (scf) x (MW/MV) (Eq. 3)

Where: EF = Emission factor

ppmv = concentration of sulfur in the fuel gas

scf = volume of fuel gas in units of scf/MMBtu

MW = molecular weight of the species; SO_2 = 64.1 lbs/mole

MV = molar volume of gas (385 dscf/mole)

Calculations for SO_2

Basis: 45 ppmv sulfur in the fuel gas, and 1,150 Btu/dscf average HHV of fuel

EF$_{SO2}$ (lbs/MMBtu) = (45 ppmv/10^6) x (1 dscf/1,150 Btu) x [((1 mol SO_2/mol S)
x (64.1 lb SO_2/mol)) / 385 dscf) = 0.00656 lb SO_2/MMBtu

Emissions$_{SO2}$ (lbs/hr) = (0.00656 lb SO_2/MMBtu) x (53 MMBtu/hr) =0.3 lbs/hr

Emissions$_{SO2}$ (lbs/day) = (0.3 lbs/hr) x (24 hrs/day) = 8.3 lbs/day

Emissions$_{SO2}$ (tons/yr) = (0.3 lbs/hr) x (1 ton/2,000 lb) x (8,760 hr/yr) = 1.5 tons/yr

FCCU/CKR Scrubber Stack Emissions

The BAAQMD ATC for VIP included a Main Stack Emission Limitation (MSEL) for criteria pollutants from the Main Stack (BAAQMD Permit Condition #20820 Parts 8 and 21). The MSEL applied to the sources then exhausting through the Main Stack (F-101, F-102, F-103, and the two sulfur recovery unit (SRU) emergency vents, as well as the proposed PS Helper Furnace. Under the VIP Amendments, Valero proposes to operate the sources exhausting through the new FCCU/CKR Scrubber Stack F-105 and F-106) and through the Main Stack (F-103 and the SRU emergency vents) in compliance with the MSEL. The MSEL includes both short-term limits and annual maximum emissions, as presented in **Table A-1** and **Table A-2** at the end of the attachment. For the purpose of these emission calculations, PM2.5 emissions are assumed to be equal to PM10 emissions.

The sections below present the expected emissions from the new CO furnaces F-105 and F-106, and the existing gas-fired furnace F-103.

New CO Furnaces F-105 and F-106

The Certified EIR for VIP anticipated the installation of a scrubber to control SO_2 emissions from the CKR unit. As part of the VIP Amendments, Valero will install a scrubber which will control SO_2 emissions from the FCCU in addition to the CKR. This will result in a significantly greater SO_2 emission reduction than predicted for VIP In addition, the Certified EIR included a proposed new gas-fired PS Helper Furnace. As part of the VIP Amendments, Valero will install two new CO furnaces, F-105 and F-106, to combust the CO gas from the FCCU and CKR instead of the PS Helper Furnace. The design of these new furnaces will allow the emissions from both process units to be controlled by a scrubber that is similar to the scrubber described in the Certified EIR.

SO_2 and CO Emission Calculations

Estimated emissions of SO_2 and CO from the two new furnaces are based on the projected stack gas concentration at the scrubber outlet. Emissions of these pollutants are calculated using **Equation 1**.

The FCCU/CKR Scrubber will be designed to operate at a total exhaust flow rate of 360,000 dscfm. The scrubber will be designed and operated to achieve a maximum stack gas SO_2 concentration of 50 ppmvd, corrected to zero percent excess O_2 over a seven-day rolling average, and 25 ppmvd corrected to zero percent O_2 on a 365-day average basis. The furnaces will be designed and operated to achieve a CO concentration of 100 ppmv, corrected to three percent excess O_2 on a seven-day rolling average basis.

The calculation of emissions of these pollutants is presented below.

Calculations for SO_2 – Short Term

Short term emissions of SO_2 are based on a concentration of 50 ppmvd corrected to 0%O_2.

Emissions$_{\mathbf{SO2}}$ (lbs/hr) = (50 ppmv $SO_2/10^6$) x (360,000 dscf exhaust/min) x (60 min/hr) x (20.9/(20.9 –0)) x (1 mol/385 dscf) x (64 lb SO_2/mol) = 179.5 lbs/hr

Emissions$_{\mathbf{SO2}}$ (lbs/day) = (179.5 lbs/hr) x (24 hrs/day) = 4,308 lbs/day

Calculations for SO_2 – Annual

Annual emissions of SO_2 are based on a concentration of 25 ppmvd corrected to 0%O_2.

Emissions$_{SO2}$ (tons/yr) = (25 ppmv $SO_2/10^6$) x (360,000 dscf exhaust/min) x (60 min/hr) x (20.9/(20.9 –0)) x (1 mol/385 dscf) x (64 lb SO_2/mol) x (8,760 hr/yr) x (1 ton/2,000 lb) = 393.2 tons/year

Calculations for CO – Short Term

Short-term emissions of CO are based on a concentration of 100 ppmvd corrected to 3%O_2.

Emissions$_{CO}$ (lbs/hr) = (100 ppmv CO/10^6) x (360,000 dscf exhaust/min) x (20.9/(20.9 – 3)) x (60 min/hr) x (1 mol/385 dscf) x (28 lb CO/mol) = 183.4 lbs/hr

Emissions$_{CO}$ (lbs/day) = (183.4 lbs/hr) x (24 hrs/day) = 4,402 lbs/day

Annual emissions of CO from F-105 and F-106 will be based on the MSEL. The emissions are presented as the MSEL, less the projected emissions from the gas-fired furnace F-103

Emissions$_{CO}$ (tons/yr) = (288.0 tons/yr) – (5 tons/yr) = 283 tons/yr

NO_X Emission Calculations

Estimated emissions of NO_X are based on the estimated stack gas concentration exiting the furnaces and the Best Available Control Technology (BACT) level of control efficiency of the NO_X control system. The exhaust gas from the SCR for F-105 and F-106 is expected to have a NO_X concentration of up to 100 ppmvd corrected to zero percent O_2 on a seven-day average basis, and 50 ppmvd corrected to zero percent O_2 on an annual average basis. Emissions are estimated using **Equation 1**. For $NO_{X,}$ the molecular weight of NO_2 is used for the molecular weight in **Equation 1**.

Calculations for NO_X – Short Term

Molecular weight of NO_X (as NO_2) = 46

Emissions$_{NOx}$ (lbs/hr) = (100 ppmv $NO_X/10^6$) x (360,000 dscf exhaust/min) x (60 min/hr) x (1 mol/385 dscf) x (46 lb NO_X/mol)) x (20.9/(20.9 - 0)) = 258.1 lbs/hr

Emissions$_{NOx}$ (lbs/day) = (258.1 lbs/hr) x (24 hrs/day) = 6,194 lbs/day

Calculations for NO_X – Annual

Emissions$_{NOx}$(tons/yr) = (50 ppmv $NO_X/10^6$) x (360,000 dscf exhaust/min) x (60 min/hr) x (1 mol/385 dscf) x (46 lb NO_X/mol) x (8,760 hr/yr) x (1 ton/2,000 lb)) x (20.9/(20.9 - 0)) = 565.2 tons/yr

POC and PM10/PM2.5 Emission Calculations

POC and PM10/PM2.5 emissions from the CO furnaces are based on the MSEL. The emissions are presented as the MSEL, less the projected emissions from the gas-fired furnace F-103. POC has no short-term MSEL, and short-term POC emissions specifically from F-105 and F-106 have not been quantified.

Calculations for PM10/PM2.5

MSEL for PM10/PM2.5: 40 lbs/hr and 106.5 tons/yr

Emissions$_{PM}$ (lbs/hr) = (40 lbs/hr) – (0.1 lbs/hr) = 39.9 lbs/hr

Emissions$_{PM}$ (lbs/day) = (39.9 lbs/hr) x (24 hrs/day) = 957.6 lbs/day

Emissions$_{PM}$ (tons/yr) = (106.5 tons/yr) – (0.6 tons/yr) = 105.9 tons/yr

Calculations for POC

Emissions$_{POC}$ (tons/yr) = (16.1 tons/yr) – (.5 tons/yr) = 15.6 tons/yr

Table A-1 summarizes the short-term emissions from the new CO furnaces F-105 and F-106 and the existing furnace F-103. **Table A-2** summarizes the annual emissions from these sources.

New H2U Reformer Furnace Emissions

Criteria pollutant emissions from the combustion of fuel in the H2U Reformer furnace are based on the proposed BACT limitations. The BACT limit for each pollutant is converted to an emission factor expressed as mass emission rate per MMBtu of heat input. The emission factors are shown in **Table A-3**.

For each pollutant, maximum hourly emissions are calculated by multiplying the emission factor by the maximum heat input capacity of the reformer furnace of 980 MMBtu/hr. Annual emissions are calculated assuming continuous operation at the maximum heat input rate for 8,760 hours per year. The calculations presented in this attachment represent maximum potential to emit, and not the emissions at the expected load on the furnace under actual operating conditions.

Sample calculations are provided below to illustrate the methods, formulas and assumptions used to derive the emission factors from the BACT basis and to calculate emissions. EFs and criteria pollutant emissions are summarized in **Table A-3**.

NO_X and CO Emission Calculations

Emissions of NO_X and CO are estimated based on pollutant concentration in the stack discharge. The volumetric stack flow rate is determined using an F-factor of 8,446 scf/MMBtu derived by Valero during a source test of a RFG-fueled device (URS 2002), with the appropriate correction for O_2 content. The volumetric flow is used to convert the proposed BACT limit from units of ppmv to an EF in units of lbs/MMBtu. The EF is calculated using **Equation 1**. Emissions are calculated using **Equation 2**.Daily emissions are based on 24 continuous hours of operation at full fire per day, and annual emissions are based on continuous operation at full fire 8,760 hours per year.

Calculations for NO_X

Basis: Stack concentration of NO_X = 7 ppmv corrected to 3% O_2

EF$_{NOx}$ = (7 ppmv/10^6) x (8,446 dscf/MMBtu) x (20.9/(20.9 – 3.0)) x (46 lb/mol / 385 dscf/mol)
= 0.0082 lbs NO_X/MMBtu

Emissions$_{NOx}$ (lbs/hr) = (0.0082 lb NO_X/MMBtu) x (980 MMBtu/hr) = 8.1 lbs/hr

Emissions$_{NOx}$ (lbs/day) = (8.1 lbs/hr) x (24 hrs/day) = 194.0 lbs/day

Emissions$_{NOx}$ (tons/yr) = (8.1 lbs/hr) x (1 ton/2,000 lb) x (8,760 hr/yr) = 35.4 tons/yr

Calculations for CO

Basis: stack concentration CO = 30 ppmv corrected to 3% O_2

EF_{CO} = (30 ppmv/10^6) x (8,446 dscf/MMBtu) x (20.9/(20.9 – 3.0)) x (28 lb/mol / 385 dscf)
= <u>0.0215 lb CO/MMBtu</u>

$Emissions_{CO}$ (lbs/hr) = (0.0215 lb CO/MMBtu) x (980 MMBtu/hr) = <u>21.1 lbs/hr</u>

$Emissions_{CO}$ (lbs/day) = (21.1 lbs/hr) x (24 hrs/day) = <u>506.4 lbs/day</u>

$Emissions_{CO}$ (tons/yr) = (21.1 lbs/hr) x (1 ton/2,000 lb) x (8,760 hr/yr) = <u>92.4 tons/yr</u>

<u>POC and PM10/PM2.5 Emission Calculations</u>

Proposed BACT for POC emissions is expressed in units of lb/MMBtu heat input at the HHV of the fuel. The emission rate for PM10/PM2.5 is based on the permitted emission limit for a similar source at the Benicia Refinery, and is also expressed in units of lb/MMBtu. Hourly emissions are calculated according to **Equation 2**. Daily and annual emissions are based on continuous operation.

<u>Calculations for POC</u>

Basis: EF = 0.0023 lb POC/MMBtu

$Emissions_{POC}$ (lbs/hr) = (0.0023 lb POC/MMBtu) x (980 MMBtu/hr) = <u>2.25 lbs/hr</u>

$Emissions_{POC}$ (lbs/hr) = (2.25 lbs/hr) x (24 hrs/day) = <u>54.0 lbs/day</u>

$Emissions_{POC}$ (tons/yr) = (2.25 lbs/hr) x (1 ton/2,000 lb) x (8,760 hr/yr) = <u>9.9 tons/yr</u>

<u>Calculations for PM10/PM2.5</u>

Basis: EF = 0.0025 lb PM/MMBtu

$Emissions_{PM}$ (lbs/hr) = (0.0025 lb POC/MMBtu) x (980 MMBtu/hr) = <u>2.45 lbs/hr</u>

$Emissions_{PM}$ (lbs/day) = (2.45 lbs/hr) x (24 hrs/day) = <u>58.8 lbs/day</u>

$Emissions_{PM}$ (tons/yr) = (2.45 lbs/hr) x (1 ton/2,000 lb) x (8,760 hr/yr) = <u>10.7 tons/yr</u>

<u>SO_2 Emission Calculations</u>

Emissions of SO_2 are based on the sulfur content of the fuel gas, assuming all the sulfur in the fuel is converted to SO_2. The average heating value of the fuel gas, in Btu/scf, is used to calculate an EF in units of lb/MMBtu, according to **Equation 3**. Emissions are calculated using **Equation 2**.

<u>Calculations for SO_2</u>

Basis: 45 ppmv sulfur in the fuel gas, and 1,150 Btu/scf average HHV of fuel

EF_{SO2} (lbs/MMBtu) = (45 scf S/MMscf) x (1 scf/1,150 Btu) x [((1 mol SO_2/mol S)
x (64.1 lb SO_2/mol)) / 385 scf) = <u>0.00656 lb SO_2/MMBtu</u>

$Emissions_{SO2}$ (lbs/hr) = (0.00656 lb SO_2/MMBtu) x (980 MMBtu/hr) = <u>6.4 lbs/hr</u>

$Emissions_{SO2}$ (lbs/day) = (6.4 lbs/hr) x (24 hrs/day) = <u>153.6 lbs/day</u>

$Emissions_{SO2}$ (tons/yr) = (6.4 lbs/hr) x (1 ton/2,000 lb) x (8,760 hr/yr) = <u>28.0 tons/yr</u>

Fugitive Emissions.

The Benicia Refinery emits POC from fugitive sources such as flanges, valves, and pump seals. Valero estimates that the VIP Amendments will result in up to an additional 3 tons per year of fugitive POC emissions from these sources. The annual emission rate is divided by 365 days per year to determine daily project emissions, and the daily emission rate by 24 hours per day to determine hourly emissions.

Emissions$_{POC}$ (tons/yr) = 3.0 tons/yr

Emissions$_{POC}$ (lbs/day) = (3.0 tons/yr) x (2,000 lbs/ton) x (1 yr/365 days) = <u>16.4 lbs/day</u>

Emissions$_{POC}$ (lbs/day) = (16.4 lbs/day) / (24 hrs/day) = <u>0.68 lbs/hr</u>

Transportation Emissions

The VIP Amendments will require up to 2 truck trips per week on average more that what was analyzed in the Certified EIR. This section describes the methodology used to estimate emissions associated with this transportation.

For the purpose of this calculation, additional truck trips are assumed to transport additional hazardous waste generated by the scrubber project and small quantities of chemicals such as sodium hydroxide. Hazardous waste is expected to be transported to Clean Harbors landfill in Buttonwillow, California. The route taken by these trucks will be South on Interstate 680 (I-680) across the Benicia Bridge, to Interstate 580 (I-580) East to the BAAQMD regional border near Tracy, California. To simplify the analysis, trucks transporting other materials are assumed to follow the same route to exit the BAAQMD borders. The round trip travel distance to the BAAQMD border on I-580 is approximately 100 miles. The two trucks per week (104 trucks annually) will thus travel a total of 10,400 miles/year. The estimated truck traffic is summarized in **Table A-4**.

Truck exhaust emission factors are developed based on EMFAC 2007 for the BAAQMD airshed (CARB 2002). Entrained road dust emission factors are derived from CARB Methodology 7.9 (CARB 1997). Emissions are calculated based on these emission factors and the travel distance.

The BURDEN component of EMFAC was run for heavy heavy-duty diesel trucks for calendar year 2010. This is the anticipated start-up year for the Main Stack Scrubber, which will be associated with most of the additional trucking.

BURDEN computes the total vehicle miles traveled (VMT) per day by the trucking fleet, and also computes the total mass emissions in tons per day for each subject pollutant. This information is used to create an EF for each pollutant in pounds per mile traveled, in accordance with **Equation 4**. An EF for entrained road dust PM10 emissions is calculated using the methods described in CARB Methodology 7.9 (CARB 1997), pursuant to **Equation 5**. The emission factors for exhaust and entrained road dust (ERD) are then used to calculate the emissions from trucks associated with the VIP Amendments, in accordance with **Equation 6**.

EF_i (lbs/mile) = (airshed emissions) ÷ (VMT) (Eq. 4)

Where: EF_i = Emission Factor for pollutant *i*

VMT = Vehicle miles traveled

EF_{ERD} (lbs/mi) $= 0.016 \times (SL / 2)^{0.65} \times (AVW / 3)^{1.5}$ (Eq. 5)

Where: EF_{ERD} = Emission factor for entrained road dust

SL = Silt Loading

AVW = Average vehicle weight, assumed to be 2.4 tons

Emissions (lbs/day) = (EF) x (VMT) (Eq. 6)

Example calculation for NO_X

Basis: From EMFAC for BAAQMD Average, Heavy Heavy-Duty Diesel Trucks
Total VMT/day: 2,878,000
NO_X Emissions: 50.48 tons/day

EF$_{NOx}$ = (50.48 tons/day) x (2,000 lbs/ton) x (1 day/2,878,000 miles) = 0.035 lbs/mile

Emissions$_{NOx}$ (tons/year) = (0.035 lb NO_X/mile) x (10,400 mi/yr) x (1 ton/2,000 lb) = 0.18 tons/year

The emission factor for entrained road PM10 emissions is shown in **Table A-5**. Emission calculations for CO, POC, PM10/PM2.5 and SO_2 are similar to those presented for NO_X. Mobile source criteria pollutant emissions are shown in **Table A-6**.

Summary of Stationary Source Criteria Pollutant Emissions

A summary of criteria pollutant emissions is provided in **Table A-7**. The emissions shown in **Table A-7** include the potential to emit (PTE) pollutants form the new H2U, and do not include emissions from incremental firing of existing sources or reflect emission reductions from the shutdown of any sources that may result from the VIP Amendments.

Toxic Air Contaminants

TAC emissions will occur as products of incomplete combustion from the new H2U reformer furnace and will also be emitted as fugitive POC emissions. The emission estimation methodology and sample calculations are provided below.

Valero expects reductions in TAC emissions due to the shutdown of one train of the existing H2U. The TAC emissions reductions are not quantified in this analysis because the reductions have no regulatory significance, i.e., the reductions are not used in the health risk assessment and are not subject to the offset/banking provisions of the BAAQMD rules and regulations.

FCCU/CKR Scrubber Stack Emissions

The installation of the FCCU/CKR Scrubber will affect emissions of sulfuric acid (H_2SO_4) mist (SAM). A portion of the sulfur in the crude oil processed in the FCCU and CKR is converted to sulfur trioxide (SO_3) rather than SO_2. SO_3 reacts with water vapor in the exhaust gas to create SAM. The new pre-scrubber will remove a portion of the SO_3 from the exhaust gas, resulting in a reduction in SAM emissions.

Based on available source test data, approximately 7 percent by weight of the oxides of sulfur generated in the process units is SO_3, with the remainder being SO_2. Upon implementation of the VIP Amendments, Valero projects the total sulfur oxides from the FCCU and CKR to be approximately 51.4 tons/day. The vendor of the pre-scrubber guarantees 60 percent reduction in SO_3 emissions. While the regenerative amine scrubber may provide additional reductions, Valero has not attempted to quantify any reduction beyond the guaranteed pre-scrubber levels.

The estimated reduction in SAM emissions is presented below

Calculation for Sulfuric Acid Mist

Basis: 7 percent (by weight) of sulfur oxides is SO_3
60 percent SO_3 reduction in pre-scrubber
SO_3 converts to H_2SO_4 on a one-to-one molecular ratio
Molecular weight SO_3 = 80
Molecular weight H_2SO_4 = 98

Emissions$_{\mathbf{SO3(Uncontrolled)}}$ = (51.4 tons/day) x (0.07) x (365 days/yr) = 1,313 tons/year

Emissions$_{\mathbf{SO3(Controlled)}}$ = (1,313 tons/year) (100 – 60)/100 = 525.3 tons/year

Reduction$_{\mathbf{SO3}}$ = (1,313 tons/year) – (525.3 tons/year) = 787.7 tons/year

Reduction$_{\mathbf{H2SO4}}$ = (787.4 tons/year) x (98) / (80) = 965 tons/year

Other than the above presented reduction in SAM, emissions of TACs from F-105 and F-106 will be the same or lower than the emissions evaluated in VIP from F-101, F-102, and the 240 MMBtu/hr Helper Furnace F-102A. Since there will be no increase in TAC emissions from these sources (beyond the reduction in SAM emissions), TACs have not been quantified.

New Hydrogen Plant Reformer Furnace TAC Emissions

TAC emissions from the new H2U are either products of incomplete combustion or ammonia (NH_3) that passes through the SCR unreacted (known as "ammonia slip"). The calculation procedures and sample calculations are provided below.

Emission Estimates for Products of Incomplete Combustion

Emissions of TACs from the new H2U Reformer Furnace, other than NH_3, are derived from source testing of a similar combustion source firing Valero's RFG. The measured mass emission rate of each pollutant is divided by the heat input rate of the tested source to create an EF in units of lb/MMBtu, in accordance with **Equation 7**. For each pollutant, maximum hourly emissions are calculated by multiplying the EF by the maximum heat input capacity of the H2U reformer furnace in accordance with **Equation 2**. Daily emission rate is based on 24 hours of continuous operation at full fire, and annual emissions are calculated assuming continuous operation at the maximum heat input rate for 8,760 hours per year.

EF$_i$ (lbs/MMBtu) = (measured emission rate) ÷ (firing rate of furnace tested) (Eq. 7)

Sample calculation for Arsenic (As)

Basis: Heat input of tested source = 351 MMBtu/hr; measured emission rate of arsenic is 1.09×10^{-5} grams per second (g/s)

EF$_{\mathbf{As}}$ (lbs/MMBtu) = (1.09×10^{-5} g/s Arsenic) x (3,600 s/hr) x (1 lb/454 g) / (351 MMBtu/hr)
= 2.5×10^{-7} lb/MMBtu

Emissions$_{\mathbf{As}}$ (lbs/hr) = (2.5×10^{-7} lb/MMBtu) x (980 MMBtu/hr) = 2.4×10^{-4} lbs/hr

Emissions$_{\mathbf{As}}$ (lbs/yr) = (2.4×10^{-4} lbs/hr) x (8,760 hr/yr) = 2.1 lbs/yr

The EFs for each of the TAC characterized in the source test are shown in **Table A-8**. Emission estimates for the TAC are provided in **Tables A-9a and A-9b**.

Ammonia Emissions

Emissions of NH_3 are based on the expected stack discharge concentration, and are calculated using **Equation 1**, and the volumetric flow based on the F-Factor of 8,446 scf/MMBtu derived during a recent Valero source test for a device burning RFG (URS 2002), corrected to the appropriate excess O_2 level. Emissions are calculated in accordance with **Equation 2**.

Basis: ammonia concentration in the stack is 10 ppmv corrected to 3% O_2

EF$_{\mathbf{NH3}}$ (lbs/MMBtu) = (10 dscf $NH_3/10^6$ dscf exhaust) x (8,446 dscf/MMBtu) x (20.9/(20.9 – 3.0))
x (17 lbs/mol / 385 dscf/mol) = 0.0044 lb NH_3/MMBtu

Emissions$_{\mathbf{NH3}}$ (lbs/hr) = (0.0044 lb NH_3/MMBtu) x (980 MMBtu/hr) = 4.3 lbs/hr

Emissions$_{\mathbf{NH3}}$ (lbs/yr) = (4.3 lbs/hr) x (8,760 hr/yr) = 37,668 lbs/yr

Fugitive TAC Emissions

TAC emissions from fugitive sources are calculated by multiplying the maximum additional POC emissions of 3.0 tons/year by the greatest weight concentration of each compound in the refinery's process streams, as shown in **Equation 8**.

$$\text{Emissions}_i = (\text{mass POC emissions}) \times (\text{weight fraction of species } i) \qquad \text{(Eq. 8)}$$

Sample calculation for Benzene

Basis: maximum concentration of benzene in any process stream at the Benicia Refinery is 2% (wt)

$\mathbf{Emissions_{Benzene}}$ (lbs/hr) = (3 tons/yr) x (0.02) x (2,000 lbs/ton) x (1 yr/8,760 hr) = 0.014 lbs/hr

$\mathbf{Emissions_{Benzene}}$ (lbs/yr) = (3 tons/yr) x (0.02) x (2,000 lbs/ton) = 120 lbs/yr

Emission estimates for the remainder of the fugitive TAC are provided in **Table A-10**.

Mobile Source TAC

The additional trucks associated with the VIP Amendments will be diesel fueled and will emit diesel particulate matter (DPM), classified as a carcinogenic TAC by the State of California. Truck DPM exhaust emission factors are developed using EMFAC 2007 for the BAAQMD airshed. Assuming a temperature of 60 degrees Fahrenheit (^oF), relative humidity of 75 percent, and an average truck speed of 55 miles per hour, DPM emissions from heavy duty diesel trucks are estimated to be 0.341 grams/mile. Emissions are calculated using **Equation 6**.

Emission calculation for DPM

$\mathbf{Emissions_{DPM}}$ (lbs/year) = (0.341 g/mile) x (1 lb/454 g) x (10,400 miles/yr) = 7.8 lbs/year

Greenhouse Gases

GHG emissions occur as a result of the combustion of fossil fuels. The Benicia Refinery's furnaces, boilers, and heaters directly emit GHGs through the combustion of RFG. The Refinery's demand for electrical power from the grid results in indirect GHG emissions from off-site power generating facilities. Mobile sources associated with Refinery operations combust liquid fuel, emitting GHGs. The VIP Amendments will not change the refinery's electrical demand relative to VIP; therefore the VIP Amendments will not result in changes to GHG emissions associated with electrical demand.

GHGs associated with fuel combustion consist of several different compounds, including CO_2, N_2O, and CH_4. Not all GHGs are considered to affect global warming equally. The differences are approximated using a global warming potential (GWP) factor, relative to CO_2, for which the GWP has been defined as one (1.0). Emissions of each GHG are multiplied by the appropriate GWP factor to determine the equivalent emissions relative to CO_2 (CO_2-e). N_2O has a GWP of 310, and CH_4 has a GWP of 21. GHG emissions are typically expressed in metric tons per year (Tonnes/year) CO_2-e.

The changes to the Benicia Refinery's GHG emissions as a result of the VIP Amendments were estimated using emission factors and protocols developed by the California Climate Action Registry (CCAR), a non-profit, voluntary registry for GHG emissions. Under this analysis, emission changes due to fuel combustion were estimated using emission factors presented in the CCAR General Reporting Protocol Version 2.2 (CCAR 2007). This source is currently being used to estimate GHG emissions from petroleum refineries, though it has not been widely accepted as the standard.

Fuel Combustion GHG Emissions

As described above, the VIP Amendments will result in an average net reduction in consumption of gaseous fuels of 30 MMBtu/hr (HHV) relative to VIP. Annual emissions of CO_2 and CH_4 from RFG combustion are calculated according to **Equation 9**.

Emissions (Tonnes/yr) = (EF [Tonnes/MMBtu]) x (Change in Heat Input [MMBtu/hr]) x (8,760 hr/year) (Eq. 9)

Calculations for Fuel Combustion

The following calculations use GHG emission factors are provided by CCAR.

Calculations for CO_2

Basis: EF = 0.0639 Tonnes CO_2/MMBtu

$\textbf{Emissions}_{\textbf{CO2}}$ (Tonnes/yr) = (0.0639 Tonnes/MMBtu) x (-21 MMBtu/hr) x (8,760 hr/yr)
= -11,751 Tonnes/yr

Calculations for CH_4

Basis: EF = 5.9×10^{-6} Tonnes CH_4/MMBtu

$\textbf{Emissions}_{\textbf{CO2}}$ (Tonnes/yr) = (5.9×10^{-6} Tonnes/MMBtu) x (-21 MMBtu/hr) x (8,760 hr/yr)
= -1.09 Tonnes/yr

Calculations for N_2O

Basis: EF = 1.0×10^{-7} Tonnes N_2O/MMBtu

$\textbf{Emissions}_{\textbf{CO2}}$ (Tonnes/yr) = (1.0×10^{-7} Tonnes/MMBtu) x (-21 MMBtu/hr) x (8,760 hr/yr)
= -0.0184 Tonnes/yr

Calculations for CO2-e

$\textbf{Emissions}_{\textbf{CO2-e}}$ (Tonnes/yr) = (-11,771 Tonnes/yr CO_2) + (-1.09 Tonnes/yr CH_4 x 21)
+ (-0.0184 Tonnes/yr N_2O x 310) = -11,780 Tonnes/yr CO2-e

Incremental emissions of GHGs from fuel combustion as a result of the VIP Amendments, using both Compendium and CCAR emission factors, are presented in **Table A-11**.

Mobile Source GHGs

The VIP Amendments will require up to two (2) truck trips per week on average more that what was analyzed in the Certified EIR. For the purpose of estimating GHG emissions, all transportation within the State of California must be considered. The round-trip distance between the Benicia Refinery and the Buttonwillow landfill is approximately 506 miles.

Emissions of CO_2 are calculated using an emission factor derived from the same EMFAC 2007 model run used for criteria pollutant emissions. The emission factor is calculated using **Equation 5**, and emissions are calculated in accordance with **Equation 7**, with appropriate unit conversions. Emissions of CH_4 and N_2O are estimated using **Equation 12**.

Emissions (Tonnes/yr) = (EF [Tonnes/1,000 gal fuel]) ÷ (Miles/gal fuel) x (VMT/year) (Eq. 12)

Where: VMT = Vehicle miles traveled per year

Calculations for Mobile Sources

Emission factors are presented by CCAR. Fuel efficiency for heavy-duty trucks is assumed to be 7 miles per gallon.

Calculations for CO_2

CO_2 emissions are calculated as above.

Emissions$_{\mathbf{CO2}}$ (Tonnes/year) = 100 Tonnes/year

Calculations for N_2O

Basis: EF = 1.33 x 10^{-4} Tonnes/1,000 gal; 7 miles/gal fuel efficiency

Emissions$_{\mathbf{N20}}$ (Tonnes/yr) = (1.33 x 10^{-4} Tonnes/1,000 Gal) ÷ (7 miles/gal) x (506 mi/trip) x (104 trips/yr) = 0.001 Tonnes/yr

Calculations for CH_4

Basis: EF = 7.5 x 10^{-5} Tonnes/1,000 gallons; 7 miles/gallon fuel efficiency

Emissions$_{\mathbf{CH4}}$ (Tonnes/yr) = (7.5 x 10^{-5} Tonnes/1,000 gal) ÷ (7 miles/gal) x (506 mi/trip) x (104 trips/yr) = 0.0006 Tonnes/yr

Calculations for CO2-e

Emissions$_{\mathbf{CO2\text{-}e}}$ (Tonnes/yr) = (100 Tonnes/yr CO_2) + (0.0006 Tonnes/yr CH_4 x 21) + (0.001 Tonnes/yr N_2O x 310) = 101 Tonnes/yr CO2-e

Incremental GHG emissions from mobile sources associated with the VIP Amendments, using both *Compendium* and CCAR emission factors, are presented in **Table A-12**.

Calculations of VIP Amendments Net GHG Emissions

Emissions$_{\mathbf{CO2\text{-}e}}$ (Tonnes/yr) = (-11,780 Tonnes/yr Combustion) + (101 Tonnes/yr Mobile Sources) = -11,679 Tonnes/yr

Valero Refining Company
Valero Improvement Project Amendments

Table A-1
Pipestill Furnace Emissions - Short Term

Furnace Fired Heat Duties, HHV (MMBtu/hr)

Fuel	F-105	F-106	F-103
Fuel Gas	349.5	169.8	53
CO Gas	179.8	89.4	0
Total	529.3	259.2	53

For F-105 and F-106, the CO Gas/Fuel Gas breakdowns are approximate

Short-Term Main Stack Emission Limitation

Pollutants	Limits	Comments
NO_x	150 ppmvd @3% O_2	Operating Day Average
SO_2	784 ppmvd @3% O2	Operating Day Average
PM10/PM2.5	40 Lbs/hr	Demonstrated by Source Test
POC	N/A	No Short-Term Limits
CO	400 ppmvd @3% O_2	Operating Day Average

Source: BAAQMD Permit Condition 20820 Part 21

Estimated Short-Term Emissions - New CO Furnaces, F-105/F-106

Scrubber Dry Gas Flow: 360,000 dscfm *Both Furnaces Combined*

Pollutants	Concentration or Emission Factor	Emissions Lbs/hr	Comments
NO_x	100 ppmv @0% O_2	258.1	Proposed BACT
SO_2	50 ppmv @0% O_2	179.5	Consent Decree - 7-Day Average
PM10/PM2.5	N/A	39.9	Hourly MSEL - Less F-103 Emissions
POC	N/A	N/A	No Short-Term Emissions Established
CO	100 ppmv @3% O_2	183.4	Proposed BACT - 7-Day Average

Estimated Short-Term Emissions - Existing Furnace F-103

Totals 53.0 MMBtu/hr FG *Balance of Currently Permitted Heat Input*

Pollutants	Concentration or Emission Factor	Emissions Lbs/hr	Comments
NO_x	50 ppmv @3% O_2	3.1	Engineering Estimate
SO_2	45 ppmv S in RFG	0.3	RFG Sulfur Limit
PM10/PM2.5	0.0025 lb/MMBtu	0.1	Basis: Permit Condition for Source S-237
POC	0.0023 lb/MMBtu	0.1	Engineering Estimate
CO	30 ppmv @3% O_2	1.1	Engineering Estimate

MSEL = Main Stack Emission Limitation per BAAQMD Condition #20820 Parts 8 and 21

Valero Refining Company
Valero Improvement Project Amendments

Table A-2
Pipestill Furnace Emissions - Annual

Annual Emissions - F-103, F-105, and F-106

Pollutants	Annual Emissions TPY	Basis
NO_X	578.9	Calculated
SO_2	394.7	Calculated
PM10/PM2.5	106.5	MSEL
POC	16.1	Proposed MSEL[1]
CO	288.0	MSEL

Estimated Annual Emissions - New CO Furnaces, F-105 and F-106

Dry Gas Flow: 360,000 dscfm *Both Furnaces Combined*

Pollutants	Concentration or Emission Factor	Emissions TPY	Comments
NO_x	50 ppmv @0% O_2	565.2	Proposed BACT
SO_2	25 ppmv @0% O_2	393.2	Consent Decree - 365 Day Average
PM10/PM2.5	N/A	105.9	MSEL - Less F-103 Emissions
POC	N/A	15.6	Proposed MSEL - Less F-101/102/103 Emissions
CO	N/A	283.0	MSEL - Less F-103 Emissions

Estimated Annual Emissions - Existing Furnace F-103

Totals 53.0 MMBtu/hr FG *Balance of Currently Permitted Heat Input*

Pollutants	Concentration or Emission Factor	Emissions TPY	Comments
NO_x	50 ppmv @3% O_2	13.7	Engineering Estimate
SO_2	45 ppmv S in RFG	1.5	RFG Sulfur Limit
PM10/PM2.5	0.0025 lb/MMBtu	0.6	Basis: Permit Condition for Source S-237
POC	0.0023 lb/MMBtu	0.5	Engineering Estimate
CO	30 ppmv @3% O_2	5.0	Engineering Estimate

MSEL = Main Stack Emission Limitation per BAAQMD Condition #20820 Parts 8 and 21

[1]POC VIP Emission Limitation was based on a single source that did not accurately represent the variability of emissions from the process; application to correct limit submitted to BAAQMD in October 2006

Total Estimated Main Stack Annual Emissions

Pollutants	Emissions (Tons/yr)		
	F-105/F-106	F-103	Total
NO_x	510.2	175.9	686.1
SO_2	355.0	19.4	374.4
PM10/PM2.5	99.0	7.5	106.5
POC	9.2	6.9	16.1
CO	223.8	64.2	288.0

Table A-3
Hydrogen Plant Reformer Furnace Criteria Pollutant Potential To Emit

Pollutants	BACT Emission Factor	Unit of Measure	Emission Factor (lb/MMBtu)	Reformer Furnace 980 MMBtu/hr			Reference
				Lb/hr	Lb/day	TPY	
NO_x	7	ppmv @ 3% O_2	0.0082	8.1	194.0	35.4	Proposed BACT
SO_2	45	ppmv TRS in fuel gas	0.0065	6.4	153.2	28.0	Proposed BACT
PM10/PM2.5	0.0025	lb/MMBtu	0.0025	2.5	58.8	10.7	Permit Condition for Source S-237
POC	0.0023	lb/MMBtu	0.0023	2.3	54.1	9.9	Proposed BACT
CO	30	ppmv @ 3% O_2	0.0215	21.1	506.1	92.4	Proposed BACT
NH_3	10	ppmv @ 3% O_2	0.0044	4.3	102.4	18.7	Proposed by Valero

Higher Heating Value of Fuel Gas (Btu/scf) = 1,150

Table A-4
Vehicle Miles Traveled

Truck Route	Trucks/Week	Miles R/T	Total Trucks/Yr	Total Mi/Yr
BAAQMD Boundary to Valero	2	100	104	10,400
Totals	2	100	104	10,400

Table A-5
Motor Vehicle Entrained Paved Road PM10 Emission Factors

Vehicle Type	On-Road Average Vehicle Weight (tons)[a]	Road Type	Silt Loading (g/m2)[b]	PM10 Emission Factor (lb/mi)[c]
Off-Site Delivery Truck	2.4	Freeway	0.02	0.0006

a. Off-site average vehicle weight from Methodology 7.9, Entrained Road Dust (1997)

b. From ARB Emission Inventory Methodology 7.9, Entrained Paved Road Dust (1997)

c. Emission factor [g/mi] = 7.26 (Silt Loading/2)0.65 (Weight/3)1.5, from
ARB Emission Inventory Methodology 7.9, Entrained Paved Road Dust

Table A-6
Mobile Source Criteria Pollutant Emissions

Pollutant	Model Emissions, Tons/day	Emission Factor lb/mile	Emissions Lb/Day	Emissions Tons/yr
NO_x	50.48	0.035	3.6	0.18
SO_2	0.06	0.00004	0.00	0.0002
PM10/PM2.5	2.03	0.0020	0.2	0.0103
POC	4.07	0.0028	0.3	0.01
CO	14.58	0.010	1.1	0.1

Basis: 2,878,000 VMT/day

Model run for heavy heavy-duty diesel trucks for calendar year 2010

Emissions [pounds/day] = Emission factor [pounds/mile] x Vehicle miles traveled [miles/day]

Table A-7
VIP Amendments Emission Changes

Daily Emissions	Emission Changes (lb/day)				
	NOx	**SO_2**	**PM10/ PM2.5**	**POC**	**CO**
Emission Changes in VIP Amendments					
FCCU/CKR Scrubber and F-103	-851	-12,665	12	0	59
New Hydrogen Plant	194.0	153.2	58.8	54.1	506.1
Fugitive Emissions	0	0	0	16	0
Trucks	1	0.00	0.1	0.1	0.3
Total VIP Amendments Emission Changes	**-656**	**-12,512**	**70**	**71**	**565**
Annual Emissions	**Emission Changes (tons/year)**				
	NOx	**SOx**	**PM10/ PM2.5**	**POC**	**CO**
FCCU/CKR Scrubber and F-103	-155	-2,311	2	0.0	11
New Hydrogen Plant	35.4	28.0	10.7	9.9	92.4
Fugitive Emissions	0	0	0	3	0
Trucks	0.2	0.0002	0.01	0.01	0.1
Total VIP Amendments Emission Changes	**-120**	**-2,283**	**13**	**13**	**103**

Note: The emissions shown in Table A-7 do not include emission changes from incremental firing of other sources. The emissions shown for the new hydrogen plant are the potential to emit, not the projected actual operations shown in ***Table 4.***

Table A-8
Toxic Emissions Data

Pollutant	Avg.Emissions g/sec	Lb/hr	Lb/MMBtu
Naphthalene	4.16E-03	3.30E-02	9.40E-05
Benzo(a)Anthracene	3.36E-08	2.66E-07	7.59E-10
Benzo(a)Pyrene	3.36E-08	2.66E-07	7.59E-10
Benzo(b)Fluoranthene	3.36E-08	2.66E-07	7.59E-10
Benzo(k)Fluoranthene	3.36E-08	2.66E-07	7.59E-10
Indeno(1,2,3-cd)Pyrene	3.36E-08	2.66E-07	7.59E-10
Dibenzo(a,h)Anthracene	3.36E-08	2.66E-07	7.59E-10
Arsenic	1.09E-05	8.64E-05	2.46E-07
Cadmium	4.08E-06	3.24E-05	9.22E-08
Chromium (Total)	4.06E-05	3.22E-04	9.17E-07
Copper	4.73E-05	3.75E-04	1.07E-06
Lead	1.20E-05	9.52E-05	2.71E-07
Manganese	2.17E-05	1.72E-04	4.90E-07
Mercury	1.31E-05	1.04E-04	2.96E-07
Zinc	1.22E-04	9.67E-04	2.76E-06
Nickel	8.63E-05	6.84E-04	1.95E-06
Hexavalent Chromium	7.19E-06	5.70E-05	1.62E-07
Formaldehyde	4.47E-04	3.54E-03	1.01E-05
Acetaldehyde	1.04E-04	8.25E-04	2.35E-06
Phenol	1.63E-04	1.29E-03	3.68E-06
Benzene	9.02E-05	7.15E-04	2.04E-06
Toluene	2.48E-04	1.97E-03	5.60E-06
Xylene	1.23E-04	9.75E-04	2.78E-06
NH_3	3.92E-02	3.11E-01	8.86E-04
H_2S	1.00E-02	7.93E-02	2.26E-04

From Source Test on F-4460 Hot Oil Furnace
Testing Performed Jan/Feb 1996
Heat Input of F-4460: 351 MMBtu/hr

Table A-9a
Summary of Toxic Air Contaminant Emissions

CAS No	Pollutant	H2U Reformer Furnace Emission Factor (lb/MMBtu)[1]	H2U Reformer Furnace Emissions (lb/yr) 980 MMBtu/hr	Fugitive Emissions (lb/yr)	Total TAC Emissions (lb/yr)	Chronic Trigger Level (lb/yr)[2]	Exceed Trigger? (Yes/No)
75-07-0	Acetaldehyde	2.3E-06	2.0E+01		2.0E+01	6.40E+01	No
7664-41-7	Ammonia[3]	4.4E-03	3.7E+04		3.7E+04	7.70E+03	**Yes**
7440-38-2	Arsenic	2.5E-07	2.1E+00		2.1E+00	1.20E-02	**Yes**
71-43-2	Benzene	2.0E-06	1.7E+01	1.2E+02	1.4E+02	6.40E+00	**Yes**
56-55-3	Benzo(a)Anthracene	7.6E-10	6.5E-03		6.5E-03	PAH	N/A
50-32-8	Benzo(a)Pyrene	7.6E-10	6.5E-03		6.5E-03	PAH	N/A
205-99-2	Benzo(b)Fluoranthene	7.6E-10	6.5E-03		6.5E-03	PAH	N/A
205-82-3	Benzo(k)Fluoranthene	7.6E-10	6.5E-03		6.5E-03	PAH	N/A
7440-43-9	Cadmium	9.2E-08	7.9E-01		7.9E-01	4.50E-02	**Yes**
7440-47-3	Chromium (Total)	9.2E-07	7.9E+00		7.9E+00	N/A	N/A
7440-50-8	Copper	1.1E-06	9.2E+00		9.2E+00	9.30E+01	No
53-70-3	Dibenzo(a,h)Anthracene	7.6E-10	6.5E-03		6.5E-03	PAH	N/A
100-41-4	Ethylbenzene			1.2E+02	1.2E+02	7.70E+04	No
50-00-0	Formaldehyde	1.0E-05	8.7E+01		8.7E+01	3.00E+01	**Yes**
18540-29-9	Hexavalent Chromium	1.6E-07	1.4E+00		1.4E+00	1.30E-03	**Yes**
7783-06-4	Hydrogen Sulfide	2.3E-04	1.9E+03		1.9E+03	3.90E+02	**Yes**
193-39-5	Indeno(1,2,3-cd)Pyrene	7.6E-10	6.5E-03		6.5E-03	PAH	N/A
7439-92-1	Lead	2.7E-07	2.3E+00		2.3E+00	5.40E+00	No
7439-96-5	Manganese	4.9E-07	4.2E+00		4.2E+00	7.70E+00	No
7439-97-6	Mercury	3.0E-07	2.5E+00		2.5E+00	5.60E-01	**Yes**
91-20-3	Naphthalene	9.4E-05	8.1E+02		8.1E+02	PAH	N/A
7440-02-0	Nickel	1.9E-06	1.7E+01		1.7E+01	7.30E-01	**Yes**
108-95-2	Phenol	3.7E-06	3.2E+01		3.2E+01	7.70E+03	No
108-88-3	Toluene	5.6E-06	4.8E+01	3.0E+02	3.5E+02	1.20E+04	No
108-38-3	Xylene	2.8E-06	2.4E+01	3.6E+02	3.8E+02	4.90E+01	**Yes**
7440-66-6	Zinc	2.8E-06	2.4E+01		2.4E+01	1.40E+03	No
Total TAC Emissions					4.1E+04		

1. Emission factors developed from source test conducted on F-4460 in 1996, except ammonia
2. Trigger Level presented in BAAQMD Table 2-5
3. Ammonia emissions based on BACT
4. Heat input capacity of this unit is 614 MMBtu/hr. The figure used in the calculation is the actual 2006 annual average firing rate.

Table A-9b
Polycyclic Aromatic Hydrocarbon Equivalence - H2U Furnace

CAS No	PAH Name	Emissions (lb/yr)	PEF	B(a)P Equivalent
56-55-3	Benzo(a)Anthracene	6.5E-03	0.1	6.5E-04
50-32-8	Benzo(a)Pyrene	6.5E-03	1	6.5E-03
205-99-2	Benzo(b)Fluoranthene	6.5E-03	0.1	6.5E-04
205-82-3	Benzo(k)Fluoranthene	6.5E-03	0.1	6.5E-04
53-70-3	Dibenzo(a,h)Anthracene	6.5E-03	0.1	6.5E-04
193-39-5	Indeno(1,2,3-cd)Pyrene	6.5E-03	1.05	6.8E-03
Benzo(a)Pyrene Equivalent				1.6E-02
PAH Chronic Trigger Level (Benzo(a)Pyrene Equivalent)				1.10E-02
Exceed Trigger Level?				**Yes**

Table A-10
Fugitive TAC Emission Increases

Chemical Name	CAS Number	Maximum Concen-tration	Fugitive TAC Emissions			
			lb/hr	lb/day	lb/yr	tpy
Benzene	71-43-2	2%	1.4E-02	3.3E-01	1.2E+02	6.0E-02
Ethylbenzene	100-41-4	2%	1.4E-02	3.3E-01	1.2E+02	6.0E-02
Toluene	108-88-3	5%	3.4E-02	8.2E-01	3.0E+02	1.5E-01
Xylene	1330-20-7	6%	4.1E-02	9.9E-01	3.6E+02	1.8E-01

Total Fugitive POC Emission Increase: 3.0 Tons/Year
16.4 Lb/Day

Speciated emissions from fugitives are calculated by:
POCi = Ci * POC
where POCi = emissions of species i
Ci = maximum concentration of species i (from EPA TANKS program)
POC = total POC emissions

Table A-11
Incremental Change to Greenhouse Gas Emissions

Change in Refinery Fuel Gas Consumption Compared to VIP

Source	Change (MMBtu/hr)
Increased Firing of GT-702	70
Reduced Firing of Boilers Due to H2U Efficiency Improvements	-100
Increased Firing of Boilers for Soot Blowing	9
	-21

Combustion Emission Factors

Parameter	Tonnes/MMBtu	Reference
CO_2	6.39E-02	*GRP2.2 Table C5*[2]
CH_4	5.90E-06	*Table C5, nat gas*
N_2O	1.00E-07	*Table C5, nat gas*

[1]Assumes lowest EF value for RFG, HHV > 9.9 MMBtu/hr
[2]Emission factor for still gas

Change to Combustion GHG Emissions

Parameter	GHG Emissions Tonnes/year
CO_2	-11,751
CH_4	-1.09E+00
N_2O	-1.84E-02
CO_2-e	**-11,780**

<u>References</u>
GRP2.2 = General Reporting Protocol version 2.2, California Climate Action Registry, March 2007

Table A-12
Incremental Change to Greenhouse Gas Emissions
Mobile Sources

VIP Amendments Operations

Truck Route	Trucks/Week	Miles R/T	Total Mi/Week	Total Mi/Yr
Valero to Buttonwillow	2	506	1,012	52,624

CO_2 Emission Factor

Fleet Vehicle Miles Traveled/Day	2,878,000
CO_2 Emissions, Tons/Day	6,040
CO_2 Emissions, Tonnes/Day	5,479
Emission Factor, Tonnes/Mile	0.00190

Reference: *EMFAC2007 for Heavy-duty diesel trucks*

N_2O and CH_4 Emission Factors

Pollutant	Tonnes/1,000 Gal Fuel	Tonnes/Mile
N_2O	1.33E-04	1.90E-08
CH_4	7.35E-05	1.05E-08
Reference	*GRP2.2 Table C4*	

Heavy Duty Truck Fuel Economy: 7 miles/gallon

Pollutant	Tonnes/Year CO2-e
CO_2	100
N_2O	0.3
CH_4	0.01
Total CO2-e	**101**

References
GRP2.2 = General Reporting Protocol version 2.2, California Climate Action Registry, March 2007
EMFAC2007 = California Air Resources Board EMission FACtors model for vehicle emissions

Appendix C
AERMET Meteorological Processing

Prepared for:
Valero Refining Company – California
Benicia Refinery

AERMET Meteorological Processing

ENSR Corporation
September 2007
Document No.: 06993-023-300-D

ENSR | AECOM

ENSR | AECOM

Prepared for:
Valero Refining Company – California
Benicia Refinery

AERMET Meteorological Processing

Prepared By

Reviewed By

ENSR Corporation
September 2007
Document No.: 06993-023-300-D

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List of Abbreviations and Acronyms

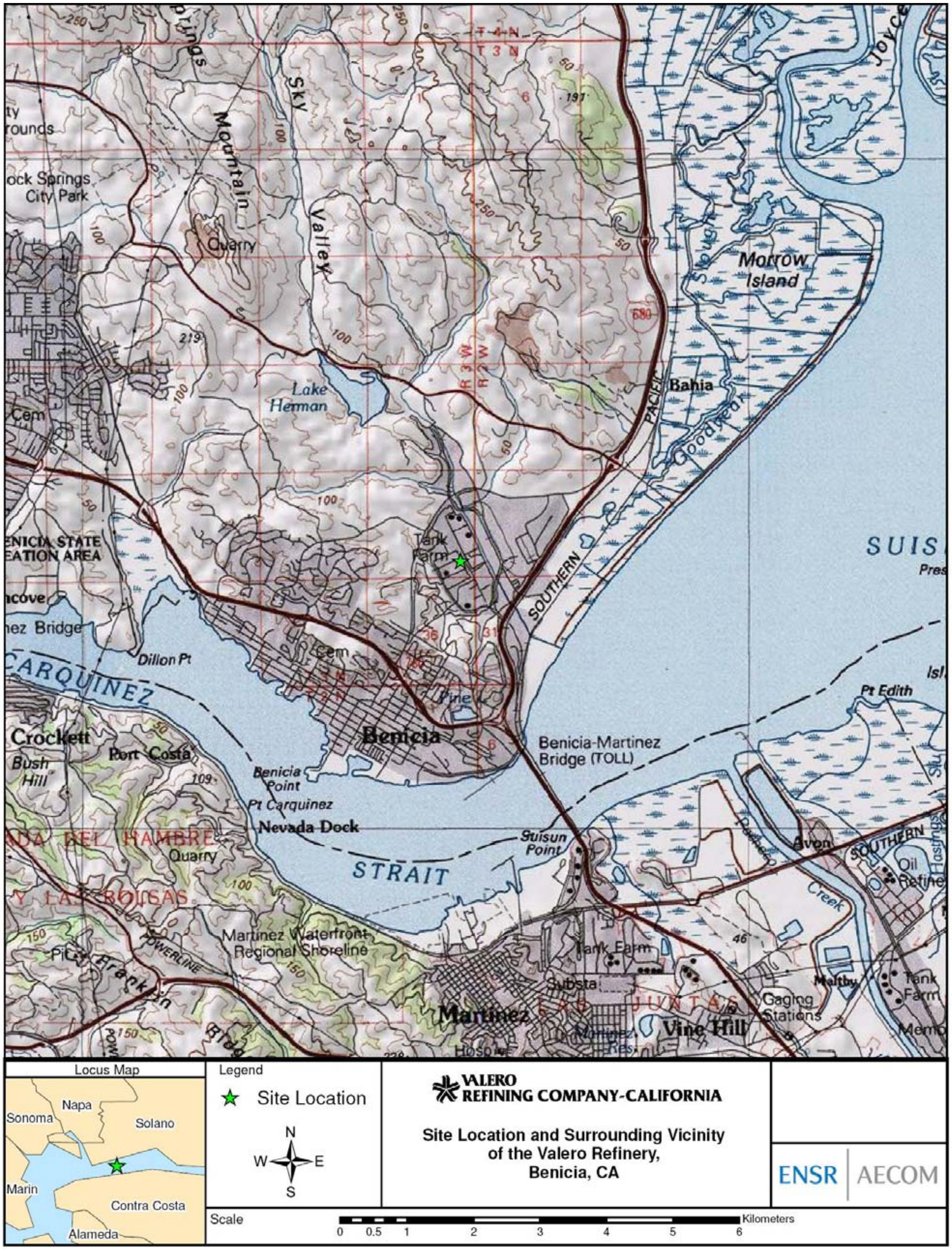
AAQS	Ambient Air Quality Standards
AIG	AERMOD Implementation Guide
BAAQMD	Bay Area Air Quality Management District
B_o	Bowen ratio
km	kilometers
NWS	National Weather Service
r	Albedo
USEPA	U.S. Environmental Protection Agency
z_o	surface roughness

1.0 Introduction

This appendix describes the meteorological processing that was performed to prepare the data for input to AERMOD in support of the ambient air quality modeling analysis for the Valero Refining Company – California (Valero). This analysis was performed for Valero's Use Permit application for the project known as the Valero Improvement Project (VIP) Amendments. The processing followed the guidance provided in the U.S. Environmental Protection Agency (USEPA) AERMOD Implementation Guide (AIG) (USEPA 2005a).

Figure 1-1 presents the facility location on a topographic map.

Figure 1-1 Location of the Valero Refinery



2.0 Meteorological Data Processing

2.1 Dispersion Environment

The application of the dispersion model requires characterization of the local dispersion environment (within three kilometers [km]) as either urban or rural, based on an USEPA-recommended procedure (Auer, 1978) that characterizes an area by prevalent land use. This land use approach classifies an area according to 12 land use types. In this scheme, areas of industrial, commercial, and compact residential land use are designated urban. According to the USEPA Guideline on Air Quality Models (USEPA 2005b), if more than 50 percent of an area within a three-km radius of the proposed facility is classified as rural, then rural dispersion assumptions are to be used in the dispersion modeling analysis. Conversely, if more than 50 percent of the area is urban, urban dispersion is assumed.

As shown in **Figure 2-1**, the land-use within 3 km of the Refinery is primarily rural, which is consistent with the dispersion coefficients used in the original VIP modeling. AERMOD does not require any specification for rural applications since rural dispersion is the default dispersion mode.

2.2 Availability of Onsite Meteorological Data

The AERMOD model requires a sequential hourly record of dispersion meteorology representative of the region of the sources to be modeled. The USEPA and Bay Area Air Quality Management District (BAAQMD) modeling guidelines recommended that, if available, refined modeling should be conducted with one year of onsite meteorological data. Two meteorological towers are operated at the Refinery that measure and record wind speed, wind direction and temperature data. The location of the “Admin” and “Warehouse” Met Towers are shown below in **Figures 2-2** and **2-3**, respectively. The 2005 data was used because this is the most recent data available from BAAQMD, and BAAQMD has identified this year to be complete for dispersion modeling purposes (i.e., data capture greater than or equal to 90 percent). The onsite data sets were supplemented with National Weather Service (NWS) data from Buchanan Field Airport in Concord, California, to provide cloud cover and cloud ceiling height data also required for the modeling. Concurrent upper air data from Metropolitan Oakland International Airport in Oakland, California, was used, as required, for the dispersion modeling.

Given some observed differences in wind directions between the Admin and Warehouse Met Towers (see **Figures 2-4** and **2-5**, respectively), both tower data sets were used in the modeling and the higher of the modeled concentrations from either set was used to demonstrate compliance with the California and National Ambient Air Quality Standards (AAQS).

Figure 2-1 Land Use Within 3 Kilometers of the Valero Refinery

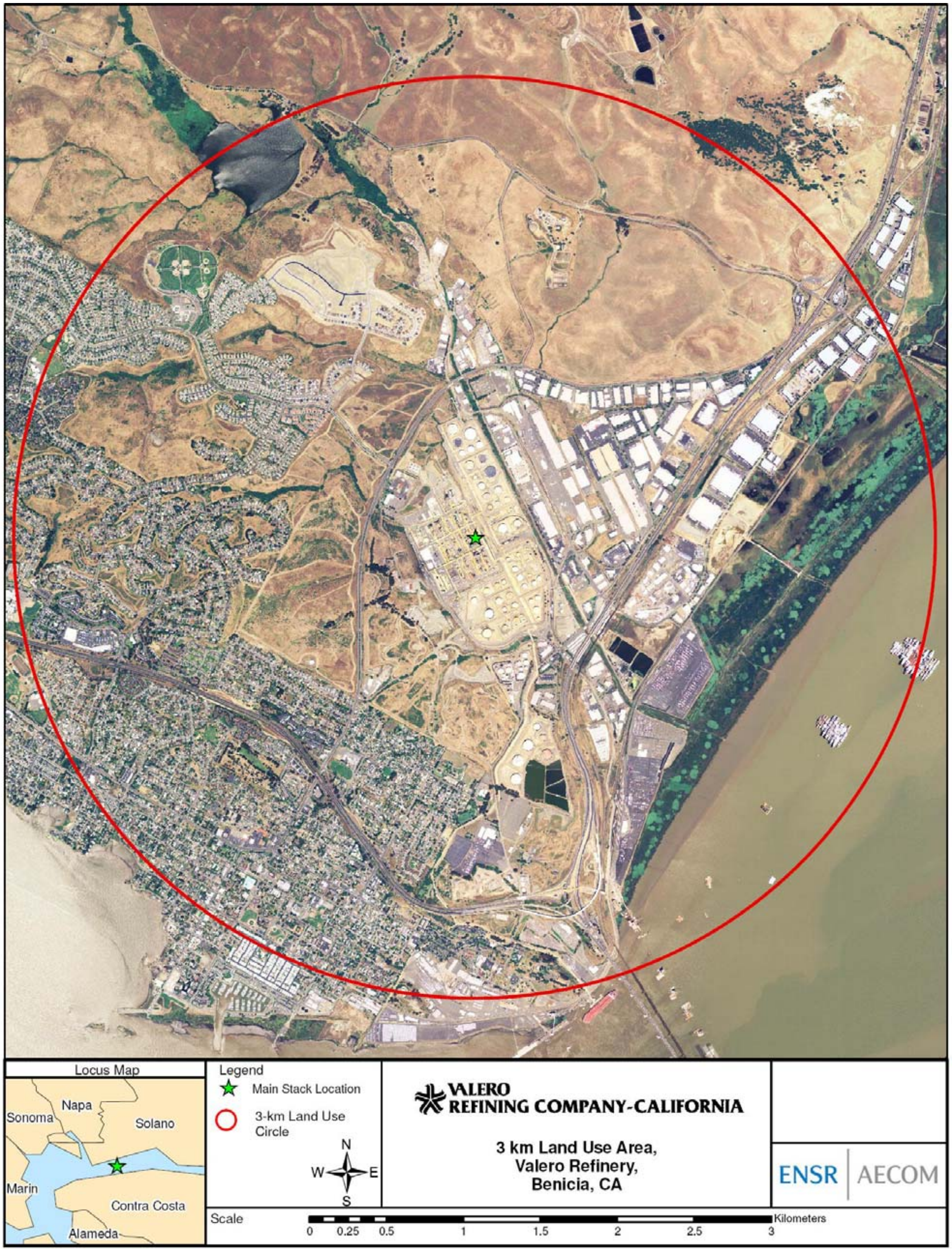


Figure 2-2 Three-Kilometer Land-use Circle Around the Admin Met Tower

Figure 2-3 Three-Kilometer Land-use Circle Around the Warehouse Met Tower

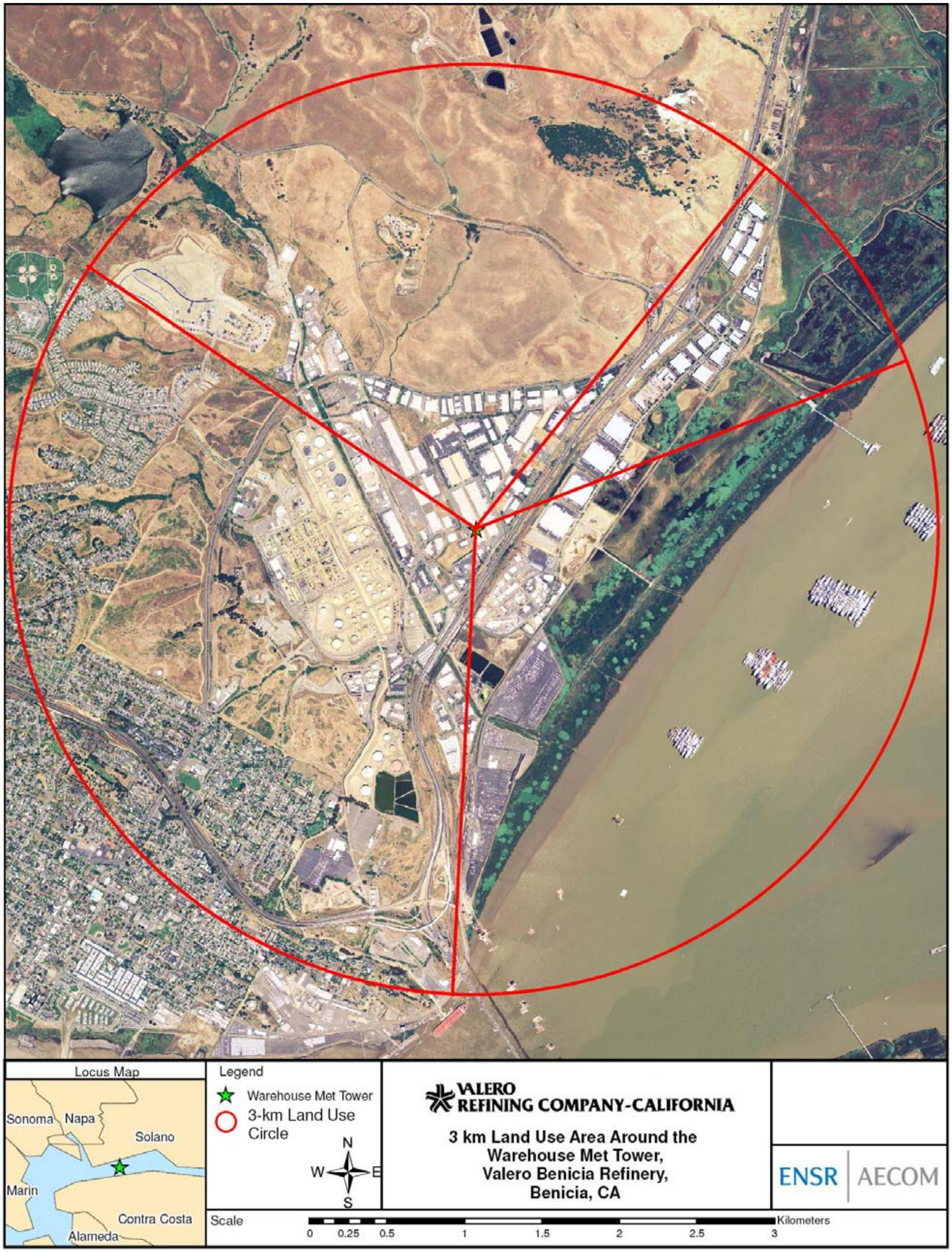
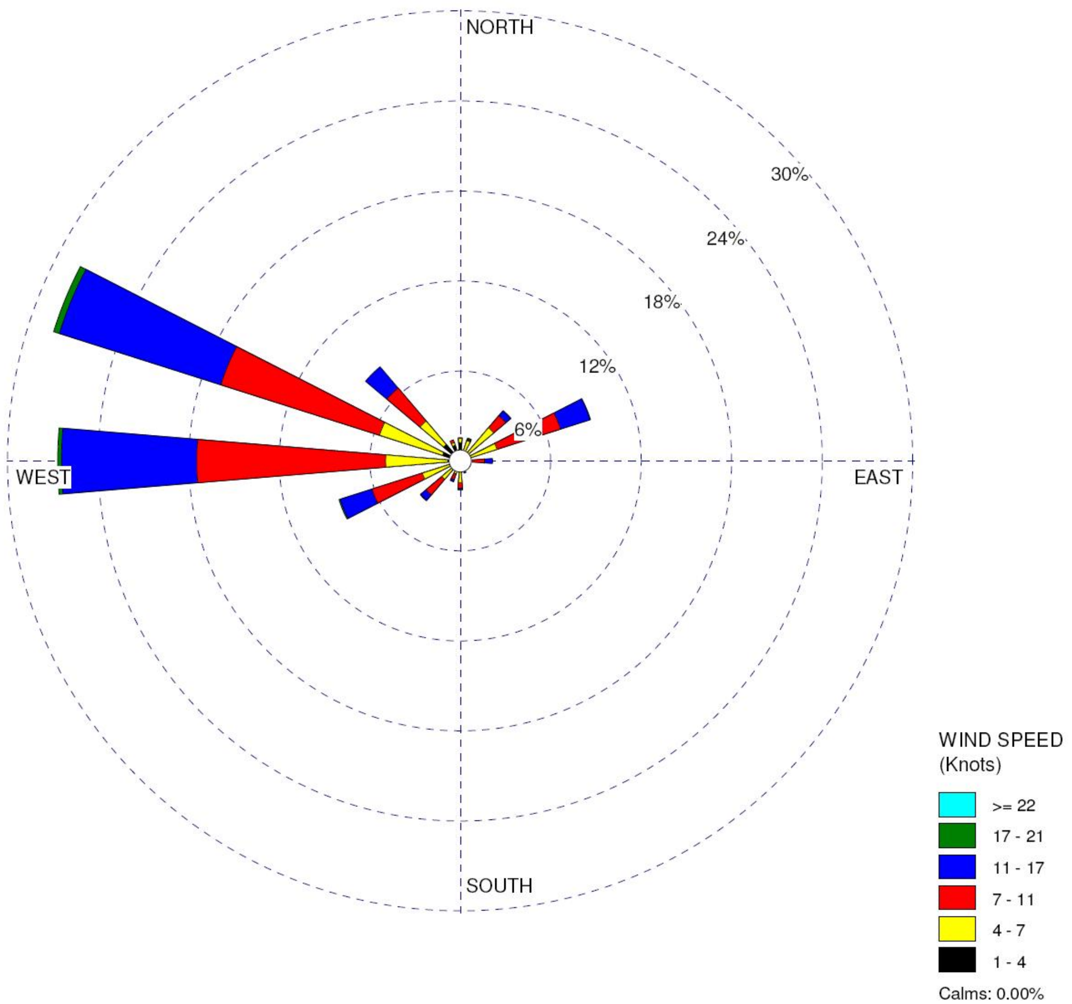


Figure 2-4 Wind Rose (2005) for the Admin Met Tower

WIND ROSE PLOT:
Valero Admin Met Tower, Benicia, CA
Wind Rose for 2005

DISPLAY:
Wind Speed
Direction (blowing from)



COMMENTS:

DATA PERIOD:
2005
Jan 1 - Dec 31
00:00 - 23:00

COMPANY NAME:
ENSR

VALERO REFINING COMPANY-CALIFORNIA

CALM WINDS:
0.00%

TOTAL COUNT:
8758 hrs.

AVG. WIND SPEED:
9.01 Knots

DATE:
4/5/2007

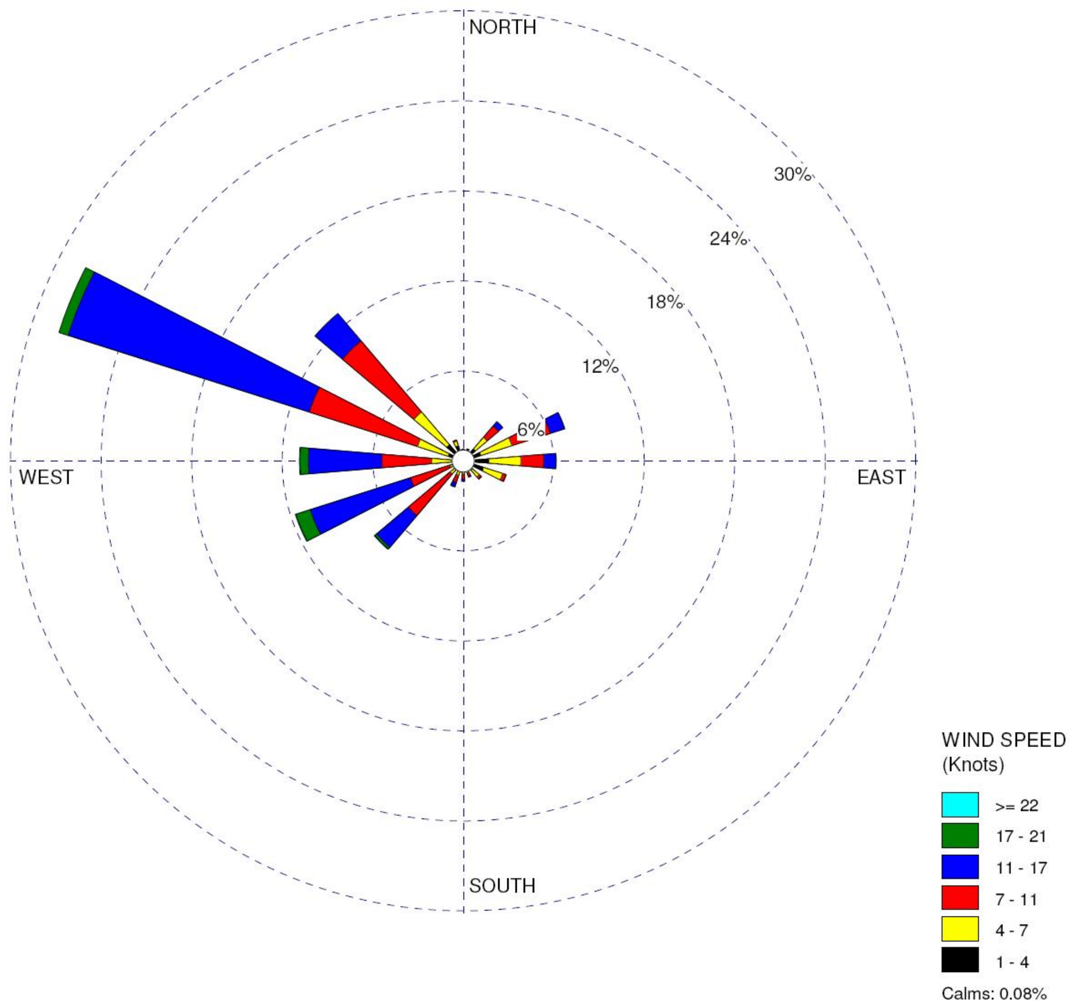
PROJECT NO.:
06993-023-400

WRPLOT View - Lakes Environmental Software

Figure 2-5 Wind Rose (2005) for the Warehouse Met Tower

WIND ROSE PLOT:
Valero Warehouse Met Tower, Benicia, CA
Wind Rose for 2005

DISPLAY:
Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	2005 **Jan 1 - Dec 31** **00:00 - 23:00**	**ENSR**	
		MODELER: **Richard Hamel**	VALERO REFINING COMPANY-CALIFORNIA
	CALM WINDS: **0.08%**	TOTAL COUNT: **8754 hrs.**	
	AVG. WIND SPEED: **9.55 Knots**	DATE: **4/5/2007**	PROJECT NO.: **06993-023-400**

WRPLOT View - Lakes Environmental Software

2.3 Meteorological Data Processing with AERMET

One year (2005) of wind speed, wind direction and temperature data from each of two on-site meteorological towers (Admin and Warehouse Met Towers), NWS cloud data from Buchanan Field Airport in Concord, California, and concurrent upper air data from Metropolitan Oakland International Airport in Oakland, California, obtained from BAAQMD, were processed with AERMET (Version 06341). Concurrent Buchanan Field Airport cloud cover data exceeds 90 percent and, therefore, meets the USEPA's minimum data capture requirement for use in air quality modeling.

AERMET was run to create two meteorological data files required for input to AERMOD:

- SURFACE: a file with boundary layer parameters such as sensible heat flux, surface friction velocity, convective velocity scale, vertical potential temperature gradient in the 500-meter layer above the planetary boundary layer, and convective and mechanical mixing heights. Also provided are values of Monin-Obukhov length, surface roughness, albedo, Bowen ratio, wind speed, wind direction, temperature, and heights at which measurements were taken.

- PROFILE: a file containing multi-level meteorological data with wind speed, wind direction, temperature, and sigma-theta and sigma-w when such data are available. For this application involving on-site tower data, the profile file will contain a single level of wind data (23.3 meters for the Admin Met Tower and 24.7 meters for the Warehouse Met Tower) and the temperature data only.

AERMET requires specification of site characteristics including surface roughness (z_o), Albedo (r), and Bowen ratio (B_o) that are developed according to the guidance provided by USEPA in the AERMET User's Guide (USEPA 1998) and the AIG (USEPA 2005a).

The AIG recommends that the surface characteristics should be determined based on the land use within 3 km of the site where the surface meteorological data were collected. The land-use has been delineated within three km of the two on-site meteorological towers. The primary source of information used to characterize the land-use was aerial photographs (year 2005; http://archive.casil.ucdavis.edu/casil/remote_sensing/naip_2005/). **Figures 2-2** and **2-3** show the aerial photographs covering the 3 km radius area about the Valero Admin and Warehouse towers respectively. The photographs were reviewed for the land-use types specified in the AERMET User's Guide as listed in **Tables 2-1** and **2-2**.

Based on a review of the aerial photography, the 3 km area surrounding the meteorological sites consist of a mix of urban, swamp, grassland, and water. Monthly values (based on seasonal variability) of the site characteristics are required by AERMET based on weighted land use for the 3 km area. As recommended by the AIG, the 3 km area was broken down into sectors; 3 sectors for Admin Met Tower and 4 sectors for the Warehouse Met Tower, based upon visual observation of the land-use about the meteorological sites as shown on aerial photographs (see **Figures 2-4** and **2-5**). **Tables 2-1** and **2-2** summarize the land-use categories and percentages developed for each sector at each site.

Table 2-1 Surface Characteristics to be Used as Input to AERMET for Admin Met Tower

Land-Use Type	Fractional Land-Use		
	Sector 1 307-68 deg.	**Sector 2 68-161 deg.**	**Sector 3 16-307 deg.**
Water	0.05	0.05	0
Deciduous	0	0	0
Coniferous	0	0	0
Swamp	0.05	0.2	0
Cultivated Land	0	0	0
Grassland	0.8	0.1	0.35
Urban (Default)	0.1	0.6	0.6
Urban (Paved) [1]	0	0.05	0
Desert Shrubland	0	0	0

1. Only applies to surface roughness; see footnotes in surface characteristic spreadsheet on CD-ROM for details.

Table 2-2 Surface Characteristics to be Used as Input to AERMET for Warehouse Met Tower

Land-Use Type	Fractional Land-Use			
	Sector 1 304-39 deg.	**Sector 2 39-69 deg.**	**Sector 3 69-183 deg.**	**Sector 4 183-304 deg.**
Water	0	0	0.65	0
Deciduous	0.05	0	0	0
Coniferous	0	0	0	0
Swamp	0	0.4	0.2	0
Cultivated Land	0	0	0	0
Grassland	0.8	0.25	0	0.4
Urban (Default)	0.1	0.35	0.1	0.55
Urban (Paved) [1]	0.05	0	0.05	0.05
Desert Shrubland	0	0	0	0

1. Only applies to surface roughness; see footnotes in surface characteristic spreadsheet on CD-ROM for details.

The seasonal values of the site characteristics (z_o, r, and Bo) for the areas of the meteorological towers were developed based on the recommended values for the various land-use types in the AERMET User's Guide and computed as area-weighted values using the land-use percentages listed in **Tables 2-1** and **2-2**. For the purpose of defining seasonal values, months were assigned to seasons as follows based on climatology of the area: Summer – June, July, August, September,; Fall – October, November, December, January, February, March; Spring –April, May. The proposed seasonal values of B_o, r and z_o for use in AERMET are provided in **Tables 2-3** through **2-5** for the Admin Met Tower and **Tables 2-6** through **2-8** for the Warehouse Met Tower, respectively. Representative climatological precipitation data for Martinez Water Plant[1] were used to determine the monthly Bowen ratio. In order to determine whether the rainfall for a given month of meteorological data was average, abnormally wet, or abnormally dry, the following process was used:

- The month being considered is compared to the average rainfall for that month over at least a 30-year period (in this case 1970-2005).
- If the month had more than twice the average rainfall for that month over the climatological period, it was classified "wet" for calculating the Bowen ratio for that month.
- If the month had less than half the average rainfall for that month over the climatological period, the month was classified "dry" for use in calculating the Bowen Ratio.
- Otherwise, the month is considered "average" and no adjustment is made.

The winter season is defined as any month that had an observed snow cover on more than 50 percent of the days, which would yield a higher albedo. Since there was no snow cover during the processing period, which is typical of this climate, none of the months were classified as winter. Winter surface characteristics are provided in **Tables 2-3** through **2-5** for informational purposes only and were not used in the analysis. The season definitions and Bowen ratio determinations are consistent with recommendations provide in Appendix F of the AERMET *User's Guide*. A spreadsheet with the computation of the weighted values of these surface characteristics is included in the computer modeling archive CD-ROM.

The base elevation of the Admin Met Tower is 54.9 meters (180 feet) above sea level. The base elevation of the Warehouse Met Tower is 15.2 meters (49.9 feet) above sea level.

1 http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca5378

Table 2-3 Seasonal Bowen Ratio Used as Input to AERMET for Admin Met Tower

	Bowen Ratio Values from AERMET User's Guide											
	Average				Dry				Wet			
Land-Use Type	Spring	Summer	Autumn	Winter	Spring	Summer	Autumn	Winter	Spring	Summer	Autumn	Winter
Water	0.1	0.1	0.1	1.5	0.1	0.1	0.1	2.0	0.1	0.1	0.1	0.3
Deciduous	0.7	0.3	1.0	1.5	1.5	0.6	2.0	2.0	0.3	0.2	0.4	0.5
Coniferous	0.7	0.3	0.8	1.5	1.5	0.6	1.5	2.0	0.3	0.2	0.3	0.3
Swamp	0.1	0.1	0.1	1.5	0.2	0.2	0.2	2.0	0.1	0.1	0.1	0.5
Cultivated Land	0.3	0.5	0.7	1.5	1.0	1.5	2.0	2.0	0.2	0.3	0.4	0.5
Grassland	0.4	0.8	1.0	1.5	1.0	2.0	2.0	2.0	0.3	0.4	0.5	0.5
Urban	1.0	2.0	2.0	1.5	2.0	4.0	4.0	2.0	0.5	1.0	1.0	0.5
Desert Shrubland	3.0	4.0	6.0	6.0	5.0	6.0	10.0	10.0	1.0	1.5	2.0	2.0
Seasonal Weighted Geometric Mean												
Sector 1	0.38	0.71	0.85	1.50	0.88	1.64	1.64	2.00	0.28	0.38	0.46	0.49
Sector 2	0.51	0.86	0.88	1.50	1.01	1.70	1.70	2.00	0.32	0.51	0.52	0.49
Sector 3	0.73	1.45	1.57	1.50	1.57	3.14	3.14	2.00	0.42	0.73	0.78	0.50

Table 2-4 Seasonal Albedo Used as Input to AERMET for Admin Met Tower

Land-Use Type	Albedo Values from AERMET User's Guide			
	Spring	Summer	Autumn	Winter
Water	0.12	0.10	0.14	0.20
Deciduous	0.12	0.12	0.12	0.50
Coniferous	0.12	0.12	0.12	0.35
Swamp	0.12	0.14	0.16	0.30
Cultivated Land	0.14	0.20	0.18	0.60
Grassland	0.18	0.18	0.20	0.60
Urban	0.14	0.16	0.18	0.35
Desert Shrubland	0.30	0.28	0.28	0.45
Seasonal Weighted Average				
Sector 1	0.17	0.17	0.19	0.54
Sector 2	0.14	0.16	0.18	0.36
Sector 3	0.15	0.17	0.19	0.44

Table 2-5 Seasonal Surface Roughness Used as Input to AERMET for Admin Met Tower

Land-Use Type	Surface Roughness Values from AERMET User's Guide			
	Spring	Summer	Autumn	Winter
Water	0.00	0.00	0.00	0.00
Deciduous	1.00	1.30	0.80	0.50
Coniferous	1.30	1.30	1.30	1.30
Swamp	0.20	0.20	0.20	0.05
Cultivated Land	0.03	0.20	0.05	0.01
Grassland	0.05	0.10	0.01	0.00
Urban	1.00	1.00	1.00	1.00
Desert Shrubland	0.30	0.30	0.30	0.15
Seasonal Weighted Average				
Sector 1	0.15	0.19	0.12	0.10
Sector 2	0.65	0.65	0.64	0.61
Sector 3	0.62	0.64	0.61	0.60

Table 2-6 Seasonal Bowen Ratio Used as Input to AERMET for Warehouse Met Tower

	Bowen Ratio Values from AERMET User's Guide											
	Average				Dry				Wet			
Land-Use Type	**Spring**	**Summer**	**Autumn**	**Winter**	**Spring**	**Summer**	**Autumn**	**Winter**	**Spring**	**Summer**	**Autumn**	**Winter**
Water	0.1	0.1	0.1	1.5	0.1	0.1	0.1	2.0	0.1	0.1	0.1	0.3
Deciduous	0.7	0.3	1.0	1.5	1.5	0.6	2.0	2.0	0.3	0.2	0.4	0.5
Coniferous	0.7	0.3	0.8	1.5	1.5	0.6	1.5	2.0	0.3	0.2	0.3	0.3
Swamp	0.1	0.1	0.1	1.5	0.2	0.2	0.2	2.0	0.1	0.1	0.1	0.5
Cultivated Land	0.3	0.5	0.7	1.5	1.0	1.5	2.0	2.0	0.2	0.3	0.4	0.5
Grassland	0.4	0.8	1.0	1.5	1.0	2.0	2.0	2.0	0.3	0.4	0.5	0.5
Urban	1.0	2.0	2.0	1.5	2.0	4.0	4.0	2.0	0.5	1.0	1.0	0.5
Desert Shrubland	3.0	4.0	6.0	6.0	5.0	6.0	10.0	10.0	1.0	1.5	2.0	2.0
Seasonal Weighted Geometric Mean												
Sector 1	0.47	0.87	1.11	1.50	1.13	2.09	2.22	2.00	0.32	0.44	0.55	0.50
Sector 2	0.32	0.48	0.51	1.50	0.67	1.01	1.01	2.00	0.23	0.32	0.33	0.50
Sector 3	0.14	0.16	0.16	1.50	0.18	0.20	0.20	2.00	0.13	0.14	0.14	0.36
Sector 4	0.69	1.39	1.52	1.50	1.52	3.03	3.03	2.00	0.41	0.69	0.76	0.50

Table 2-7 Seasonal Albedo Used as Input to AERMET for Warehouse Met Tower

Land-Use Type	Albedo Values from AERMET User's Guide			
	Spring	Summer	Autumn	Winter
Water	0.12	0.10	0.14	0.20
Deciduous	0.12	0.12	0.12	0.50
Coniferous	0.12	0.12	0.12	0.35
Swamp	0.12	0.14	0.16	0.30
Cultivated Land	0.14	0.20	0.18	0.60
Grassland	0.18	0.18	0.20	0.60
Urban	0.14	0.16	0.18	0.35
Desert Shrubland	0.30	0.28	0.28	0.45
Seasonal Weighted Average				
Sector 1	0.17	0.17	0.19	0.56
Sector 2	0.14	0.16	0.18	0.39
Sector 3	0.12	0.12	0.15	0.24
Sector 4	0.16	0.17	0.19	0.45

Table 2-8 Seasonal Surface Roughness Used as Input to AERMET for Warehouse Met Tower

Land-Use Type	Surface Roughness Values from AERMET User's Guide			
	Spring	Summer	Autumn	Winter
Water	0.00	0.00	0.00	0.00
Deciduous	1.00	1.30	0.80	0.50
Coniferous	1.30	1.30	1.30	1.30
Swamp	0.20	0.20	0.20	0.05
Cultivated Land	0.03	0.20	0.05	0.01
Grassland	0.05	0.10	0.01	0.00
Urban	1.00	1.00	1.00	1.00
Desert Shrubland	0.30	0.30	0.30	0.15
Seasonal Weighted Average				
Sector 1	0.21	0.25	0.17	0.17
Sector 2	0.44	0.46	0.43	0.37
Sector 3	0.14	0.14	0.14	0.11
Sector 4	0.57	0.59	0.56	0.55

3.0 References

Auer, A. H. 1978. Correlation of Land Use and Cover with Meteorological Anomalies. J. Appl. Meteor., Vol 17, pp 636-643.

U.S. Environmental Protection Agency (USEPA). 2005a. AERMOD Implementation Guide. www.epa.gov/scram001/7thconf/aermod/AERMOD_Implementation_Guide_final_09_27_05.pdf. September.

U.S. Environmental Protection Agency (USEPA). 2005b. Guideline on Air Quality Models (Revised). Codified in the Appendix W to 40 CFR Part 51. OAQPS, Research Triangle Park, North Carolina. November.

U.S. Environmental Protection Agency (USEPA). 1998. AERMET Users Guide (http://www.epa.gov/scram001/metobsdata_procaccprogs.htm#aermet).

Appendix D
Biological Survey Memo

EDAW Inc
150 Chestnut Street, San Francisco, California 94111
T 415.955.2800 F 415.788.4875 www.edaw.com

Memorandum

Date:	*Revised August 2, 2007*
To:	Elizabeth Copley, ENSR Timothy Burchfield, ENSR
From:	Charles Battaglia, EDAW Marylee Guinon, EDAW
Subject:	Results of Biological Survey for Valero Refinery Project

Distribution: Electronic

At your request, EDAW conducted a reconnaissance-level survey of specific sites within the Valero Benicia Refinery (Benicia Refinery) in order to assess general biological resources and the potential for special-status plant and wildlife species to occur. The site specific survey was undertaken to update information presented in the Certified Environmental Impact Report for Valero's Land Use Application for the Valero Improvement Project dated 2002 (Certified EIR), with additional information that represents minor technical changes or additions to the Certified EIR (VIP Amendments). There are three additional areas, located within the Benicia Refinery Boundaries that had not been previously surveyed as part of the Certified EIR for biological resources that we have been asked to assess. Each of the three sites were surveyed on foot and one site was reviewed via aerial photographs.

The refinery is located on the northeast side of Benicia, California, between Interstates 680 and 780. The western and northern sides of the refinery are bordered by rolling hills composed of annual grassland and scattered shrubs, the eastern side is bordered by Sulphur Springs Creek, beyond which is industrial development and eventually salt-marsh habitat associated with the Carquinez Strait and San Pablo Bay, and the southern side is bordered by residential development. Due to the developed nature and the day-to-day operations of the refinery, the property and its boundaries are highly disturbed and provide minimal habitat for special-status plants and wildlife. However, Sulphur Springs Creek does provide at least marginally suitable wildlife habitat.

This memo presents the methods and results of the investigation.

Methods

Pre-field Investigation

Prior to our field investigation, information on special-status plant and wildlife species with potential to occur on at the Benicia Refinery was compiled by performing database searches of the California Department of Fish and Game's (CDFG) California Natural Diversity Database (CNDDB 2006), as well as the California Native Plant Society's (CNPS) Electronic Inventory of Rare and Endangered Vascular Plants (CNPS 2006). Three U.S. Geological Survey (USGS) 7.5-minute quadrangles (Benicia, Mare Island, and Vine Hill) were used as the basis for the searches. The quadrangles cover the Benicia Refinery and the surrounding area. Other sources of information referenced during this investigation include the CDFG's State and Federally Listed Endangered, Threatened, and Rare Plants of California (CDFG 2006), and the U.S. Fish and Wildlife Service's Endangered and

Threatened Species (USFWS 2006). Additionally, EDAW reviewed the biological resources section of the Certified Environmental Impact Report for information regarding previous biological surveys conducted at the Benicia Refinery (ESA 2002).

The Certified EIR included a focused list of special-status species with the potential to occur in or near the Benicia Refinery (EIR Table 4.3-1). Table 4.3-1 is included as **Appendix A** to this memorandum.

Field Surveys

Biological field surveys at the project site were conducted on two separate dates. The sites include an area adjacent to the proposed new Hydrogen Unit, the Relocated Employee Parking area, and the Fire House location. The three sites are illustrated in Figure 1.

On January 18, 2007, EDAW biologist Charles Battaglia conducted a reconnaissance-level survey for general biological resources and potential special-status plant and wildlife species and their habitat at two sites within the Benicia Refinery. Also present was an ENSR representative and a Valero employee. The two sites Mr. Battaglia visited included an area to the northeast of the proposed location for the new Hydrogen Unit and the proposed location for the Relocated Employee Parking area. Due to security and safety requirements, the survey was limited to access from designated safe areas within the refinery, and at specific sites outside of refinery operations. It should be noted that this survey was conducted during winter. The new Hydrogen Unit is proposed to be located within an existing parking lot. The existing parking area would be removed to facilitate construction of the new Hydrogen Unit at this proposed location. The Relocated Employee Parking site is a gently sloped area located to the northeast of the existing parking lot.

On April 5, 2007 EDAW biologist Marylee Guinon conducted a follow-up reconnaissance-level site visit of the location proposed for the new Hydrogen Unit and the proposed Relocated Employee Parking site. Ms. Guinon also visited the area proposed for the Relocated Fire House, which is potentially planned for location on the edge of a graveled parking lot in the southern central portion of the refinery.

This memorandum contains the results of the reconnaissance level evaluations conducted for the Benicia Valero Refinery area and summary of our findings.

Results

As described in the Certified EIR the majority of the Benicia Refinery is thoroughly developed and contains few biological attributes. ESA indicated in the Certified EIR that habitat types within the vicinity of the Refinery included non-native grassland, freshwater emergent wetland, riparian, and estuarine open water; however, ESA indicated that the term “habitat” should be used very guardedly – since the patches observed and recorded are too small to support a full suite of associated species. Mr. Battaglia’s and Ms. Guinon’s observations of habitats and species were generally consistent with the findings of the Certified EIR. As described above, Table 4.3-1 in the Certified EIR contained a focused list of the terrestrial plants and animals with the potential to occur in or near the Benicia Refinery. Table 4.3-1 is attached as **Appendix A** to this memorandum.

New Hydrogen Unit

The new Hydrogen Unit is proposed to be located within an area currently occupied by an employee parking lot, a fire house, and a training building. Due to the heavily developed and disturbed nature of this area, no suitable habitat for special-status plant or wildlife species is present.

To the north of the proposed new Hydrogen Unit location, EDAW biologists observed a drainage ditch that is approximately 6 feet wide and several hundred feet long that appears to have been constructed to capture the minimal runoff from an adjacent berm. The drainage ditch extends west through an approximately eight-inch culvert and continues for several hundred feet down the slope where it drains into a tributary to Sulphur Springs Creek. No special-status species or habitat was observed in the constructed drainage ditch. However, the Sulphur Springs tributary to which the ditch drains contained cattail (*Typha sp*.), rush (*Juncus sp*), and willow (*Salix sp*.) species. Wildlife detected or observed at this site included Pacific tree frog (*Hyla regilla*) and house finch (*Carpodacus mexicanus*).

The drainage ditch could be considered an unvegetated water and, as such may fall under the jurisdiction of the U.S. Army Corps of Engineers (USACE) who regulate waters of the U.S. and wetlands under Section 404 of the Clean Water Act. The project will avoid the drainage ditch during construction and operation of the VIP Amendments. During construction of the Hydrogen Unit, the following avoidance measures as described in the Project Description shall be provided:

- To ensure complete avoidance of the drainage ditch and the Sulphur Springs Creek tributary, silt fencing shall be erected around the construction zone;
- No fueling or maintenance of construction equipment or vehicles shall occur within 50 feet of the drainage ditch or the Sulphur Springs Creek tributary.

Based on this analysis, avoidance of the drainage ditch and the Sulphur Springs Creek tributary can be achieved and no further action is necessary at this site for special-status species and their habitat.

Relocated Employee Parking:

The area designated as Relocated Employee Parking Lot will be a two-level lot terraced into the gentle sloping area located on currently unused Valero property north of the process block. This area consists of ice plant (*Mesembryanthemum crystallinum L.)* and various annual grasses. During the survey, no suitable habitat for any of the special-status plant or animal species documented to occur in the region was observed on the site.

Based on this analysis and as discussed in the Project Description, no further action is necessary at the relocated employee parking site for special-status species and their habitat.

Relocated Fire House:

Based on the reconnaissance-level site visit conducted by Ms. Guinon and on aerial photography obtained on Google Earth, the location of fire house is in the corner of a gravel parking lot immediately adjacent to grassland and trees or shrubs. As discussed in the VIP Amendments Project Description, all construction activities are to occur within the gravel parking lot; therefore, no wildlife or plant species would be affected and no further action is necessary.

Summary

In summary, EDAW concludes the following:

New Hydrogen Unit:

As described in the Project Description, no further action is necessary based on Valero's avoidance measures for the drainage ditch and Sulphur Springs Creek.

Relocated Employee Parking:

As described in the Project Description, no further action is necessary at this site due to the absence of suitable habitat for special-status species.

Fire House:

As described in the Project Description, no further action is necessary as all construction activities are to take place within the existing gravel areas.

Yours sincerely,

Charles F. Battaglia
charles.battaglia@edaw.com

Marylee Guinon
Principal, EDAW

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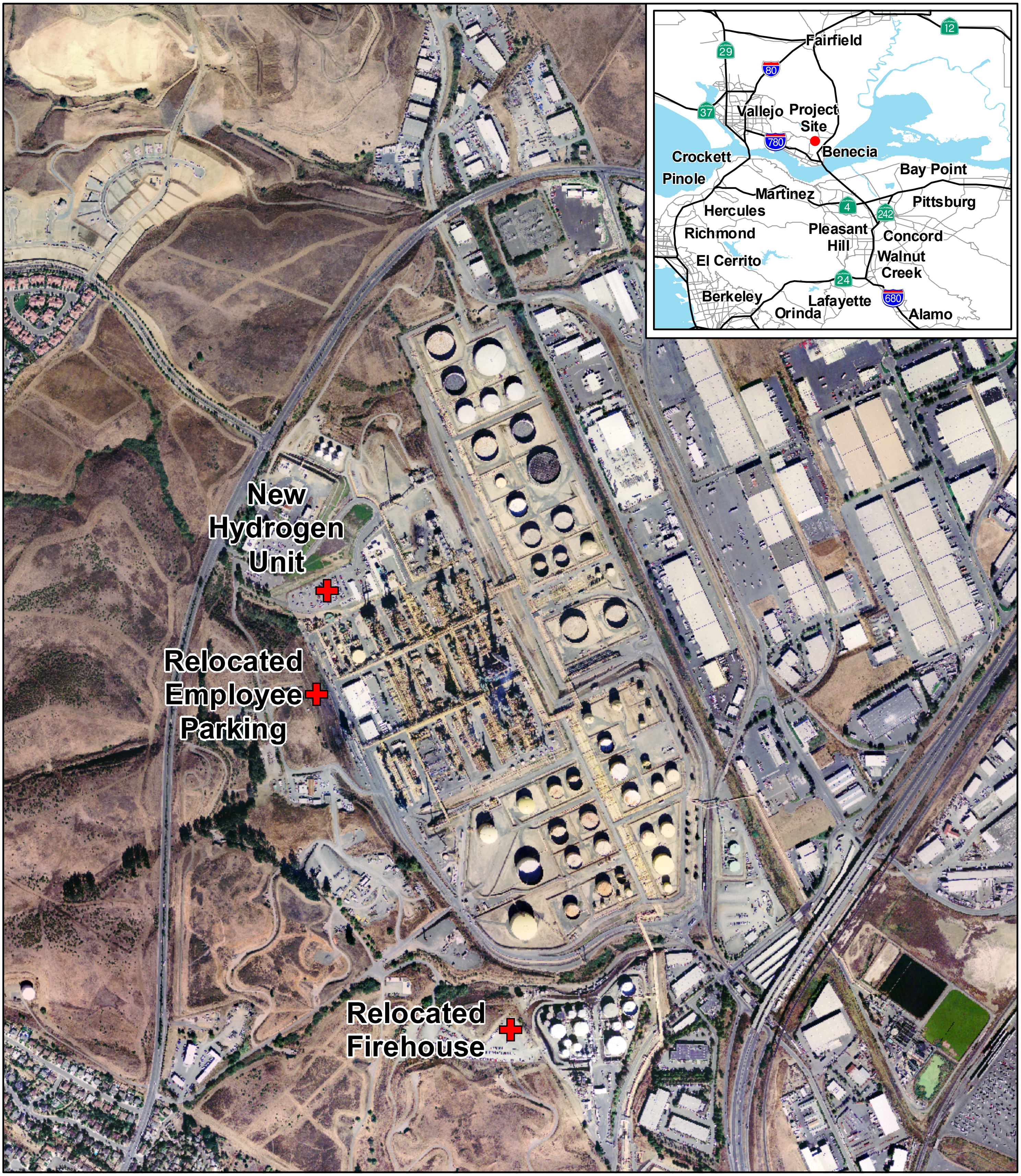


Legend

Project Site

1:12,000 4/2/07
1 inch equals 1,000 feet

0 1,000 2,000 Feet

This document provided for the sole use of the Valero Energy Corporation. This document not intended for detail design work.

Figure 1

Location of the Project Site

Valero Improvement Project

Benecia, Solano County, California

EDAW AECOM

EDAW Natural Resources - Walnut Creek
2099 Mt. Diablo Blvd. Suite 204
Walnut Creek, CA 94596
925.279.0580 www.edaw.com

S:\Projects\Valero\Graphics\GIS\Project Site 080207.mxd

Appendix A

TABLE 4.3-1
FOCUSED LIST OF SPECIAL STATUS SPECIES WITH POTENTIAL TO OCCUR IN OR NEAR THE VALERO REFINERY

Common Name *Scientific Name*	**Listing Status[1] USFWS/ CDFG/CNPS**	**General Habitat**	**Potential to Occur**
	Federal or State Threatened and Endangered Species		
Amphibians			
California red-legged frog *Rana aurora draytonii*	FT/CSC	Breeds in stock ponds, pools, and slow moving streams with emergent vegetation; adjacent upland habitats are often used outside the breeding season.	**Moderate. Potential habitat exists on-site (Tank Farm Ponds).**
Birds			
California black rail *Laterallus jamaicensis coturniculus*	FSC/CT	Nests and forages in tidal emergent wetland with pickleweed.	**Absent. Nearest occupied/suitable habitat at near Lake Herman Rd and Hwy 680.**
California clapper rail *Rallus longirostris obsoletus*	FE/CE	Nests and forages in emergent wetlands with pickleweed, cordgrass, and bulrush.	**Absent. No suitable habitat.**
Mammals			
Salt marsh harvest mouse *Reithrodontomys raviventris raviventris*	FE/CE	Saline emergent marshlands with dense pickleweed.	**Absent. Nearest suitable/ occupied habitat at Goodyear Slough.**
Plants			
Soft bird's beak *Cordylanthus mollis* ssp. *mollis*	FE/CR/List 1B	Soft-haired bird's beak is found in heavy clay soils of either coastal salt or brackish marshes of northern San Francisco Bay.	**Absent. Nearest occurrence Southampton Marsh. Habitat not present in refinery**.
	Other Species Of Concern		
Invertebrates			
Curved-foot hygrotus diving beetle *Hygrotus curvipes*	FSC/--	Found in a variety of aquatic habitats, including vernal pools, stock ponds, and ditches, often in alkaline conditions.	**Moderate. Suitable habitat exists at Tank Farm Ponds.**
San Francisco lacewing *Nothochrysa californica*	FSC/--	Grasslands and a variety of habitats.	**Absent. Suitable habitat does not occur at or near the refinery**.
Amphibians			
California tiger salamander *Ambystoma californiense*	FC/CSC	Wintering sites occur in grasslands occupied by burrowing mammals; breed in ponds, vernal pools, and slow-moving or receding streams.	**Moderate. Suitable habitat exists at Tank Farm Ponds.**

See notes at end of table for explanation of status codes.

TABLE 4.3-1 (Continued)
FOCUSED LIST OF SPECIAL STATUS SPECIES WITH POTENTIAL TO OCCUR IN OR NEAR THE VALERO REFINERY

Common Name *Scientific Name*	**Listing Status[1] USFWS/ CDFG/CNPS**	**General Habitat**	**Potential to Occur**
	Other Species Of Concern (cont.)		
Reptiles			
Western pond turtle *Clemmys marmorata*	FSC/CSC	Freshwater ponds and slow streams edged with sandy soils for laying eggs.	**Moderate. Suitable habitat exists at Tank Farm Ponds.**
Birds			
Tricolored blackbird *Agelaius tricolor*	FSC/CSC	Nests in freshwater marshes with dense stands of cattails or bulrushes, occasionally in willows, thistles, mustard, blackberry brambles, and dense shrubs and grains.	**Moderate. Nesting habitat available is available at Tank Farm ponds. Colony at Lake Herman.**
Short eared owl *Asio flammeus*	FSC/--	Nests and forages in grasslands and marshes. Nests in on dry ground in depression concealed by vegetation.	**Absent. Suitable habitat does not occur at or near the refinery.**
Burrowing owl *Athene cunicularia*	FSC/CSC	Nests and forages in low-growing grasslands that support burrowing mammals.	**Absent. Suitable habitat does not occur at or near the refinery.**
Northern harrier (nesting) *Circus cyaneus*	--/CSC	Nests in coastal freshwater and saltwater marshes, nest and forages in grasslands.	**Absent. Suitable habitat does not occur at or near the refinery.**
White-tailed kite (nesting) *Elanus leucurus*	DFG fully protected—CA Fish & Game Code, Section 3511	Nests near wet meadows and open grasslands dense oak, willow or other large tree stands.	**Absent. Suitable habitat does not occur at or near the refinery.**
California horned lark *Eremophila alpestris*	--/CSC	Nests and forages in barren dirt areas, shores, and gravel areas.	**Absent. Suitable habitat does not occur at or near the refinery.**
Saltmarsh common yellowthroat *Geothlypis trichas sinuosa*	FSC/CSC	Breeds in moist saltmarsh habitats with dense, low cover.	**Absent. Suitable habitat does not occur at or near the refinery**.
Loggerhead shrike *Lanius ludovicianus*	FSC/CSC	Scrub, open woodlands, and grasslands.	**Absent. Suitable habitat does not occur at or near the refinery**.
Suisun Song Sparrow *Melospiza melodia maxillaris*	FSC/CSC	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.	**Moderate. Habitat (fragmented) along Sulphur Springs Creek. Recorded at Southampton Marsh and Goodyear Slough.**

See notes at end of table for explanation of status codes.

TABLE 4.3-1 (Continued)
FOCUSED LIST OF SPECIAL STATUS SPECIES WITH POTENTIAL TO OCCUR IN OR NEAR THE VALERO REFINERY

Common Name *Scientific Name*	Listing Status USFWS/ CDFG/CNPS	General Habitat	Potential to Occur
Other Species Of Concern (cont.)			
Mammals			
Salt marsh wandering shrew *Sorex vagrans halicoetes*	FSC/CSC	Salt marsh habitat 6-8 feet above sea level, with abundant pickleweed and driftwood.	**Moderate. Suitable habitat exists adjacent to the refinery. Nearest CNDDB location is San Pablo Creek Marsh**.
Plants			
Congdon's tarplant *Hemizonia parryi* ssp. *congdonii*	FSC/--/List 1B	Valley and foothill grassland (alkaline soils)	**Absent. Habitat does not occur; nearest observation NW of Benicia.**
Suisun marsh aster *Aster lentus*	FSC/--/List 1B	Occurs along levees of rivers and sloughs in Suisun and Napa marshes and around Delta islands.	**Absent. Habitat does not occur; nearest observation at mouth of Goodyear Slough**
Carquinez goldenbush *Isocoma arguta*	FSC/--/List 1B	Found along the Carquinez Straits in Solano and Contra Costa counties in alkaline soils, flats, and on lower hills.	**Absent. Suitable habitat does not occur at or near the refinery**.
Delta tule pea *Lathyrus jepsonii* var. *jepsonii*	FSC/--/List 1B	Natural edges of estuarine marshes, sloughs, and rivers in the Sacramento – San Joaquin Delta.	**Absent. Suitable habitat does not occur at or near the refinery**.
Mason's lilaeopsis *Lilaeopsis masonii*	FSC/CR/List 1B	Brackish and freshwater marshes.	**Absent. Suitable habitat does not occur at or near the refinery**.

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.
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 Game)
CE/CT = Listed as Endangered/Threatened by the State of California
CSC = California Species of Special Concern
CR = California Rare Plant Species

CALIFORNIA NATIVE PLANT SOCIETY (CNPS)
List 1B: Plants rare, threatened, or endangered in California and elsewhere

SOURCES: USFWS; CNDDB, 2001; CNPS 2001.

Appendix E
Amendment to VIP Water Study

May 28, 2008

Mr. Todd Lopez
Environmental Manager
Valero Benicia Refinery
3400 East Second Street
Benicia, California 94510

Subject: Supplement to the Water Study for the Valero Improvement Project, October 2002, Revision 2

Dear Mr. Lopez:

Glaze Regulatory Consulting (GRC) was retained as a subcontractor to ENSR Corporation in support of the Valero Refining Company – California (Valero) Benicia Refinery and their development of a use permit application for amendments to the Valero Improvement Project (VIP) (VIP Amendments). Specific tasks assigned to GRC included:

1. Review previously prepared VIP project documents related to Benicia Refinery water demand, including the City of Benicia Water Study prepared by Environmental Science Associates (ESA), October 2002 (Water Study), and the Certified Environmental Impact Report (EIR), State Clearinghouse #002042122, completed in March 2003 and certified in April 2003 for VIP (Certified EIR).

2. Review current forecasts for water demands associated with the VIP Amendments.

3. Review past refinery water demand data for 2004, 2005, and 2006.

4. Prepare a Supplement to the Water Study detailing incremental water demand changes associated with the proposed VIP Amendments.

This report serves as the Supplement to the Water Study and summarizes information and conclusions from these tasks under the following headings:

- Certified EIR and Water Study
- City of Benicia Water Supply Contracts
- City of Benicia 2005 Urban Water Management Plan (UWMP)
- VIP Amendments Supplemental Analysis

<u>Certified EIR and Water Study</u>

In April 2003, the City of Benicia (City) certified an EIR for a refinery modernization project titled VIP at the Benicia Refinery. The project encompassed a variety of process unit modifications. The Certified EIR includes a comprehensive review of the available water supply to the City for various uses, including delivery of raw water for the Benicia Refinery.

The EIR's water demand impacts analysis relied substantially on data and conclusions from a Water Study to review the project in a manner consistent with California Senate Bill 610 (SB 610) passed by the legislature in 2000. This Water Study was conducted with concurrence of Valero and the City.

The Water Study concluded that because the City's water supply in the single-dry and multiple-dry years is not sufficient to meet demand even without the added demand of the VIP, it must be concluded that current supply is not sufficient to meet existing or any projected future demands of the Benicia Refinery.

The Report also described several options that were being considered by the City to increase supply, and that "If one or more of these sources were to be secured, Benicia's firm supply would be sufficient to meet the current and projected demand in most years."

Based in part on the Water Study, the Certified EIR concluded that the project would increase demand for raw, untreated water from the City in excess of the baseline refinery demand anticipated in the 2001 Urban Water Management Plan (UWMP). Further, that in the future, the City's overall water demand may exceed available supplies from current sources in dry years. As a result, the Certified EIR concluded that this impact would be significant; however, it also found that this impact could be rendered insignificant if the following mitigation measures were implemented:

> Mitigation Measure 4.14-1a: The City will continue to move forward with obtaining the future water supplies as identified in the Water Study, the UWMP, and the 1996 Water System Master Plan.
>
> Mitigation Measure 4.14-1b: The City and Valero will continue to implement General Plan Program 2.36A to pursue reuse of reclaimed wastewater where feasible, and the Valero Refinery will accept and use reclaimed water from a City reclamation project.
>
> Mitigation Measure 4.14-1c: Drought Contingency. If a "water shortage" (as defined below) occurs, then Valero shall take the steps necessary to reduce water consumption at the refinery by an amount equal to or greater than the amount of raw water that is being consumed due to implementation of the VIP during the period the water shortage. This reduction shall be in addition to any amount of reduction required by Condition WATER RES-2, approved by the California Energy Commission on October 31, 2001, for the Valero Cogeneration Project. Upon notification that a water shortage exists for any given year, Valero shall provide prompt documentation to the City of: the amount of water expected to be consumed by the VIP during the year of the shortage; a description of the steps planned to reduce consumption; the amounts to be saved by the steps; and the timing of implementation. Valero shall notify the City as the steps are implemented and will provide an annual report at the end of the year, verifying the amounts of water saved by the steps taken.

For purposes of this mitigation, "water shortage" means that all of the following conditions have occurred:

a) The City is unable to secure, pursuant to Supplemental Water Rights Application 30681, rights to the amount of water projected to accommodate City demand for the year of the water shortage, as shown in Table 4.14-3 of the Certified EIR, plus the amount of water needed for the VIP;

b) The City is unable to secure other water entitlements to the amount of water projected to accommodate City demand for the year of the water shortage, as shown in Table 4.14-3 of the Certified EIR, plus the amount of water needed for the VIP;

c) Valero has not secured a separate water entitlement, valid for the year of the water shortage, adequate for the amount of water needed for the VIP;

d) The City has not implemented the wastewater reuse project; and

e) The City has announced a water alert, as defined by Benicia Municipal Code Title 13, Chapter 13.35, section 13.35.060(B), and has ordered implementation of conservation stage two pursuant to the City Code.

Benicia – Valero Water Supply Contracts

Following the certification of the VIP EIR by the Benicia City Council, on June 4, 2003, Valero and various organizations entered into a Settlement Agreement regarding water supplies to the Benicia Refinery. The Settlement Agreement provided that "Valero shall continue to participate in the planning and development of the City's wastewater reuse project, consistent with its commitment to that project dated October 11, 2002 … ."

Pursuant to the Settlement Agreement, Valero's commitment in this planning and development process continues "as long as the reuse project continues to be economically, regulatorily, and technically feasible." "Economically feasible" is defined in the Settlement Agreement to mean "approximately $15 million of financial support for the water reuse project so long as Valero is anticipated to receive, as agreed by Valero and the City, at least one million gallons of useable water per day from the water reuse project."

To evaluate whether the wastewater reuse would be economically, regulatorily, and technically feasible, the People Using Resources Efficiently (PURE) Committee was formed. Valero has participated with PURE for the last four years to evaluate the wastewater reuse project. However, the Benicia City Council agreed on June 5, 2007 to terminate further work on the wastewater reuse project (the PURE Project) once the Preliminary Design Review and administrative draft CEQA report documents were prepared.

Also following the certification of the VIP EIR, the City of Benicia entered into a Settlement Agreement with the Department of Water Resources to provide an additional 10,500 acre-feet of firm contracted water supply per year. This in essence implemented Certified EIR Mitigation Measure 4.14-1a.

This increased supply was subsequently included in the City's Urban Water Management Plan (UWMP) completed and approved by the Benicia City Council in December 2005. As detailed in the City's 2005 UWMP, this increased supply provides an adequate water supply for both the City of Benicia (through its projected build out) and the Benicia Refinery (assuming a projected increased demand rate) through the year 2030.

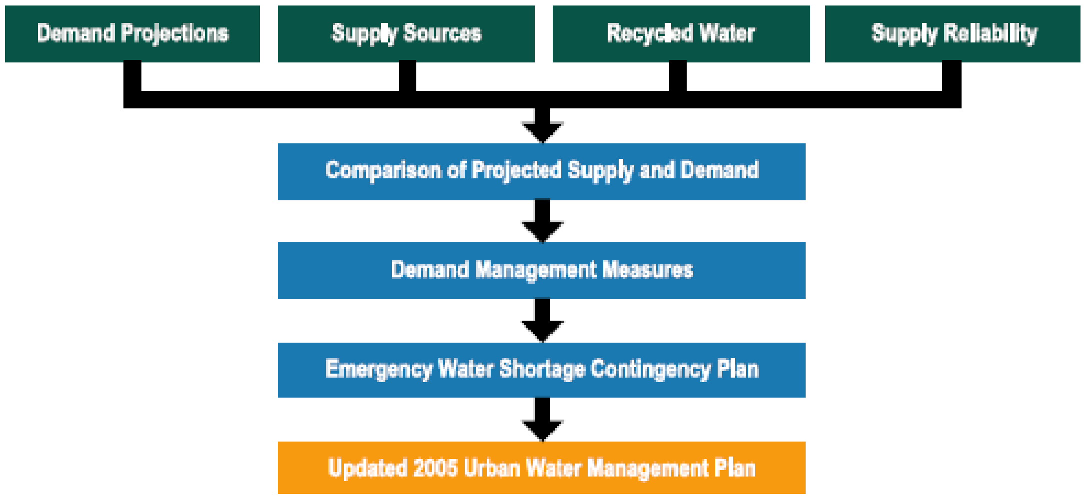
Valero is now submitting a use permit application for amendments to the Use Permit issued for the VIP (PLN 2002-00022) by taking into account new information which was not known and could not have been known with the exercise of due diligence at the time the VIP EIR was certified in 2003. The VIP Amendments have been primarily designed to further reduce environmental impacts of the original project through implementation of additional energy efficiency, air pollution control, and flare minimization measures.

City of Benicia 2005 UWMP

In 1983, the California Legislature enacted the Urban Water Management Planning Act. This Act requires water suppliers serving more than 3,000 customers or water suppliers providing more than 3,000 acre-feet per year of water to prepare an urban water management plan to promote water conservation and efficient water use.

The City provides treated water to a population of over 25,000 people and is required to submit an updated UWMP by December 31st in years ending in zero or five. The UWMP must address all the elements in Figure 1.

Figure 1 Overview of Major Plan Elements



Tables displayed in Appendix A from the 2005 UWMP (Tables 3-2, 6-1, 7-2, 7-3, and 7-4) provide summaries of water demand as well as projected evaluations of surpluses through the year 2030. As indicated in Table 7-4 of Appendix A, even with the projected 2,240 acre-feet per year from recycled water backed out, the UWMP's worst-case scenario shows a surplus of 3,783 (6023-2240) acre-feet per year.

Importantly, consistent with CEQA Guidelines, the Certified EIR established "significance criteria" with regard to water supply/demand considerations for VIP. Specifically the project's impact would be considered significant if it would:

> "Result in City water use in excess of water supplies available in normal, dry, and multiple dry years with water from all existing entitlements and sources, or if the project would require new or expanded water entitlements or resources."

With the new long-term, firm water supply provided by the 2003 Water Rights Settlement Agreement, which has been incorporated into the 2005 UWMP, and in essence is an implementation of Mitigation Measure 4-14-1.a, impacts due to increased water demand from the VIP would not now be considered significant. Moreover, as indicated below, this finding is also true regarding to the currently proposed VIP Amendments.

Accordingly, as concluded by the UWMP, the City of Benicia has sufficient water to supply Valero's requirements even during multiple dry year scenarios.

VIP Amendments Supplemental Analysis

The VIP Amendments are not expected to incrementally increase water demand over what was previously authorized in the Certified EIR.

Table 1 displays the projected water demand associated with the original VIP project components analyzed in the Certified EIR and the VIP Amendments.

Table 1 VIP Amendments Water Demand Projections Compared to Certified EIR

	Gallons Per Day[1]		
Operating Unit	**Certified EIR**	**Incremental Increase**	**New Total Water Usage**
VIP Amendments			
FCCU/CKR Scrubber	172,800	-51,260	121,540
Hydrogen Production	21,600	-38,900	-17,300
New Desalter (if recycle water not used)	---	93,600	93,600
Sulfur Recovery Cooling Water	14,400	-14,400	0
Coker Modifications	7,200	0	7,200
Steam Generation Unit Incremental Blowdown	---	2,880	2,880
VIP Amendments Subtotal	**216,000**	**-8,080**	**207,920**

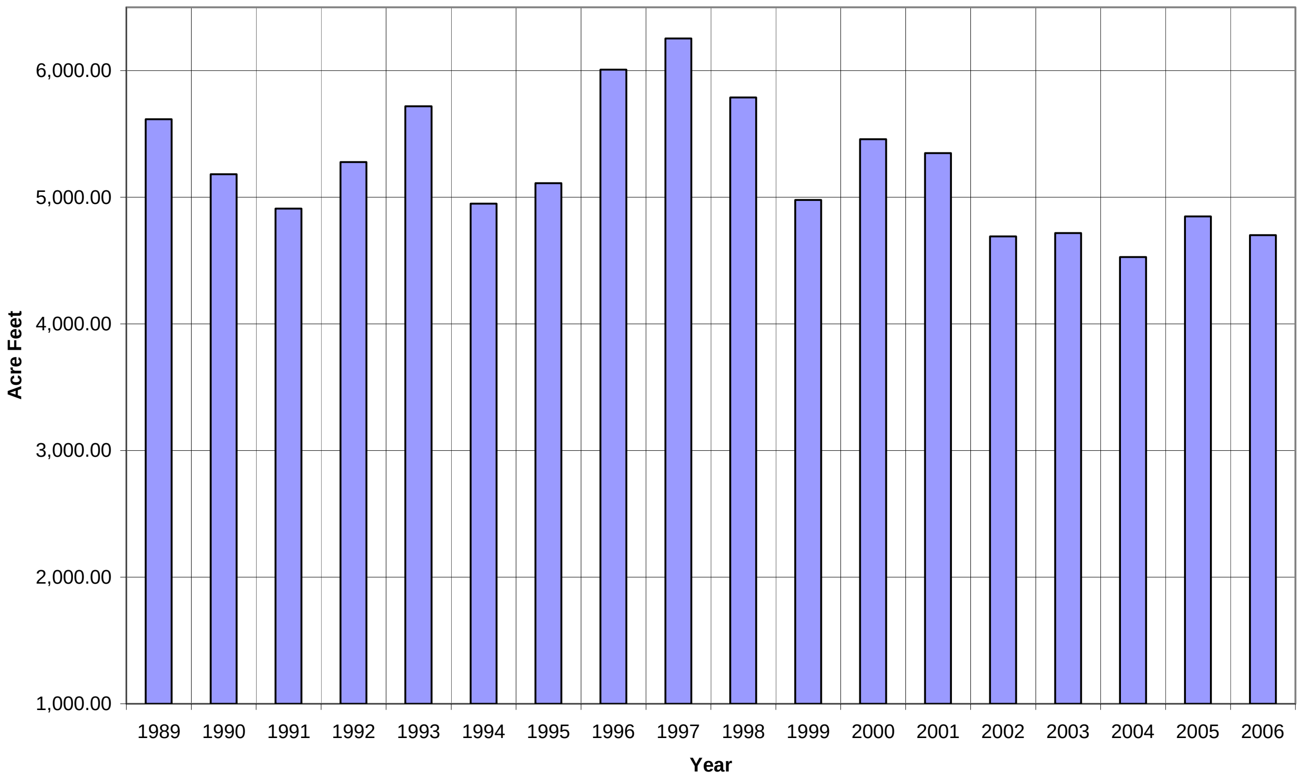
1. Acre feet/year = 893 gallons/day = 0.62 gallons/minute

In planning for construction and operation of the Benicia Refinery, the City of Benicia and Humble Oil Company (the original owner) entered into an initial water delivery contract in 1967. In the ensuing years this contract was amended several times to allow for ownership changes, as well as rate and supply adjustments. City staff have notified Valero of their intent to commence negotiations for future water delivery in 2007.

Valero would reasonably expect that water delivery negotiations would be based on the 2005 UWMP. As indicated in Table 6-1 from the UWMP (displayed in Appendix A), the anticipated refinery water demand is 4,675-5,800 acre-feet per year from the years 2005-2030, respectively. Since the VIP Amendments produces no net increase in water demand above the currently authorized amount, the worst-case “multiple dry years” calculations still results in water supply surpluses, even after City buildout.

As indicated in the Benicia Refinery water demand graph for 1989-2006 below, refinery consumption has been as high as 6,255 acre-feet per year (in 1997). Projects associated with the VIP Amendments are not expected to increase water usage above what is currently approved in the Certified EIR.

Figure 2 Valero Water Use Histogram for Benicia Refinery (1986-2006)



Conclusions

Based on the supporting background information related to the Water Supply contracts for the City and no net increase in water needs of the VIP Amendments, the following conclusions can be made with regards to the sufficiency of available water supply.

- The long-term, firm water supply provided by the 2003 Water Rights Settlement Agreement between the California Department of Water Resources and the cities of Vacaville, Fairfield and Benicia satisfies Mitigation Measure 14-4.1a of the Certified VIP EIR regarding increased water demand.

- According to the City of Benicia's 2005 UWMP, the City has sufficient water in secured long-term, firm contracts to supply water needs for the VIP Amendments even during multiple dry year scenarios. This conclusion remains valid without considering any supplies from recycled water.

- New long-term, firm water deliveries are provided by the 2003 Water Rights Settlement Agreement. This has been incorporated into the 2005 UWMP and in essence is an implementation of Mitigation Measure 4-14-1.a. Accordingly, water demand impacts from the VIP Amendments would not now be considered significant since there is no net increase over what is currently permitted for VIP.

Please feel free to contact me at (707) 643-0729 if you have any questions.

Sincerely

Daniel E. Glaze
Glaze Regulatory Consulting

List of Tables

List of Figures

Appendix A
Tables from 2005 UWMP

Table 3-2 Water Demand Projections, AF/year						
Component/Year	***2005***	***2010***	***2015***	***2020***	***2025***	***2030***
Treated Water Use						
Single-Family Residential	3,401	3,411	3,420	3,430	3,430	3,430
Multi-family Residential	555	573	590	607	607	607
Commercial	1,181	1,223	1,264	1,306	1,306	1,306
Industrial	163	200	236	272	272	272
Irrigation	182	193	204	215	215	215
Other	159	159	160	160	160	160
Total Treated Water Use	5,642	5,758	5,874	5,990	5,990	5,990
Other Components of Demand						
Unaccounted-for Water	564	576	587	599	599	599
Operations and Emergency Water	1,016	1,036	1,057	1,138	1,138	1,138
Valero Untreated Water(1)	4,675	5,050	5,425	5,800	5,800	5,800
Total Demand including Treated Water Use and Other Components						
Total Demand	*11,897*	*12,420*	*12,944*	*13,527*	*13,527*	*13,527*

(1) Valero untreated water will be supplied by raw surface water and by recycled water when it becomes available in 2010.

Table 6-1 Supply Availability at Buildout (2020) during Normal, Single Dry and Multiple Dry Years						
Source	***Normal Year***		***Single Dry Year***		***Multiple Dry Years (1) (4-Year Period)***	
	Reliability (%)	***Amount (AF/year)***	***Reliability (%)***	***Amount (AF/year)***	***Reliability (%)***	***Amount (AF/year)***
Lake Herman	100	500	0	0	0	0
State Water Project	90	14,468(2)	61(3)	9,806	44(3)	7,073
Water Rights Settlement	72	7,560	72	7,560	70	7,350
Vallejo Agreement (Solano Project Water)	99	1,089	98	1,078	92	1,012
Mojave Exchange	0	0	0	0	100	1,875
Recycled Water(4)	100	2,240	100	2,240	100	2,240
Total		*25,357*		*20,684*		*19,550*

(1) The City defines a multiple dry year period as 4 consecutive dry years. The City's wholesaler (SCWA) uses a 6-year period. If the City uses a period of 6 consecutive dry years, this reduces the SWP reliability to 39%, and the total supply to 18,746 AF/year, which is more than the buildout demand (see Section 7).

(2) The 100% supply contract amount for SWP water is 16,075 acre-feet per year for purposes of this UWMP, which conservatively assumes that Rio Vista and Dixon build facilities to take SWP water by 2016. This amount would be available only during wet or very wet years. During a normal year, 90% of the contract amount s anticipated to be available.

(3) Even if the City were to only get 9 percent of its SWP amount, which is the worst case single dry year on record, it would be an additional cutback of 5,626 AF per year, which could still be accommodated with its planned supply.

(4) Recycled water is a future supply and will be available after 2010. Section 5 descries the recycled water supply.

Table 7-2 Normal Year Comparison of Supply and Demand Projections, AF/ year						
	2005	***2010***	***2015***	***2020***	***2025***	***2030***
Supply	21,670	25,357	25,357	25,357	25,357	25,357
Demand	11,897	12,440	12,984	13,527	13,527	13,527
Surplus of Supply (Difference between Supply and Demand)	*9,773*	*12,917*	*12,373*	*11,830*	*11,830*	*11,830*

Table 7-3 Single Dry Year Comparison of Supply and Demand Projections, AF/year						
	2005	***2010***	***2015***	***2020***	***2025***	***2030***
Supply	18,937	20,684	20,684	20,684	20,684	20,684
Demand	11,897	12,440	12,984	13,527	13,527	13,527
Surplus of Supply (Difference between Supply and Demand)	*7,040*	*8,244*	*7,700*	*7,157*	*7,157*	*7,157*

Table 7-4 Multiple Dry Years Comparison of Supply and Demand Projections, AF/ year						
	2005	***2010***	***2015***	***2020***	***2025***	***2030***
Supply	17,354	19,550	19,550	19,550	19,550	19,550
Demand	11,897	12,440	12,984	13,527	13,527	13,527
Surplus of Supply (Difference between Supply and Demand)	*5,457*	*7,110*	*6,566*	*6,023*	*6,023*	*6,023*

SECTION 3

Peer Review of Valero's Environmental Analysis

3.1 Introduction

Recently, Valero applied to the City to amend its Use Permit for the VIP and presented its case that the VIP Amendments are within the bounds of the 2003 EIR and that an Addendum to this EIR could be prepared to support the City's discretionary approval of the amendment. Valero provided an Environmental Analysis (EA) in support of this amendment. City staff determined that its independent review of the EA would be a reasonable and timely method to examine the conclusions of the EA and to independently support the City's determination as to the type of CEQA document required. This section presents the City's peer review of the Valero EA.

The City's peer reviewers examined the proposed changes to the VIP project description, the individual CEQA environmental criteria sections, additional supporting sections, and appendices to the EA (see Section 2 of this document). Peer reviewers also requested additional information to clarify portions of the EA and used independent sources and judgment to corroborate some EA provided data and/or conclusions.

Peer reviewers used the most current version of CEQA and other regulations to examine the findings of the EA. Where appropriate, peer reviewers have made suggested additions to the EA to strengthen its findings. The fundamental aspect of this review is to determine if the EA is adequate and the amended project is within the bounds of the certified EIR such that an addendum is the appropriate environmental document.

3.1.1 Methodology

Each peer review section presents the original conclusions from the 2003 VIP EIR, the changes in the baseline that may have occurred since 2003, an independent peer review of the EA, a discussion of cumulative impacts, and a summary of conclusions.

The potential environmental impact of the VIP Amendments on each CEQA environmental criteria area was examined to assess:

1. Whether the VIP Amendments themselves, or changes in circumstances under which they would be undertaken would result in the involvement of new significant effects or a substantial increase in severity of previously identified significant effects;

2. Whether new information not known at the time of the EIR shows significant effects not discussed in the EIR or that significant effects identified in the EIR would be substantially more severe as a result of the VIP amendments, or that mitigation measures or alternatives previously found not to be feasible would in fact be feasible and would substantially reduce one or more significant effects of the project but that the Applicant declines to adopt the mitigation, or that mitigation measures or alternatives which are considerably different from those analyzed in the EIR would substantially reduce one or more significant effects on the environment but that the Applicant declines to adopt the mitigation (see CEQA Section 15162(a)).

3.2 Environmental Analysis Review

3.2.1 Aesthetics

Introduction

This section provides a peer review of EA Section 3.1.1, *Aesthetics* (Valero, 2008). Also presented are the original conclusions from the 2003 VIP EIR, the changes in the baseline that may have occurred since 2003, an independent peer review of the EA, a discussion of cumulative impacts, and a summary of conclusions.

Impacts Conclusion in the EIR

In the EIR, all visual quality impacts related to the implementation of the VIP were determined to be less than significant. No mitigation was identified (ESA, 2003).

Changes after EIR Certification

EA Figure 3.1-8 depicts a view from Addison Court within the Southampton housing development. Since Figure 3.1-8 (EA pages 3-11 and 3-12) was created, more residences in the Southampton housing development have been constructed between the viewpoint and the Refinery Process Block, further blocking publicly accessible views of the Refinery Process Block. Views from this location are now limited to intermittent views of the Refinery vertical stacks between the new housing development, as well as the tops of a few Refinery vertical stacks that extend beyond the new developments.

Environmental Analysis Review

Scenic Vistas

The VIP Amendments would not have an adverse effect on scenic vistas. As demonstrated in the updated computer simulations presented in EA Figures 3.1-2 through 3.1-9, the proposed structures would not extend above the existing skyline, nor would they be the tallest Refinery Process Block features in the view. The new proposed structures would generally blend in with the existing development.

Water Vapor Plume Visibility

Operation of the Refinery with the VIP Amendments would not create a significant impact related to increased water vapor plume visibility to surrounding residents and motorists. Water vapor plumes are predicted to occur no more than 66 hours per year (less than 0.7% of the year), with no visible plumes predicted to occur when they would be most noticeable (i.e., during daylight hours with no adverse weather conditions, such as fog, rain, or other occurrences with 100 percent relative humidity). The 66 hours per year of plumes would be expected to form during the nighttime hours or under atmospheric conditions that would mask visibility. Implementation of the VIP Amendments would result in an increase from the total 28 hours per year predicted to occur under the originally proposed VIP (plumes would increase from 0.32% of the year to 0.7% of the year), but represents a decrease from the predicted 3 hours per year of visible plumes during day-time non-fog hours (less than 0.04% of the year to 0% of the year). As determined by the EA, the presence of visible water vapor plumes is still considered to be less than significant because the frequency and duration of plume visibility would be very limited (less than 66 hours per year) and the plumes would not touch the ground or roadways.

Scenic Resources

The VIP Amendments would not substantially damage scenic resources within a State scenic highway because the project elements would not be visible in or from any area where scenic resources exist. As noted in the EA, the VIP Amendments would be located within the footprint of the existing Refinery, which does not presently contain scenic resources (e.g., trees, rocks, outcroppings, and historic resources). Interstate 680, in the vicinity of the Refinery, is not designated as a state scenic highway and is not subject to any state management requirements related to visual conditions. While the Refinery is visible within the Interstate 680 view corridor, the elements of the VIP Amendments would not be visible from this view corridor.

Visual Character and Quality

As noted in the EA, the VIP Amendments would be located within or adjacent to the Refinery Process Block. The elements of the VIP Amendments, including the reformer furnace vertical stack, HPU vessels, parking lot, firehouse, and FCCU/CKR Scrubber and associated equipment would be compatible in shape, scale, and color to other visual conditions in the surrounding area. When placed contextually within the Refinery, the elements of the VIP Amendments will not alter the visual character of the Refinery as these elements will be visually harmonious with the existing industrial character of the site.

Light and Glare

The VIP Amendments would not create a new source of substantial light or glare which would adversely affect day or nighttime views in the area beyond what was previously analyzed in the certified EIR. As noted in the EA, while the H2U would have lighting on the staircases and the roof of the reformer furnace for security purposes, this additional lighting would blend in with lighting in the rest of the Refinery Process Block when viewed from off site.

Cumulative Impact Review

This peer review concurs with the aesthetics cumulative impact review presented in Section 4.2.1 of the EA. As concluded on EA page 4-5, the construction and operation of the proposed VIP Amendments, in addition to other cumulative Refinery and non-Refinery cumulative developments, would not result in significant cumulative impacts to visual quality. While each of the developments would alter the visual character of their respective sites and the visual character of the entire area, these visual changes would have a limited total effect in changing the existing visual context of the region. The construction of the other non-Refinery cumulative projects, together with all of the reasonably foreseeable projects at the Refinery, would reinforce the industrial appearance of the overall Benicia Industrial Park as well as the northeast portion of the City of Benicia. Therefore, the total visual impact of the cumulative projects combined with the VIP Amendments, are less than cumulatively significant.

Summary and Conclusions

Based on this peer review, the change in the environmental impact between the VIP and VIP Amendments would not be significant; therefore, the impacts of the proposed VIP Amendments would be similar to those identified in the certified EIR. Although there would be an increase in the mass of the Refinery infrastructure and a slight increase in the visible water plumes from the VIP Amendments, it would not constitute a significant change from the certified EIR for the following reasons: (1) as with the original VIP elements, the elements of the VIP Amendments would also be constructed in industrialized areas of the Refinery property and would be similar in appearance to structures already present; and (2) the frequency and duration of plume visibility would still be very limited. The changes due to the proposed amendments themselves would not create a significant impact and would not increase the severity of a previously identified significant impact because no significant aesthetic impacts were identified in the EIR.

Additionally, the VIP Amendments would reduce the potential for flaring below existing conditions. The VIP as amended remains consistent with all public plans and policies (note that the proposed relocated firehouse must be consistent with the City of Benicia's Industrial Design Guidelines). This peer review concurs with the EA's conclusion that the proposed VIP Amendments would not result in new impacts beyond those previously disclosed in the certified EIR and no mitigation measures are necessary to reduce any potential impacts to a less than significant level.

3.2.2 Air Quality

Introduction

This section provides a peer review of EA Section 3.1.2, *Air Quality* (Valero, 2008). Also presented are the original conclusions from the 2003 VIP EIR, the changes in the baseline that may have occurred since 2003, an independent peer review of the EA, a discussion of cumulative impacts, and a summary of conclusions. It should be noted that the Bay Area Air Quality Management District (BAAQMD) is conducting its own peer review of the EA for the VIP Amendments as well as reviewing Valero's VIP Amendments Air Permit Application relative to its permit to construct/permit to operate (PTC/PTO) permit process.

Impact Conclusions of the EIR

The certified EIR for the originally proposed VIP found that construction and operation of the VIP would lead to impacts on local and regional air quality. The certified EIR concluded that impacts would occur due to fugitive dust and exhaust emissions during construction activities, resulting in a potentially significant impact. However, mitigation measures were presented in the EIR that would reduce the impact to a less than significant level. In addition, the EIR found that long-term operational emissions of volatile organic compounds (VOC) associated with the VIP would add to the regional pollutant loading in the Bay Area Air Basin. However, it was determined that an operational mitigation measure would reduce long-term emissions of VOC to below the BAAQMD CEQA threshold, resulting in a less than significant impact.

Changes after EIR Certification

Subsequent to the certification of the EIR, the BAAQMD published its Bay Area 2005 Ozone Strategy, a plan designed to serve as a roadmap on how to achieve attainment of the State one-hour standard for ozone (BAAQMD, 2006).

Also, a number of the VIP Draft EIR comments advocated placing additional air quality monitoring stations in Benicia but off the Refinery site, either to alert the public of potentially unhealthful or dangerous conditions or to perform long-term monitoring to determine compliance by Valero with air quality standards over a wider range of pollutants other than what is currently monitored by Valero. Therefore, as part of the City's conditions of approval of the original VIP, Valero assisted in establishing an air quality monitoring station north of the Refinery on Valero property in the City of Benicia. Table 3.2.2-1 provides data for fine particulate matter (PM2.5), carbon monoxide (CO), nitric oxide (NO), nitrogen dioxide (NO_2), ozone (O_3), and sulfur dioxide (SO_2) obtained from the new Benicia monitoring station, compared to data obtained from the Vallejo monitoring station, which was the monitoring station used to describe the regional air quality conditions in the VIP EIR. The table provides data for April 2007 (the first month data were collected at the Benicia station) through March 2008.

TABLE 3.2.2-1
AMBIENT AIR QUALITY SUMMARY FOR BENICIA AND VALLEJO

Month	Station	Monitored Pollutant					
		PM2.5	CO	NO	NO_2	O_3	SO_2
April	Benicia	21	0.5	11	26	78	17
	Vallejo	33	1.4	117	33	69	10
May	Benicia	39	0.4	6	21	66	9
	Vallejo	35	1.0	56	38	63	3
June	Benicia	33	0.4	11	18	73	8
	Vallejo	28	0.7	45	27	66	3
July	Benicia	34	0.4	7	15	68	10
	Vallejo	37	0.4	14	20	53	3
August	Benicia	47	0.4	13	22	82	14
	Vallejo	26	0.5	24	19	67	4
September	Benicia	36	0.7	40	34	83	21
	Vallejo	36	1.8	165	39	78	7
October	Benicia	29	0.6	31	38	70	14
	Vallejo	29	1.7	160	58	59	7
November	Benicia	38	1.1	66	36	55	72
	Vallejo	93	2.8	212	42	49	9
December	Benicia	60	0.7	68	39	45	26
	Vallejo	93	3.2	281	42	42	9
January	Benicia	49	0.7	42	37	45	23
	Vallejo	85	2.7	175	43	6	6
February	Benicia	31	0.8	52	31	50	28
	Vallejo	44	2.5	220	42	8	8
March	Benicia	26	0.7	25	35	51	24
	Vallejo	33	2.2	162	39	8	8
12 month Max	Benicia	60	1.1	68	39	83	72
	Vallejo	93	3.2	281	58	78	10

NOTES: All measurements are hourly averages and units are parts per billion (ppb) with the exception of PM2.5 and CO, which are units of micrograms per cubic meter (ug/m3) and parts per million (ppm), respectively.

SOURCE: BAAQMD, 2008.

As indicated in the table, emissions of PM2.5, CO, NO, and NO_2 collected at the Benicia monitoring station are less than those collected at the Vallejo monitoring station and emissions of O_3 and SO_2 collected at the Vallejo monitoring station are less than those collected at the Benicia monitoring station. The higher levels of SO_2 in Benicia appear to be a result of the industrial point sources in the area, such as the Valero Refinery, which are lacking in the vicinity of the Vallejo monitoring station. The higher levels of O_3 at the Benicia Refinery are less attributable to local point sources since O_3 is a regional pollutant, meaning the precursor compounds that form O_3 are not necessary emitted where the O_3 is formed. It may be assumed that these spatial patterns also existed between 1997 and 2001, which is the ambient air quality data period that was analyzed in the VIP EIR. None of the levels presented in Table 3.2.2-1 represent violations of any air quality standards. It should be noted that there are currently no hourly standards for PM2.5.

Environmental Analysis Review

The City has found the EA air quality analysis and supporting documentation to be thorough with enough supporting documentation provided for the City to adequately analyze the impacts of the proposed VIP Amendments. Although the City disagrees with some of the methods used to support the EA air quality conclusions (see below), the City has determined that the proposed VIP Amendments do not require the need for a supplemental Environmental Impact Report (EIR) or Mitigated Negative Declaration (MND). All criteria pollutant emissions, as mitigated, would continue to be below BAAQMD significance thresholds. With the exception of a slight increase in precursor organic compounds (POC) and CO emissions, the other criteria pollutant emissions (i.e., NOx, SOx, PM10, and PM2.5) would be substantially lower than those reported in the certified EIR. Therefore, the VIP Amendments would not result in new or substantially more severe significant impacts than those identified in the 2003 EIR.

The following discussion provides additional information/analysis related to the EA's characterization of construction emissions, operational mass emissions, other combustion source emissions, and fugitive emissions. No separate discussion is provided in this peer review related to the Bay Area 2005 Ozone Strategy, PS furnace emissions, indirect operational emissions, localized air quality analysis for operational emissions, or odors because the City found the EA's characterization of those issues to be adequate.

Construction Emissions

Consistent with the certified EIR, the EA uses the BAAQMD's approach to analysis of construction impacts, which emphasizes implementation of effective and comprehensive control measures rather than detailed quantification of emissions. However, the construction impact discussion (EA Section 3.1.2.b) concludes by indicating that the VIP Amendments would not be expected to create any additional construction emissions. The City agrees with the approach to construction emissions analysis presented in the EA, but does not agree that the VIP Amendments would generate no additional construction emissions compared to those that would result under the VIP identified in the certified EIR.

EA Section 2.5.3 indicates that the amendments would require demolition of an existing firehouse and training structure, excavation of approximately 26,000 cubic yards of soil, or import of about 175,000 cubic yards of fill. These activities represent potential increases in dust and exhaust emissions compared to the proposed construction activities disclosed in EIR Section 3.5.3 (i.e., no demolition, excavation of only 20,000 cubic yards of soil, and no soil imports). Although these activities likely represent an increase in construction emissions, the impact remains less than significant as long as EIR Mitigation Measures 4.2-1a and 4.2-1b are enacted, which require the implementation of BAAQMD dust control procedures and equipment exhaust reduction measures.

Operational Mass Emissions

In assessing the need to prepare a Subsequent EIR or MND associated with the VIP Amendments, the EA indicates that the differences in emissions between the proposed VIP Amendments and the originally proposed VIP emissions disclosed in the certified EIR should be compared to the BAAQMD CEQA thresholds. With this methodology, the EA makes the determination that preparation of a Subsequent EIR or MND is unwarranted because the differences between the post-VIP emissions and the VIP Amendments are estimated to be less than the BAAQMD's CEQA thresholds.

Although the City's ultimate conclusion is the same as Valero's (i.e., additional EIR or MND documentation associated with the VIP Amendments is not warranted), the City does not concur with Valero's interpretation of CEQA with respect to EIR addenda and supplemental EIRs. The City's interpretation of CEQA is that the total project mitigated emissions, as modified by the VIP Amendments, should be analyzed and compared to the baseline scenarios presented in the certified EIR. If those emissions continue to be below the BAAQMD's emissions thresholds, then additional EIR or MND documentation would not be necessary.

Therefore, EA Table 3.1.2-6, Estimated Total VIP Emissions, has been modified, presented below as Table 3.2.2-2, to clearly illustrate the amended VIP net emissions compared to the certified EIR one-year baseline. The certified EIR identified operational emissions of volatile organic compounds (presented below as POC) as a potentially significant impact. However, certified EIR Mitigation Measure 4.2-2, which requires the implementation of the Light Ends Rail Rack Arm Drains project, was required to reduce the potentially significant impact to a less than significant level. As shown in the table, the amended VIP would increase emissions of POC compared to the 2003 EIR mitigated emissions, but would continue to result in annual emissions that are less than BAAQMD operational thresholds and impacts continue to be less than significant.

As shown in Table 3.2.2-2, VIP Amendments Emissions Summary, total project emissions include emissions from several different types of refinery sources. Two of those, combustion sources and fugitive sources, merit discussion beyond what is presented in the EA.

Other Combustion Source Emissions

The City's review team posed several questions to Valero related to the firing rate and emissions factor presented for the furnace F-351 combustion emissions reductions (see Table 4 of EA

TABLE 3.2.2-2
VIP AMENDMENTS EMISSION SUMMARY

Source Type	Emissions (tons per year)				
	NO_X	SO_2	PM10/PM2.5	POC	CO
Certified EIR (ref. Table 4.2-12)					
VIP 2003 EIR Net Emissions[a]	-24	-4,233	-4	9	-171
VIP Amendments					
FCCU/CKR + F-103	-155.2	-2,311.3	2.1	0.0	10.7
Combustion Sources[b]	-107.7	1.1	-9.6	1.0	10.0
Fugitive Emissions	0.0	0.0	0.0	3.0	0.0
Mobile Source Emissions	0.2	0.0	0.0	0.0	0.1
CEQA Evaluation					
Amended VIP Net Emissions compared to Certified EIR 1-year Baseline	-286.7	-6,543.2	-11.5	13.0	-150.2
CEQA Significance Threshold	15	NA	15	15	NA
Significant?	No	No	No	No	No

[a] The term "net emissions" refers to the project emissions offset by concurrent projects and reduced by certified EIR Mitigation Measure 4.2-2.
[b] These emissions have been modified by the City to reflect the proposed change in the F-351 furnace burning rate compared to the certified EIR baseline as opposed to compared to the certified EIR project emissions. These emissions also reflect New BACT limitations proposed by BAAQMD for the new H2U. New H2U emissions estimates provided in the EA do not reflect the BACT limitations proposed by BAAQMD. See *Other Combustion Source Emissions* discussion below for details.

Appendix B). Valero's response indicated that the firing rate reductions presented in Table 4 for furnace F-351 represents the net firing rate change associated with the VIP Amendments compared to that presented for the originally proposed VIP disclosed in the certified EIR. As discussed above under *Environmental Analysis Methods*, the City's review of the VIP Amendments is based on an analysis that considers the total amended VIP emissions compared to the certified EIR baseline scenarios. Therefore, Table 4 of EA Appendix B has been revised, presented below as Table 3.2.2-3, to include the F-351 firing rate reduction (-147.5 MMBtu/hr) that would be realized by the project as amended compared to the baseline assumptions presented in the EIR. This change in the presentation of the combustion emissions results in a modest decrease in the combustion emissions reductions for NO_x and PM10/PM2.5, and combustion emission increases for SO_2, POC, and CO as compared to the combustion emissions presented in EA Table 4. This change has also been incorporated in Table 3.2.2-2.

Based on an Incompleteness letter the BAAQMD sent to Valero on December 14, 2007, Valero has revised its ATC permit application to reflect more stringent Best Available Control Technology (BACT) limitations for the operations of its proposed new H2U (Valero, 2008a). The proposed BACT limitations result in lower emission factors for NOx, SO2, and CO associated with the proposed new H2U reformer furnace relative to those presented in EA (Appendix B, pages A-5 and A-6). Table 3.2.2-4 shows the change in NOx, SO2, and CO emission factors

**TABLE 3.2.2-3
VALERO BENICIA REFINERY VIP AMENDMENTS COMBUSTION EMISSIONS**

Source	Firing (MMBtu/hr)	NOx (tpy)	SO2 (tpy)	PM10/PM2.5 (tpy)	POC (tpy)	CO (tpy)
GT-702	70	5.1	1.6	3.4	1.9	33.4
SG-1032	-91	-1.5	-2.1	-1.0	-1.0	-1.7
F-301	-450	-98.9	-10.8	-18.0	-5.4	-41.2
F-351	-147.5	-30.7	-3.4	-1.7	-1.6	-2.8
New H2U*	707.5	18.3	15.8	7.7	7.1	22.3
Total Project	**89**	**-107.7**	**1.1**	**-9.6**	**1.0**	**10.0**

* New H2U emissions reflect BACT limitations proposed by BAAQMD (see discussion that follows this table). New H2U emissions estimates provided in the EA do not reflect the BACT limitations proposed by BAAQMD.

**TABLE 3.2.2-4
VIP AMENDMENTS EMISSION SUMMARY**

Pollutant	Emissions Factor (lb/MMMBtu)	
	EA Appendix B	April 2008 Air Permit Application
NOx	0.0082	0.0059
SO2	0.0065	0.0051
CO	0.0215	0.0072

between the EA and the latest Air Permit Application. The April 2008 Air Permit Application emission factors were used to calculate the applicable emissions presented in Table 3.2.2-3 to provide a more up to date reflection of the estimated emissions of the new H2U.

Fugitive Emissions

Subsequent to Valero's use permit application submittal, the City's review team requested that Valero provide a basis for the estimated increase in fugitive POC emissions that would result under the amended VIP. Based on this request, Valero confirmed that it has not yet completed the detailed engineering necessary to accurately estimate component types and amounts that would be associated with the VIP amendment. However, Valero has decided to take a conservative approach to fugitive POC emissions estimates by recommending a POC emissions cap in its BAAQMD PTC/PTO application for the amended VIP that is twice the amount that was disclosed for the originally proposed VIP in the certified EIR (Valero, 2008b). The BAAQMD has informed the City that it will establish such a cap as part of the Authority to Construct for the amended project. That cap, however, would be subject to adjustment post-construction if needed to accommodate the actual number of fugitive sources included in the project. Although the BAAQMD would require Valero to provide offsets for any exceedance of the cap, it is conceivable that Valero might not have enough contemporaneous offsets available and would have to resort to the use of banked emission reduction credits (ERC) that are not contemporaneous. The City believes that the use of ERCs to show compliance with an emissions cap would not be an appropriate method of emission reductions under CEQA. However, Valero assures the City that the suggested fugitive POC cap of 6 tons per year is based on a conservative estimate of total POC emissions for the amended VIP and has agreed to accept a condition of approval limiting as-built fugitive emissions for the amended VIP to no more than 6 tons per year.

Cumulative Impact Review

The City agrees with the air quality cumulative impact analysis approach presented in the EA. The EA adequately evaluates the consistency of the VIP Amendments with the City of Benicia General Plan and the BAAQMD's 2005 Ozone Strategy. Based on compliance with the General Plan and the Strategy, the VIP as amended would not be cumulatively considerable and cumulative impacts would be less than significant.

Summary and Conclusion

Based on this peer review, the change in the environmental impacts relative to the VIP Amendments would not be significant; therefore, impacts on air quality associated with the proposed VIP Amendments would be similar to those identified in the certified EIR. Although implementation of the VIP Amendments would result in an increase in POC and CO emissions above those emissions presented in the certified EIR, the amended annual VIP POC and CO emissions (13 tons and -106 tons, respectively) would remain below the BAAQMD significance thresholds. Because the VOC mitigation measure identified in the EIR (implementation of the Light Ends Rail Rack Arm Drains Project) has already been implemented and the proposed POC cap would be formalized as a condition of approval of the project, this peer review concurs with the EA's conclusion that the proposed VIP Amendments would not result in new impacts beyond those previously disclosed in the certified EIR and no additional mitigation measures are necessary to reduce any potential impacts to a less than significant level.

3.2.3 Greenhouse Gases

Introduction

This section presents results of the peer review conducted for Section 3.1.3, *Greenhouse Gases* (Valero, 2008). Also presented are the changes in the baseline that may have occurred since 2003, an independent peer review of the EA, a discussion of cumulative impacts, and a summary of conclusions of the EA for the VIP Amendments.

Changes after EIR Certification

When the certified EIR was prepared and certified (2002-2003), there were no enabling laws, guidance, or direction that would have required the EIR to consider in any meaningful way the disclosure of project-related GHG emissions, as well as to consider potential impacts from GHGs and their impact on global climate change. Consequently, the certified EIR contains neither a disclosure of VIP related GHG emissions, nor any discussion of the potential effects of VIP on global climate change. As is correctly discussed in Section 3.1.3.3 of the EA, as of the publication of this document enabling legislation has been passed but, there are as yet, no formal guidelines or accepted levels of significance yet available to access the significance of project-related GHG emissions. Such guidance is currently under development by the Office of Planning and Research, but is not expected until at least 2009 or 2010. In light of these circumstances, the EA discloses the difference in GHG emissions between the VIP as amended compared to the emissions that would have resulted under the originally approved VIP.

Environmental Analysis Review

The EA estimates the net change in total CO_2e (equivalent carbon dioxide) between the original project described in the certified EIR and the amended project using emission factors developed by the California Climate Action Registry (CCAR). The EA found that the proposed amended VIP would result in 11,350 metric tons less CO_2e emissions than the previously approved project described in the certified EIR. This peer review concurs with the EA discussion in that because there are not yet any definitive guidelines on how to assess the significance of GHG emissions and because there was no need to analyze GHG emission in the certified EIR, per CEQA Guidelines Section 15145, no formal finding of significance need be made with respect to the amended project's GHG emissions. However, because the amended project would result in a net decrease in CO_2e emissions compared to the previously approved VIP, impacts related to the amended VIP are considered to be less than significant.

Cumulative Impact Review

Section 4.2.3 of the EA concludes that because the amended project would reduce project-related GHGs compared to that of the previously approved VIP, the amended VIP would not represent a cumulatively considerable significant increase in GHG emissions. Therefore, cumulative impacts related to GHGs are less than significant. This peer review concurs with this reasoning based on the information presented in the EA, but must again point out that there are no definitive guidelines on how to assess the significance of GHG emissions whether from a project or cumulatively.

Summary and Conclusion

This peer review concurs with the overall conclusions of the EA for GHG impacts; the construction and operation of the VIP as amended would reduce GHG emission levels compared to those of the original project described in the certified EIR.

3.2.4 Biological Resources

Introduction

This section provides a peer review of EA Section 3.1.4, *Biological Resources* (Valero, 2008). Also presented are the original conclusions from the 2003 VIP EIR, the changes in the baseline that may have occurred since 2003, an independent peer review of the EA, a discussion of cumulative impacts, and a summary of conclusions.

Impact Conclusions of the EIR

The EIR found that the originally proposed VIP would not have resulted in any potentially significant, unavoidable impacts to biological resources. However, potential direct, on-site impacts were disclosed associated with the construction of the proposed crude oil tanks in non-jurisdictional wetlands at the Crude Oil Tank Farm. Mitigation measures identified in the EIR would reduce all potentially significant impacts associated with the construction of the tank farm to less than significant.

Changes after EIR Certification

Since certification of the EIR in April 2003, no new or additional biological resources may be impacted during construction and operations of the VIP Amendments.

Environmental Analysis Review

This peer review concurs with, and finds adequate, the conclusions identified in Section 3.1.4, *Biological Resources,* of the EA.

Cumulative Impact Review

This peer review concurs with the *Biological Resources* cumulative impact review located in Section 4.2.4 of the EA. As concluded on page 4-6 of the EA, the construction and operation of the proposed VIP Amendments, in addition to other cumulative Refinery and non-Refinery developments, would not result in any significant cumulative impacts to biological resources. To the extent that any other projects would have cumulative impacts to biological resources, the VIP Amendments would not contribute to these impacts because the VIP Amendments avoid such impacts entirely including avoidance of direct impacts to Sulphur Springs Creek and potential habitats for special-status plants and wildlife and wetland resources.

Summary and Conclusions

The biological resources impacts that would be associated with the proposed VIP Amendments would be similar to those identified in the EIR. Note that the only biological impacts identified in the EIR were for areas around the Crude Oil Tank Farm and that these Amendments do not involve any changes to this area and thus impacts would remain exactly as before, i.e., less than significant with mitigation. This peer review concurs with the EA's conclusion that the proposed VIP Amendments would not result in any new impacts beyond those previously identified in the EIR, or any increase in the severity of impacts identified, and no mitigation measures are necessary to reduce any potential impacts to a less than significant level for the new and modified equipment for the proposed VIP Amendments on the project site.

3.2.5 Cultural Resources

Introduction

This section provides a peer review of EA Section 3.1.5, *Cultural Resources* (Valero, 2008). Also presented are the original conclusions from the 2003 VIP EIR, the changes in the baseline that may have occurred since 2003, an independent peer review of the EA, a discussion of cumulative impacts, and a summary of conclusions.

Impact Conclusions of the EIR

The EIR found that the originally proposed VIP would not have resulted in any potentially significant, unavoidable impacts to cultural resources. However, the EIR found that construction activities could disturb unknown or unidentified cultural resources. Mitigation measures identified in the EIR would reduce this potentially significant impact to less than significant.

Changes after EIR Certification

Since certification of the EIR in April 2003, no new or additional cultural resources have been identified in the vicinity of the proposed VIP Amendments.

Environmental Analysis Review

This peer review concurs with, and finds adequate, the conclusions identified in Section 3.1.5, *Cultural Resources,* of the EA.

Cumulative Impact Review

This peer review concurs with the *Cultural Resources* cumulative impact review located in Section 4.2.5 of the EA. As concluded on EA page 4-7, the construction and operation of the proposed VIP Amendments, in addition to other cumulative Refinery and non-Refinery cumulative developments, would not result in significant cumulative impacts to cultural resources.

Summary and Conclusions

The impacts of the proposed VIP Amendments on cultural resources would be similar to those identified in the EIR. This peer review concurs with the EA's conclusion that the proposed VIP Amendments would not result in any new impacts beyond those previously identified in the EIR, or any increase in the severity of impacts identified, and no mitigation measures beyond those presented in the EIR are necessary to reduce any potential impacts to a less than significant level for the new and modified equipment required for the proposed VIP Amendments.

3.2.6 Energy

Introduction

This section provides a peer review of EA Section 3.1.6, *Energy* (Valero, 2008). Also presented are the original conclusions from the 2003 VIP EIR, the changes in the baseline that may have occurred since 2003, an independent peer review of the EA, a discussion of cumulative impacts, and a summary of conclusions.

Impact Conclusions of the EIR

The EIR analyzed potential impacts from increased energy usage (electricity and natural gas) as a result of operation of the originally proposed VIP elements. The EIR found that although the VIP would increase electrical energy demand by 23 MW and natural gas consumption by 9.6 million standard cubic feet per day, these increases were less than significant. This conclusion was mostly due to the Refinery's proposed implementation of a new 51 MW cogeneration facility onsite, which had the effect of a net reduction of the Refinery's total electrical demand from the local electrical grid.

Changes after EIR Certification

The cogeneration plant, which was listed as a cumulative project in the EIR, has commenced and is now operational. Valero states that it has completed several of the originally proposed VIP elements, including: alky debottleneck; ultra low sulfur diesel unit; and the sulfur recovery unit tail gas blower. In addition, several Refinery cumulative projects have become operational as well, including: the 51 MW cogeneration facility; the MTBE phase out; and the Light Ends Rail Rack Arm Drains project. Other than the proposed amendments to the VIP, no other Refinery-specific projects have been proposed that would affect energy usage.

Environmental Analysis Review

Use of Large Amounts of Energy

The discussion in the EA regarding energy usage is generally consistent with that provided in the EIR. In addition, the EA states that there would be no increase in energy demand over the EIR levels and that the amended project would reduce the Refinery's use of natural gas.

Wasteful or Inefficient Use of Fuel or Energy

The VIP Amendments would eliminate the 100 MMBTU/hr increased firing rate of steam generator SG-1032 resulting in a decrease in the expected fuel consumption from that assumed in the EIR. This reduction is partially offset by a new increase of 70 MMBTU/hr increased firing of gas turbine GT-702, however, the net result is still a 21 MMBTU/hr decrease from the expected increase considered in the EIR. Consequently, the discussion in the EA regarding energy usage is generally consistent with that provided in the EIR and its effects are less than that of the EIR.

Cumulative Impact Review

This peer review concurs with the *Energy* cumulative impact review located in Section 4.2.6 of the EA. The EA concludes that because the amended VIP would not increase electrical energy use and would decrease consumption of natural gas, the amended VIP would not make a cumulatively considerable contribution to the use of energy resources. This reasoning is supported by the data presented in the EA and is consistent with the EIR.

It should be noted that the cumulative impact discussion for energy on page 4-7 of the EA lists the Refinery's increase in energy demand as 5151 MW and the combined increase of the VIP as 232 MW. These are typographical errors. The correct numbers should be 51 MW and 23 MW, respectively. These corrected numbers are consistent with the EIR and the EA for the amendments and that the net result of the VIP would still constitute an reduction of energy demand from the local electrical grid.

Summary and Conclusion

This peer review concurs with the overall conclusions of the EA for energy impacts. The construction and operations of the VIP Amendments would not increase the severity of energy impacts identified in the EIR and no additional mitigation measures beyond those presented in the EIR are necessary to reduce impacts to less than significant. The principle supporting fact to this conclusion is the EA's statement that there would be no increase in electrical energy usage and a net decrease in natural gas consumption.

3.2.7 Geology and Seismicity

Introduction

This section provides a peer review of EA Section 3.1.7, *Geology and Seismicity* (Valero, 2008). Also presented are the original conclusions from the 2003 VIP EIR, the changes in the baseline that may have occurred since 2003, an independent peer review of the EA, a discussion of cumulative impacts, and a summary of conclusions.

Impact Conclusions of the EIR

The EIR analyzed whether there was a potential for geologic and seismic hazards to impact the VIP elements. The potential geologic hazards analyzed were expansive soils, soil erosion, landslides, and natural settlement. The potential seismic hazards identified were ground shaking, liquefaction, lateral spreading, differential settlement, tsunamis, and seiches. The analysis determined that of these potential hazards, ground shaking (and its associated hazards), expansive soils, natural settlement, and localized slope stability were potential impacts to the project. However, impact analysis demonstrated that the potential impacts would be less than significant through the implementation of appropriate mitigation measures, that in general, require seismic design consistent with the current engineering standards, compliance with the California Building Code, and conformance with recommendations set forth in a design-level geotechnical investigation for each element of the VIP. Therefore, geologic and seismic hazards were considered less than significance with mitigation. In addition, cumulative impacts were considered less than significant when considered with other refinery and non-refinery projects.

Changes after EIR Certification

There have been no substantial changes to the Geology and Seismicity of the project site since certification of the EIR. Valero has recently conducted several site investigations in anticipation of the proposed amendments (Kleinfelder, 2007).

Environmental Analysis Review

Faulting and Seismicity

The discussion in the EA regarding faulting, seismicity, and seismic-related ground failure is generally consistent with that provided in the EIR and is considered to be adequate.

Landslides

Considering the overall topography and the underlying geology, the analysis in the EA adequately characterizes the risk of landslides. The proposed H2U unit, new employee parking lot, and the three alternative sites for the relocated firehouse are located north of the Refinery Process Block on sloped terrain underlain by competent bedrock. Although there may be a slight risk of landslides in this geologic setting, grading, slope retaining structures (where necessary), and engineered fill placement are standard engineering practice, that, when coupled with the mitigation measures in the EIR, ensure the risk of landslides would remain less than significant. The assessment of landslide risk is similar for the proposed FCCU/CKR Scrubber. The area proposed for the scrubber is currently sloped and the project proposes to regrade the area to create a terrace involving the excavation of 26,300 cubic yards of material and construction of a retaining structure to stabilize the surrounding slope. Given the topographic setting and the degree of previous development in this area, it appears that terracing and slope stabilization is feasible and would reduce impacts associated with landslides. The alternate installation scheme involving the installation of a retaining wall on the sloped area and the addition of 175,000 cubic yards of material also appears reasonable and geotechnically feasible in reducing landslide risk in this particular geologic setting.

Soil Erosion and Loss of Topsoil

The EA adequately characterizes the potential risk from soil erosion and loss of topsoil. Soil erosion, although a potential hazard on sloped terrain and especially during construction, would remain less than significant because standard engineering practice typically includes measures to reduce erosion such as the Storm Water Pollution Prevention Plan (SWPPP) required for this project (see *Hydrology and Water Quality*, Section 3.2.10). Some soil erosion is expected during a large grading project but can be controlled using Best Management Practices (BMP)[1]; these measures, in concert with accepted engineering design and standard construction methods, reduce the potential for excessive erosion that could lead to substantial loss or damage.

It should be noted that neither Section 2.5.3 – Demolition, Excavation and Grading nor Section 3.1.7 – Geology and Seismicity of the VIP EA mention the need for City grading permits. Prior to construction of any element of the amended VIP that involves grading; Valero would need to submit a grading plan and soils report to obtain a grading permit for work at the project site and in the North Canyon area of the Refinery.

Unstable Geologic Unit

The discussion in the EA regarding unstable ground, soil failure, and landslides is generally consistent with that provided in the EIR and is considered to be adequate.

Expansive Soils

The discussion in the EA regarding expansive soils is generally consistent with that provided in the VIP EIR and is considered to be adequate.

Soils Incapable of Supporting a Septic System

The EA appropriately addresses the issue of septic systems; this project does not include the use of septic systems.

1 Note that these BMPs will be required as part of the SWPPP.

Cumulative Impact Review

This peer review concurs with the geology cumulative impact review presented in Section 4.2.7 of the EA. In most cases, cumulative impacts associated with geologic and seismic hazards are less than significant because individual projects must comply with the building codes, standard engineering practice, and local grading ordinances, all of which are designed to protect people and property from damage during earthquakes or other non-seismic hazards. Because hazards are reduced in significance at the project level through engineering controls, cumulative seismic and geologic impacts due to other projects are typically not created. The components proposed under the VIP Amendments would comply with the same engineering controls, building code requirements, and local ordinances as the originally proposed VIP and identified cumulative project, and therefore, a cumulatively significant impact involving the VIP Amendments and other proposed projects would not occur.

Summary and Conclusion

The peer review generally concurs with the overall conclusions of the EA, that the construction and operations of the VIP Amendments would not increase the severity of impacts identified in the EIR and no additional mitigation measures beyond those presented in the EIR are necessary to reduce impacts to less than significant. The slope stability issues that the EA refers to at the proposed sites of the H2U, the proposed new employee parking lot, alternate firehouse locations, and FCCU/CKR Scrubber, in the opinion of the peer reviewers, remain less than significant because slope retaining structures are proposed as part of the H2U and Scrubber projects and the gradual slopes over competent bedrock would likely preclude slope instability hazards at the parking lot and firehouse. In addition, Valero conducted a supplemental geotechnical investigation to evaluate soil conditions for retaining walls and foundations associated with the proposed Scrubber (Kleinfelder, 2007). Valero also performed an investigation for the new H2U Plant to supplement the available geotechnical information compiled in the 2002 URS Geotechnical and Geologic Assessment. These studies show no new remarkable information and are part of Valero's compliance efforts with the California Building Code.

Given the existing body of geotechnical data and the understanding that the proposed structures would be evaluated and designed in accordance with proper civil engineering standards, it is reasonable to assume that significant impacts associated with existing geologic and seismic conditions would not occur under the proposed VIP Amendments. Furthermore, each element of the VIP Amendments must comply with the California Building Code and local grading ordinances and would be reviewed during the final design and construction phases by a California-registered civil or geotechnical engineer.

3.2.8 Public Health

Introduction

This section provides a peer review of EA Section 3.1.8, *Public Health* (Valero, 2008). Also presented are the original conclusions from the 2003 VIP EIR, the changes in the baseline that may have occurred since 2003, an independent peer review of the EA, a discussion of cumulative impacts, and a summary of conclusions. It should be noted that the Bay Area Air Quality Management District (BAAQMD) is conducting its own peer review of the VIP Amendments relative to its permit to construct/permit to operate (PTC/PTO) permit process.

Impact Conclusions of the EIR

The EIR found that public exposure to toxic air contaminant (TAC) emissions can result in health risks associated with the originally proposed VIP. However, the incremental health risks from the project were found to be extremely small when compared to typical day-to-day health risks. Since the predicted health risk increments from the VIP were less than the significance thresholds, the impacts were determined to be less than significant and no mitigation measures were required.

Changes After EIR Certification

Subsequent to the EIR certification, ambient air monitoring of gaseous toxic air contaminants (TACs) was conducted at a new location in Benicia by BAAQMD for one year (April 2007 through March 2008). These measurements were taken to supplement monitoring data in Vallejo that were reported in the Certified EIR. The Benicia measurements were compared with measurements taken at the Vallejo site over that same time period. The annual average concentrations of the gaseous TACs taken at the two stations are reported in Table 3.2.8-1. The Table also shows the cancer and non-cancer health risks estimated from these levels over a lifetime exposure(70 years). The cancer risk at the Benicia monitor is estimated to be 63.8 in one million, where the cancer risk from exposure to TACs monitored at the Vallejo station is estimated to be 48.8 in one million. At both stations, the highest cancer risks are from exposure to benzene, where the risks from benzene exposure at the Benicia and the Vallejo stations are estimated to be 27.8 and 13.0 in a million, respectively. The chronic hazard indices for non-carcinogens from the monitoring at the Benicia station and at the Vallejo station are estimated to be 0.10 and 0.08, respectively, both well below the level of 1.0 which is the significance threshold.

The measurements at both stations were also compared with measurements in the year 2000 in Vallejo and that are reported in the Certified EIR. The 2000 data are given in Table 3.2.8-2. The risk estimate for the 2000 Vallejo data is 139.0 in one million, much higher than levels reported at Benicia and at Vallejo in 2007/2008. The reduced levels in 2007/2008 are probably due mainly to the continuing reductions in emissions of benzene and other gaseous TACs from roadway vehicles, as the cleaner gasoline blends have been introduced into the California market in the past few years.

TABLE 3.2.8-1
AVERAGE AMBIENT AIR CONCENTRATIONS OF TOXIC AIR CONTAMINANTS MEASURED IN BENICIA AND VALLEJO (APRIL 2007 – MARCH 2008)

Compound	Average Concentration (ppb)		Unit Risk $(ug/m^3)^{-1}$	Chronic REL (ug/m^3)	Benicia (ug/m^3)	Benicia Cancer Risk (per million)	Benicia Chronic Hazard Index	Vallejo (ug/m^3)	Vallejo Cancer Risk (per million)	Vallejo Chronic Hazard Index
	Benicia	Vallejo								
1,1,2 Trichlorotrifluoroethane	0.066	0.059								
1,3-Butadiene	<0.05	<0.05	1.7×10^{-4}	20.0	0.055	9.3	.003	0.055	9.3	.007
Methyl Tert-Butyl Ether	<0.3	<0.3	2.6×10^{-7}	8,000	0.54	0.1	.00007	0.54	0.1	.00007
Acetone	3.0	2.23								
Methyl ethyl ketone	0.29	0.15		1,000	.855		.0009	0.44		.00015
Methylene chloride	<0.1	<0.1	1×10^{-6}	400	.174	0.2	.0004	0.174	0.2	.0004
Chloroform	<0.01	<0.01	5.3×20^{-6}	300	0.024	0.1	.00008	0.02	0.1	.00008
Carbon tetrachloride	0.10	0.10	4.2×10^{-5}	40	0.314	13.1	.0008	0.314	13.1	.008
Trichlorofluoromethane	0.28	0.27								
Methyl chloroform	<0.02	<0.02		1,000	.055		.00006	0.055		.00006
Ethylene dichloride	<0.1	<0.1		400	.202		.0005	0.202		.0005
Perchloroethylene	0.013	0.007	5.9×10^{-6}	35	.088	0.5	.003	0.047	0.3	.0015
Trichloroethylene	<0.01	<0.01	2×10^{-6}	600	.027	.05	.00005	0.027	.05	.00005
Ethylene dibromide	<0.01	<0.01	7.1×10^{-5}	0.8	.038	2.7	.048	0.038	2.7	.048
Vinyl chloride	<0.1	<0.1	7.8×10^{-5}	26	.128	9.9	.005	0.128	9.9	.005
M/P Xylene	0.54	0.15		700	2.34		.003	0.649		.0008
Benzene	0.30	0.14	2.9×10^{-5}	60	.958	27.8	.016	0.447	13.0	.007
Toluene	0.99	0.32		300	3.73		.012	1.206		.004
Ethylbenzene	0.13	<0.04		2,000	.560		.00028	0.087		.00004
O-Xylene	0.16	<0.04		700	.695		.001	0.09		.00015
					Total	**63.75**	**0.102**		**48.75**	**.080**

SOURCE: ESA, 2008

TABLE 3.2.8-2
AVERAGE AMBIENT AIR CONCENTRATIONS OF TOXIC AIR CONTAMINANTS MEASURED IN VALLEJO IN THE YEAR 2000

Compound (Gaseous TACs)	Concentration (ppb)	Concentration (μg/m^3)	Unit Risk (μg/m^3)$^{-1c}$	Cancer Risk (Chances in one million)
1,3-Butadiene	*0.14*	*0.32*	1.70×10^{-4}	*54.5*
Benzene	0.47	1.53	2.90×10^{-5}	44.3
Carbon Tetrachloride	0.10	0.64	4.20×10^{-5}	26.9
Perchloroethylene	0.06	0.41	5.90×10^{-6}	2.4
Methylene Chloride	0.56	1.98	1.00×10^{-6}	2.0
MTBE	0.63	2.31	2.60×10^{-7}	0.6
Chloroform	0.15	0.74	5.30×10^{-6}	3.9
Trichloroethylene	0.40	2.19	2.00×10^{-6}	4.4
			Total	**139.0**

SOURCE: Certified Valero EIR, ESA, 2003

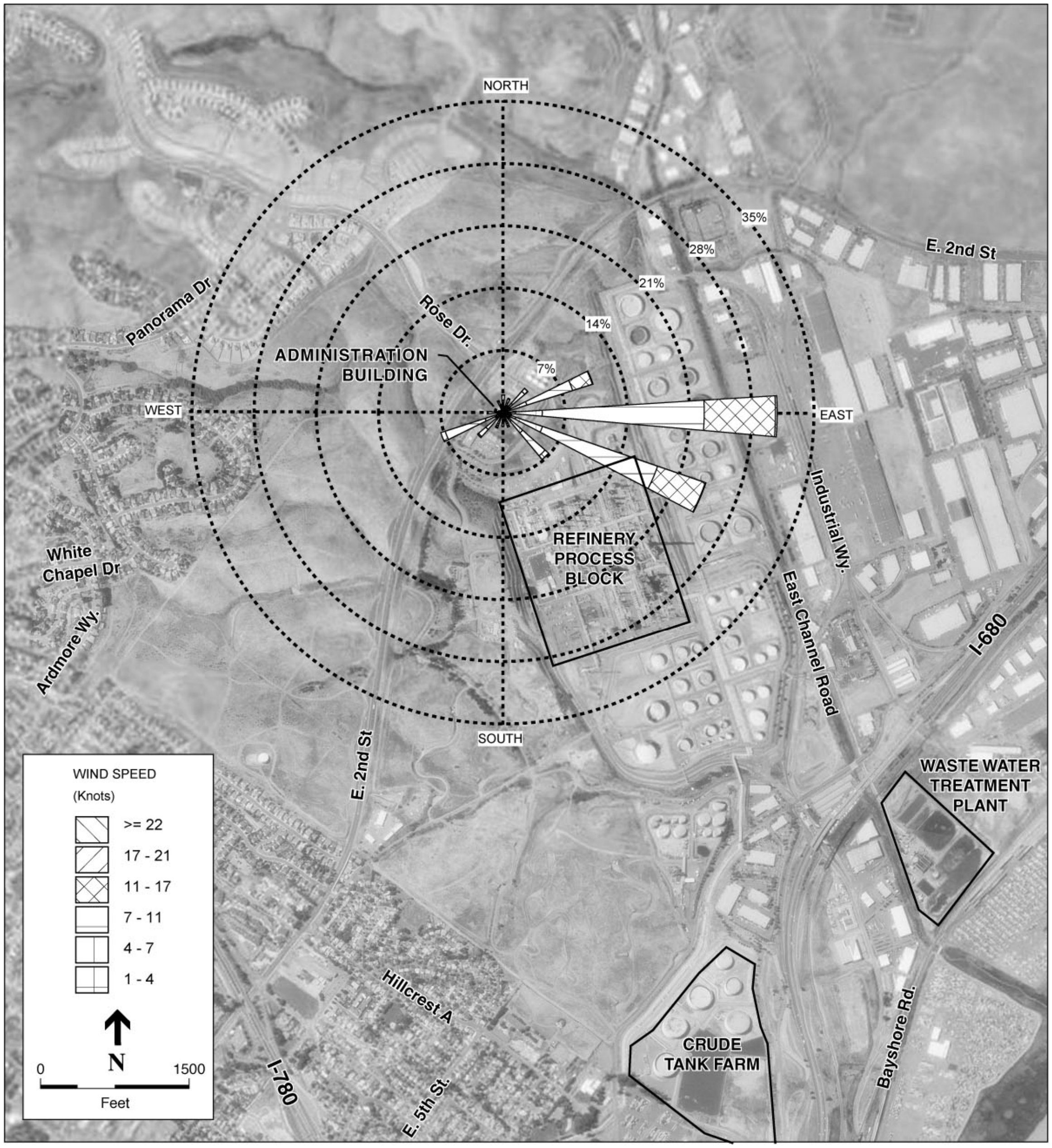
The Benicia monitor is located on Tennys Drive west of the Valero Refinery. Other sources of gaseous TACs that could affect measured levels at the monitor would include emissions from nearby roadways, where Interstate 780, a major source of these pollutants, is about 0.2 miles away from the Benicia monitor. An annual windrose plot for Benicia (Figure 3.2.8-1) shows that winds blow from Interstate 780 to the monitor on Tennys Drive much of the time, about 47% of the time. Conversely, winds blowing from the refinery to the Benicia monitor blow only about 10% of the time. Thus, TAC emissions from freeway traffic would have about 5 times the influence on monitored levels at the Benicia station than equivalent emissions from the refinery.

The Vallejo monitor which is located about 0.5 miles west of the nearest major roadway, I-80, is upwind the prevailing wind direction from I-80, and there are no major sources of gaseous TACs in the vicinity of this monitor. Thus, it is expected that levels of gaseous TACs at the Vallejo monitor should be lower than levels measured at the Benicia monitor.

Environmental Analysis Review

Health Risks Associated with Construction

The EA states that construction traffic and construction activities for the amended VIP would be similar to construction of the originally proposed VIP that was evaluated in the EIR and that the health impacts would be the same as described in the EIR. However, the EA project description states that the VIP Amendments could require the import of about 175,000 cubic yards of fill, and that approximately 40 truck trips per day would be required to bring in this fill. These additional truck activities represent potential increases in diesel particulate matter (DPM) emissions from truck exhausts compared to the proposed construction activities reported in the EIR. Assuming that the trucks would turn off their engines and would not idle for any significant time while being loaded, DPM emissions from the 40 truck trips per day would not result in a significant



The diagram shown on this figure depicts the annual frequency of wind speed and wind direction classes observed at the Valero meteorological monitoring station. The flow vectors stretch out in the direction that the wind blows over the station. For example, where the vectors stretch to the east, the frequency shown represents the percent of time the wind blows from the west to the east over the monitoring station.

SOURCE: Certified Valero EIR, ESA, 2003

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Figure 3.2.8-1
Wind Speed and Direction as
Observed at the Valero Meteorological Monitoring Station

change in DPM emissions in the area. Hence, the health risk impacts from the additional truck trips would be very low and would be less than significant.

Health Risk Associated with Operations

This section is a peer review of the health risk assessment (HRA) that is contained in the EA submitted by Valero (Valero, 2008). The HRA evaluated exposure to TACs related to the originally proposed VIP and the VIP Amendments. The incremental risk of contracting cancer and the risk of adverse health effects from exposure to non-carcinogenic substances emitted from the originally proposed VIP and the amended portion of the VIP are reported in the EA. While the incremental health risks from the stationary sources are reported in the EA, the total impact, including stationary and mobile sources, are not reported. The worst health risk impacts from the total VIP, including the amendment, can be determined by combining the maximum concentrations associated with the originally proposed VIP and the maximum concentrations associated with the VIP Amendments. This analysis is given below.

Table 3.2.8-3 reports the maximum incremental cancer risks from the amended VIP. As stated above, the EA does not report the total maximum health risks. The worst case impacts can be determined by adding the stationary and mobile source concentrations from the VIP that are reported in the EIR with the maximum concentrations from the Addendum that are reported in the EA. These maximum total incremental cancer risks (VIP plus VIP Amendment) are also reported in Table 3.2.8-3. The maximum cancer risk results reported in the table for residential receptors and for nonresidential receptors are 1.94 in one million and 2.99 in one million, respectively. These values are less than the CEQA significance threshold of 10 in one million. Thus, the cancer risk impacts of the VIP, as amended, would be less than significant.

TABLE 3.2.8-3
INCREMENTAL CANCER RISKS FOR AMENDED VIP[a]

	Incremental Cancer Risk EIR[b]			Incremental Cancer Risk VIP Amendment[c]			Total Incremental Cancer Risk VIP as Amended
Maximum Offsite Impact	**Stationary Sources**	**Mobile Sources**	**Total Risk**	**Stationary Sources**	**Mobile Sources**	**Total Risk**	
Maximum Residential Location	0.665	0.80	1.465	0.453	0.024	0.477	1.942
Maximum Nonresidential Location	0.671	1.70	2.371	0.598	0.024	0.622	2.993
Significance Threshold			10			10	10
Significant Impact? (Yes/No)	No	No	No	No	No	No	No

[a] Risks are expressed as incremental increases in cases of cancer per million population exposure to the reported TAC concentrations.
[b] Impacts are reported in the EIR of the VIP as risk in one million.
[c] Impacts are reported in the EA of the VIP Amendments.

SOURCE: ESA, 2008

The impacts from exposure to noncarcinogens related to the VIP amendments are reported in the EA. These impacts were also calculated from the modeling described above and the chronic noncancer impacts are reported in Table 3.2.8-4. They show that the maximum chronic Hazard Index, the term used for evaluating non carcinogens, for each scenario is well below the CEQA significance threshold of 1.0. Thus, the chronic noncarcinogens impacts are less than significant. In addition, the EA calculated maximum acute hazard indices for noncarcinogens that have a health outcome from acute exposure to emissions. The total maximum acute hazard index (VIP and VIP Amendments) was calculated to be 0.252, which is well below the significance threshold of 1.0, and the impact is less than significant.

TABLE 3.2.8-4
NONCANCER IMPACTS FOR AMENDED VIP[a]

	Chronic Hazard Index, VIP EIR[b]			Chronic Hazard Index, VIP Amendment[c]			
Maximum Offsite Impact	**Stationary Sources**	**Mobile Sources**	**Total Chronic Hazard Index**	**Stationary Sources**	**Mobile Sources**	**Total Chronic Hazard Index**	**Total Chronic Hazard Index, VIP as Amended**
Maximum Residential Location	0.006	0.0006	0.0066	0.0012	0.00002	0.00122	0.0078
Maximum Nonresidential Location	0.0099	0.0081	0.018	0.0016	0.00002	0.00162	0.0176
Significance Threshold			1.0			1.0	1.0
Significant Impact? (Yes/No)	No	No	No	No	No	No	No

[a] Impacts are expressed as Hazard Indices, which are the sums of the Hazard Quotients for the noncarcinogenic TAC concentrations predicted for each scenario.
[b] Impacts are reported in the certified EIR.
[c] Impacts are reported in the EA for the VIP Amendments.

SOURCE: ESA, 2008

Cumulative Impact Review

The City agrees with the public health cumulative impact analysis approach presented in the EA. Based on the cumulative impacts analysis for public health presented in EA Section 4.2.8, the exposure levels of TACs from cumulative projects would be less than significant. Therefore, the amended VIP would not result in significant cumulative impacts to public health.

Summary and Conclusion

Based on this peer review, the change in the environmental impacts relative to the VIP Amendments would not be significant; therefore impacts related to the carcinogenic and non-carcinogenic health risks from the amended VIP are less than significant, and no additional mitigation measures are required.

3.2.9 Public Safety

Introduction

This section provides a peer review of EA Section 3.1.9, *Public Safety* (Valero, 2008).

Impact Conclusions of the EIR

The EIR found that the risks to public safety from potential accidents from the VIP are low, and the impacts from plausible accidental releases would be less than significant with no mitigation measures required.

Environmental Analysis Review

The EA states that the SCR units for the H2U furnace and new CO furnace would use aqueous ammonia in addition to the amount presently used at the Refinery. Supplementary information from Valero indicates that the Benicia Refinery currently uses approximately 12.8 million pounds per year of aqueous ammonia in the Pipe Still Selective Non-Catalytic Reduction (SNCR) and various selective catalytic reduction (SCR) units throughout the facility (ENSR, 2007). The new SCRs associated with the VIP Amendments would use an additional amount of aqueous ammonia of about 1.7 million lb/yr, representing approximately a 13 percent increase. The Refinery's existing aqueous ammonia storage and delivery systems are adequate for the increased ammonia usage; so the ammonia storage capacity (the largest vessel containing ammonia) would not increase, and the risks of an accidental release from the storage tank would not change. However, the 13 percent increase in ammonia usage would result in a 13 percent increase in truck deliveries of aqueous ammonia to the Refinery. While this would lead to an increased probability of an accidental release of ammonia during truck unloading, which is one of the more probable types of accidents that can occur, the offsite consequence of such an accident would be the same risk as was analyzed for truck unloading of ammonia in the existing facility in the EIR and would remain at the same level of insignificance as the VIP.

Cumulative Impact Review

The peer review agrees with the public safety cumulative impact analysis approach presented in Section 4.2.9 of the EA. Based on the cumulative impacts analysis for public safety presented in Section 3.1.9 of the EA and Section 4.2.9, there are no new risks to public safety and the existing facilities can handle the slight increase (13% per year) of ammonia usage as a result of changes in the Amendments. This is the case, because the amended VIP would not require any new ammonia storage or handling facility, and the amended project would not introduce any new risk of a chain reaction accident, since other non-Refinery projects are located well away from the Refinery to cause any potential cumulative risk. Thus, the cumulative public safety impacts of the VIP, as amended, would be less than significant.

Summary and Conclusion

Since the VIP Amendments would result in only a small increase in the generation of hazardous waste which could be readily incorporated into the existing hazardous waste operations, the impacts would be less than significant. In addition, the offsite consequences of a possible accidental release from additional loading of ammonia for controlling NOx emissions from the new H2U furnace and the CO furnace would be less than significant, as described above. Thus, the impacts to public safety from the amended VIP would be less than significant.

3.2.10 Hydrology and Water Quality

Introduction

This section provides a peer review of EA Section 3.1.10, *Hydrology and Water Quality* (Valero, 2008). Also presented are the original conclusions from the 2003 VIP EIR, the changes in the baseline that may have occurred since 2003, an independent peer review of the EA, a discussion of cumulative impacts, and a summary of conclusions. The hydrology and water quality review below is divided into four categories: surface water and drainage, groundwater resources, flooding, and water quality.

Impact Conclusions of the EIR

In the EIR, all hydrology and water quality impacts related to the implementation of the VIP were determined to be less than significant. No mitigation was identified (ESA, 2003).

Changes after EIR Certification

The changes that have occurred since the EIR was certified in 2003 related to hydrology and water quality are as follows:

- The NRU Catalyst Regeneration Facility Project (NRU Project), which was not in the cumulative analysis in the EIR, is listed as a part of cumulative projects in the EA. The project commenced operation in April 2007.
- Valero's existing NPDES permit expired on November 30, 2007. Valero submitted the NPDES permit renewal application in May 2007 (ENSR, 2008) but a new permit has not yet been issued. At this time, this peer review assumes discharges to be covered under the existing NPDES permit.

Environmental Analysis Review

The amended VIP would essentially add more process units in the central portion of the Refinery. As discussed in the EIR and the EA, the increase in impervious areas associated with the new process units and thus the stormwater runoff would be minimal. The impacts that could be significant would be associated with process wastewater, as discussed below.

Surface Water and Drainage

Construction of the VIP Amendments could affect the stormwater quality, however as discussed in the EA, best management practices (BMPs) would be implemented as a part of the General Construction Permit requirements to minimize erosion and siltation and thus any downstream flooding. As shown in Figure 2.3-3 of the EA, the parking lot and the firehouse would be relocated to the northwest portion of the refinery. As stated in the EA, stormwater from the refinery process areas is directed to the refinery WWTP and stormwater from areas such as parking lots and other unimproved areas flows into existing permitted outfalls. The new location of the parking lot and the firehouse would be in an area that currently drains into the existing outfalls; therefore the net increase in stormwater would be negligible, if any. However, the EA states that there would be a decrease in stormwater flows to the outfalls because the existing employee parking lot that drains to the existing outfalls will be converted to a process area where runoff will be directed to the refinery WWTP (Valero, 2008; Pages 3-75, 3-76. A quantitative discussion of the increase in the runoff and the impervious surfaces under project conditions and as compared to the existing conditions would help in ascertaining that there would be no net increase in runoff to the outfalls.

Stormwater flows from the new process area in the current parking lots would add to the flows directed to the refinery WWTP. However, the increase is minimal in relation to the existing loading and available capacity of the WWTP, therefore the increase in storm flows to the WWTP would not be substantial (Valero, 2008; Pages 3-75, 3-76). Further, Valero has the ability to regulate the increased flows by controlling the storm flows that accumulates within the tank dikes (Valero, 2008; page 3-76).

The net change in runoff flows is not expected to be substantial as to cause substantial erosion, siltation, or flooding on- or offsite. The impact would be less than significant by complying with the stormwater permit requirements and ensuring no net increase in runoff.

Groundwater Resources

Construction of the VIP Amendments would not impact groundwater resources. Operation of the VIP Amendment would not require additional use of groundwater and not substantially interfere with groundwater charge. The impact would be less than significant.

Flooding

The VIP Amendments would not add any housing in the vicinity or expose people to an increase in flooding hazards. The Valero Waste Water Treatment Plant (WWTP) does lie within the 100-year flood plain and potential impacts to the WWTP were considered and discussed in the EIR, nothing in the proposed amended project would change the EIR discussion or conclusions that the impact would be less than significant. As stated in the EIR and the EA, Valero shall comply with Chapter 15.4, Flood Damage Prevention, of the Benicia Municipal Code in designing the VIP including the VIP Amendments. The impact would be less than significant.

Water Quality

As shown in Table 3.1.10-1 of the EA, the VIP Amendments would increase the wastewater volume by 184,320 gallons per day (gpd). At the same time, the NRU Project[1] has reduced the wastewater levels by approximately 100,800 gpd. The net change in wastewater volume from the VIP Amendments would therefore be an increase of 83,520 gpd with a total wastewater quantity of 343,520 gpd[2]. The EA states that the 83,520 gpd increase in wastewater discharge would cause

1 The NRU Project is a cumulative project and is not part of the VIP.
2 Total wastewater volume from the VIP and VIP Amendments, including the NRU Project is 0.26 million gpd (or 260,000 gpd) combined with 83,520 gpd.

no change in the water quality impact relying only on the assurance that Valero would adhere to the NPDES permit requirements.

This peer review finds a need to discuss the antidegradation report required under Provision D.2 in Valero's existing NPDES permit, in which Valero would demonstrate that it has implemented adequate controls (e.g., treatment capacity) to ensure high quality waters. Valero and the San Francisco Bay Regional Water Quality Control Board (RWQCB) agreed (Valero, 2008) that if VIP elements or other changes in Refinery or Waste Water Treatment Plant (WWTP) operation introduced a new contaminant to the WWTP or significantly changed the quality and/or hydraulic loading of the WWTP, Valero would conduct a study to evaluate whether compliance can be maintained with the existing WWTP. If necessary modifications were required pursuant to the study and approved by the RWQCB, then Valero would implement the changes under the NPDES permit. This provision for an antidegradation report would be carried forward to the renewed NPDES permit as per the federal antidegradation requirements. Current analysis of the VIP Amendments shows that no new contaminants would be introduced to the influent of the WWTP, and the expected additional load would be treated to maintain compliance with the discharge limits in the NPDES permit (Valero, 2008).

As shown in Table 3.1.10-1 in the EA, the VIP Amendments would increase nickel and vanadium levels in the wastewater. However, wastewater tests conducted by Valero at other locations show that nickel and vanadium are absorbed by the wastewater biomass and discharged as solid waste (Refer to Section 3.2.15, for details). Therefore, the treated wastewater discharge is not expected to exceed water quality standards (Valero, 2008).

Cumulative Impact Review

Surface Water and Drainage

The VIP Amendments along with the other projects would not cause a substantial alteration of the drainage pattern of the main refinery. The impact would not be significant. However, projects implemented concurrently with the VIP Amendments outside the refinery could cause an increase in stormwater runoff resulting in siltation and flooding downstream. As discussed previously, the stormwater from new process areas at the refinery would be treated at the refinery WWTP and discharged in compliance with the NPDES permit. The new fire station and employee parking lot would be developed in areas that currently discharge to permitted outfalls and would continue to do so after development. The change in the amount of stormwater discharged to the outfalls would be minimal. Therefore the contribution of the VIP Amendments to cumulative impacts would not be substantial hence the impact would be less than significant (Also, refer to the water quality discussion below). Consistent with the rest of the cumulative impacts discussion, the geographic scope of the cumulative analysis in the EA, for the projects located northeast and northwest of the refinery should be expanded to Suisun Bay and Carquinez Strait and not be limited to Lower Sulphur Springs Creek. Based on project-specific mitigation anticipated for such projects in the vicinity and compliance with the regulatory requirements for stormwater control, the cumulative impacts are not expected to be significant.

Groundwater

Neither the EIR nor the EA contains a cumulative impact discussion related to groundwater resources. The EA states that the VIP Amendments would not require the use of groundwater or interfere substantially with groundwater recharge. Therefore the VIP Amendments would not cause an adverse impact to the groundwater resources. As stated as a part of the project level groundwater resource impact discussion in Chapter 4.09 of the EIR, any groundwater use is restricted due to existing groundwater contamination in the area. Therefore considering other projects that would be implemented in the vicinity, the contribution from the VIP Amendments would be negligible. The impact would be less than significant.

Flooding

The EA does not contain a cumulative impact discussion related to flooding. However, project components of the VIP Amendments would not lie in a 100-year flood zone. Projects in the vicinity may be located within a floodplain; however, the contribution of VIP Amendments to the cumulative flooding impact would be negligible. The impact would be less than significant.

Water Quality

The VIP Amendments combined with other projects within and outside the Refinery would contribute controlled amounts of pollutants to Suisun and San Pablo Bay due to wastewater and/or stormwater discharges during construction and/or operation. As stated in the EA, the wastewater and stormwater contributions from the Refinery and other projects are regulated by the discharge limits in the NPDES permits. The minor increase in stormwater discharge would be reduced by designing the components to ensure that there would be no change in the pre- and post-project runoff due to VIP Amendments. The total volume of wastewater would stay within the WWTP capacity of 3.6 million gpd. Thus, the VIP Amendments would not result in a significant cumulative impact or make a considerable contribution.

Summary and Conclusion

Based on the peer review of surface water drainage, groundwater, and stormwater impacts, the change between the originally proposed VIP and amended VIP would not be substantial; therefore, the impacts from the VIP Amendments would be similar to those described in the EIR. The VIP Amendments would cause relocation of some existing non-process facilities and installation of process areas that would cause negligible increase in storm runoff flowing into the outfalls, if any. The new process areas would add to the flows directed to the refinery WWTP, however the flows would remain with the WWTP capacity. Valero would adhere with the General Construction Permit and Benicia's Floodplain Management Policy requirements as stated in the EIR and the EA. The peer review concurs with the conclusion presented in the EA that the proposed VIP Amendments would not result in new impacts to surface water drainage, and stormwater impacts beyond those identified in the EIR, or increase in the severity of the impacts identified in the EIR. In the case of stormwater impacts, the conclusion of no net change in stormwater runoff is not supported by quantitative information, but the change would be negligible.

Based on the peer review of the water quality impact analysis, a net increase of 83,520 gpd in the wastewater discharge from the VIP Amendments would not be a significant change from that discussed in the EIR. The Refinery WWTP (either in the current state or with upgraded process units) would be capable of accommodating the increased wastewater volume and the treated wastewater discharge would comply with Valero's NPDES permit requirements.

3.2.11 Land Use, Planning, and Policies

Introduction

This section provides a peer review of EA Section 3.1.11, Land Use, Plans, and Policies (Valero, 2008). Also presented are the original conclusions from the 2003 VIP EIR, the changes in the baseline that may have occurred since 2003, an independent peer review of the EA, a discussion of cumulative impacts, and a summary of conclusions.

Impact Conclusions of the EIR

In the EIR, all land use impacts related to the implementation of the originally proposed VIP were determined to be less than significant. No mitigation was identified (City of Benicia, 2003).

Changes after EIR Certification

Since certification of the EIR in April 2003, there have been no changes in surrounding land uses, General Plan or zoning designations, or any other changes in plans, policies, or ordinances in Benicia that would be relevant to the proposed elements of the VIP Amendments. The City of Benicia's Land Use Diagram was updated in November 2003, to reflect Measure K amendments; however, this adjustment would have no impact on the land use designations at the Refinery. Measure K is a City of Benicia urban growth boundary initiative, passed in 2003 that prohibits development for 20 years beyond the boundary limits, including the hillsides of Benicia's Sky Valley located north of the city, without voter approval.

Environmental Analysis Review

Divide an Established Community

The EA adequately characterizes the potential to physically divide an established community. The elements of the VIP Amendments would occur within the existing Refinery boundary, an existing industrial area. Because there would be no development within existing open space buffers and no public roads that would pass through the facility, the elements of the VIP Amendment would not physically divide an established community.

Land Use Compatibility

The discussion in the EA regarding compatibility with applicable land use plans, policies, or ordinances is generally consistent with that provided in the EIR and is considered to be adequate. The elements of the proposed VIP Amendments would occur within the existing Refinery boundary, an area designated as General Industrial (IG) by the City of Benicia Zoning Ordinance and General Plan. The elements of the VIP Amendments are permitted with a use permit in the IG zone.

Habitat Conservation or Natural Community Plans

The discussion in the EA regarding the potential to conflict with any habitat conservation plan or natural community conservation plan is generally consistent with that provided in the EIR and is considered to be adequate. Elements of the proposed VIP Amendments would be located in areas identified in an existing industrial area and would not conflict with any habitat conservation plan or natural community conservation plan.

Construction

The EA did not sufficiently analyze the potential construction-related impacts the proposed VIP Amendments may have on adjacent industrial uses and nearby residences due to traffic congestion, air emissions, noise increases, view disruptions, and public safety. As discussed in Section 2, Project Description of the EA, the proposed VIP Amendments project elements would require demolition of two existing refinery facilities. Specifically, an existing 6,000 square foot firehouse and a training building would be demolished as part of the proposed VIP Amendments. Additional grading, transport of materials, and installation of new equipment would also be required.

Although the amended VIP would likely result in additional construction activity, land use construction-related impacts are not expected to increase in severity beyond those previously identified in the certified EIR, as construction impacts would remain short-term in nature and are not expected to continue after completion of the project. For additional analysis of construction-impacts that affect land use, refer to peer review Sections 3.2.1, Aesthetics, Visual Quality, Light and Glare; Section 3.2.12, Noise; and 3.2.14, Transportation and Traffic. Mitigation measures identified in the certified EIR associated with these issue areas would mitigate all potential land use construction impacts to a less than significant level.

Cumulative Impact Review

This peer review concurs with the *Land Use, Plans, and Policies* cumulative impact review located in Section 4.2.11 of the EA. As concluded on EA page 4-10, the construction and operation of the proposed VIP Amendments, in addition to other cumulative Refinery and non-Refinery cumulative developments, would not result in any significant cumulative impacts to land use plans and policies. The impact of each project, if any, would be specific to its site and land use changes and overall effects were considered in the development of the Benicia General Plan.

Summary and Conclusions

Based on this peer review, there would not be a change in the significance of land use impacts associated with the amended VIP compared to the originally proposed VIP. This peer review concurs with the EA's conclusion that the proposed VIP Amendments would not result in any new impacts beyond those previously identified in the certified EIR, or any increase in the severity of impacts identified, and no mitigation measures are necessary to reduce any potential impacts to a less than significant level for the new and modified equipment for the proposed VIP Amendments.

3.2.12 Noise

Introduction

This section provides a peer review of EA Section 3.1.12, *Noise* (Valero, 2008). Also presented are the original conclusions from the 2003 VIP EIR, the changes in the baseline that may have occurred since 2003, an independent peer review of the EA, a discussion of cumulative impacts, and a summary of conclusions.

Impact Conclusions of the EIR

The certified EIR for the originally proposed VIP determined that construction noise impacts would be less than significant with implementation of a mitigation measure designed to reduce pile driving noise and that operational impacts would be less than significant with no need for mitigation measures.

Changes after EIR Certification

Since certification of the EIR, there are no changes to either the physical environment with respect to project-related noise or changes to the regulatory environment that would affect conclusions of the EIR.

Environmental Analysis Review

The discussion in the EA regarding construction and operation noise and vibration is consistent with that provided in the VIP EIR and is considered to be adequate. The EA uses a conservative approach to assessing operational impacts in that it does not account for the noise reductions that would occur due to the VIP equipment that is now not proposed to be installed.

It should be noted that the noise discussion on EA, page 3-88 lists the estimated noise levels associated with the amended VIP to be 13.55 to 155.5 dBA less than the levels at the Administration Building without the new equipment. The 155.5 dBA is an apparent typographical error and should be 15.55 dBA.

Cumulative Impact Review

This peer review concurs with the noise cumulative impact review located in Section 4.2.12 of the EA in that expected noise impacts from the construction and operation of the amended project would not significantly change day and nighttime noise levels above those considered in the EIR for the VIP. The amended VIP plus other Refinery and non-Refinery projects would not result in significant cumulative impacts to noise primarily because the main cumulative impacts would be most likely occur from construction noise and all cumulative projects are sufficiently separated to attenuate any potential cumulative noise impacts.

Summary and Conclusion

This peer review concurs with the overall conclusions of the EA for noise impacts. The construction and operations of the amended VIP would not increase the severity of noise impacts identified in the certified EIR and no additional mitigation measures beyond those presented in the certified EIR are necessary to reduce impacts to less than significant.

3.2.13 Public Services

Introduction

This section provides a peer review of EA Section 3.1.12, *Public Services* (Valero, 2008). Also presented are the original conclusions from the 2003 VIP EIR, the changes in the baseline that may have occurred since 2003, an independent peer review of the EA, a discussion of cumulative impacts, and a summary of conclusions.

Impact Conclusions of the EIR

The EIR determined that all impacts to Public Services related to the implementation of the VIP would be less than significant. No mitigation was required.

Changes after EIR Certification

Since the EIR was certified in 2003, one of the previously identified five elementary schools in Benicia, Mills Elementary, no longer serves the public. The student body was redistributed to the remaining four elementary schools and the Benicia Unified School District continues to operate at capacity.

Environmental Analysis Review

The discussion in the EA regarding impacts to public services is consistent with that provided in the EIR and is considered to be adequate. The EA states that there would be no change to any public service as a result of the proposed amendments nor would there be any new environmental impacts. The only proposed new physical change will be the need to relocate the existing Valero firehouse because of construction of the new H2U. Valero has proposed three new potential locations for this firehouse all of which are considered in the EA.

Cumulative Impact Review

This peer review concurs with the cumulative impact review related to public services located in Section 4.2.13 of the EA. The amended VIP plus other Refinery projects would not result in any substantial increase in local population and consequently and increased demands on public services. While other non-Refinery local cumulative projects could result in potential significant cumulative impacts to public services through increases to local population the contribution to these potential impacts would not be cumulatively significant.

Summary and Conclusion

Based on the peer review of Public Service impacts, the changes between the EIR and VIP Amendments would be less than significant and similar to those in the EIR. Because Valero must adhere to all City regulations for the proposed new firehouse and must ensure that fire protection services at the Refinery do not experience any disruptions, interruptions, or compromises in capabilities, the proposed relocation of the existing firehouse would not result in any potential impacts. Although there would be a slight increase in the permanent workforce compared to that described in the EIR, the increase is less than significant in terms of its impact on public services. The peer review concurs with the conclusion in the EA that the proposed VIP Amendments would not result in any significant impacts, or and increase in the severity of an impact, beyond those previously identified in the EIR.

3.2.14 Transportation/Traffic

Introduction

This section provides a peer review of EA Section 3.1.14, *Transportation/Traffic* (Valero, 2008). Also presented are the original conclusions from the 2003 VIP EIR, the changes in the baseline that may have occurred since 2003, an independent peer review of the EA, a discussion of cumulative impacts, and a summary of conclusions.

Impact Conclusions of the EIR

The EIR for the originally proposed VIP found that construction of the VIP would lead to potentially significant impacts to the a.m. peak hour operations of I-680 northbound off-ramp/Bayshore Road. However, the EIR concluded that the impact would be reduced to less than significant with mitigation. The EIR found all other construction related and long-term operational traffic and transportation impacts to be less than significant with no other mitigation measures required.

Environmental Analysis Review

Trip Generation

The EA indicates that the operational phase of the VIP Amendments would have a minimal incremental effect on traffic when compared to the volumes and types of traffic previously analyzed in the EIR. The VIP Amendments are estimated to add 30 permanent operations staff to the existing workforce. This new staff will generate 30 new trips arriving at and 30 new trips departing from the Refinery each day. These trips would be distributed over three work shifts and would generate about an additional 20 a.m. and 20 p.m. peak hour trips during weekdays or a total of 40 a.m. and 40 p.m. when combined with the original VIP. A comparison of project trips generated under the originally proposed VIP and the 2007 VIP Amendments is shown below in Table 3.2.14-1

TABLE 3.2.14-1
OPERATIONAL PHASE TRIP GENERATION – COMPARISON

	Size/ Units	ADT	A.M. Peak Hour			P.M. Peak Hour		
			In	Out	Total	In	Out	Total
Original VIP New Employees	20	40	20	0	20	0	20	20
Trucks	16	32	0	0	0	0	0	0
Original VIP Total		72	20	0	20	0	20	20
2007 VIP Amendment Employees	30	60	10	10	20	10	10	20
Trucks	2	4	0	0	0	0	0	0
VIP Amendments		64	10	10	20	10	10	20
Total Vehicle/Truck Trips	68	136	30	20	40	20	30	40

ADT = Average Daily Traffic

The projected level of operational phase vehicle activity would have minimal to no affect on study area intersection and freeway operations under short-range and long range conditions. This assumption is based on the current level of service (2006) during intersection peak hour conditions (Table 3.2.14-2).Adding the VIP Amendment vehicle trips generation to the original VIP trip generation estimates from the EIR would result in approximately 40 a.m. and 40 p.m. peak hour operational trips. Given the current study area peak hour conditions and the projected cumulative peak hour conditions, the traffic from the VIP Amendments would continue to have the same significance as the EIR.

During the construction phase the VIP Amendments are estimated to generate the same level of vehicle traffic as was analyzed for the EIR and therefore have the same level of impact on study area intersection and freeway operations. The traffic analysis prepared for the EIR was based in part on intersection traffic counts taken in 2002. A review of the *Benicia Business Park EIR*, January 2006 Transportation Section indicates that existing intersection peak hour level of service (LOS) has remained relatively constant between 2002 and 2006. Table 3.2.14-2 shows a comparison of study area LOS existing conditions for the a.m. and p.m. peak hours.

TABLE 3.2.14-2
STUDY AREA 2002-2006 INTERSECTION LOS – COMPARISON

		August 2002				January 2006			
		AM Peak		PM Peak		AM Peak		PM Peak	
Intersection	**Control**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
I-680 northbound off-ramp / Bayshore Road	1-way stop	13.3	B	10.4	B	11.2	B	9.7	A
I-680 southbound on-ramp / Bayshore Road	no control	8.0	A	8.1	A	7.9	A	8.6	A
Park Road / Bayshore Road	all-way stop	13.5	B	10.6	B	13.1	B	14.6	B
I-680 northbound on-ramp / Industrial Way	no control	7.4	A	8.4	A	11.3	B	14.0	B
I-680 sorthbound off-ramp / Industrial Way	1-way stop	10.5	B	10.2	B	9.7	A	11.0	B
Park Road / Industrial Way	all-way stop	12.1	B	11.8	B	11.7	B	12.3	B
E. Second Street / Industrial Way	signal	10.3	B	12.4	B	9.8	A	10.9	B

Note: delay = seconds per vehicle

SOURCE: Benicia Business Park DEIR, January 2007; Valero Improvement Project DEIR, October 2002.

Based on the updated (2006) study area intersection LOS analysis, it is reasonable to assume that construction traffic impacts under the proposed amendments would remain relatively unchanged from those documented in the EIR and that Mitigation Measure 4.13-1 would continue to adequately address the impact to the I-680 northbound off-ramp/Bayshore Road during the a.m. peak hour.

Freeway Impacts

The EA utilizes the freeway analysis from the *Benicia Business Park EIR* (City of Benicia, 2007). The analysis provides the p.m. peak hour LOS on Congestion Management Program (CMP) routes in Benicia. The CMP identifies a system of State highways and regionally significant principal arterials (known as the CMP system) and specifies the p.m. peak hour LOS standards for those roadways. The latest revision was completed in 2005 and the minimum standard throughout the Solano County system is LOS E. The Benicia CMP Routes are shown in Table 3.2.14-3. The I-680 segments operate in the LOS B range.

TABLE 3.2.14-3
PM PEAK HOUR LOS ON FREEWAY CMP ROUTES IN BENICIA

Route	Location	LOS Standard	2005 LOS
I-680	North of Lake Herman Road	E	B
	South of Lake Herman Road	E	B
	South of Bayshore Road	E	B
I-780	West of East 2nd Street	E	C
	East of East 2nd Street	E	C
Military West Street	West of East 2nd Street	E	A
Military East Street	East of East 2nd Street	E	C

SOURCE: 2005 Solano Congestion Management Program.

The VIP EIR assessed freeway operations at the ramp junctions rather than freeway segments as was done for the Benicia Business Park EIR. While the focus of the freeway analysis is different between the two documents, the findings of no significant impact for the operational phase during short-range plus project conditions and long-range (2030) cumulative conditions is correct and appropriate given the baseline and cumulative CMP model outputs and projected LOS operations.

This peer review agrees with the EA in that the amendments with a peak hour vehicle generation of 20 a.m. and 20 p.m. peak hour trips during the operational phase would not significantly affect the LOS on the regional roadway system serving the site. Adding the operational phase peak hour trips generated by the amendments to the 20 a.m. and 20 p.m. peak hour trips anticipated in the EIR would likewise not significantly affect LOS on the regional system.

Cumulative Impact Review

The VIP Amendments are estimated to generate approximately 20 new a.m. and 20 p.m. peak hour trips for a total of 40 a.m. and 40 p.m. peak trips, which would have minimal to no effect on study area intersection and freeway operations under long range conditions. This assumption is based on the projected cumulative (2030) intersection peak hour LOS operations shown in Table 3.2.14-4. Cumulative traffic is based on adding traffic generated by the VIP amendments to the 2030 forecasts developed for the Benicia Business Park EIR. The 2030 Benicia Business Park EIR traffic volumes (baseline) would include traffic from the VIP EIR.

TABLE 3.2.14-4
STUDY AREA CUMULATIVE 2025-2030 INTERSECTION LOS COMPARISON

		VIP DEIR Cumulative 2025				Benicia Business Park DEIR Cumulative 2030			
		AM Peak		PM Peak		AM Peak		PM Peak	
Intersection	**Control**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
I-680 northbound off-ramp / Bayshore Road	1-way stop	7.6	A	4.9	A	12.7	B	10.1	B
I-680 southbound on-ramp / Bayshore Road	WB left yield	28.9	C	12.5	B	8.2	A	9.2	A
Park Road / Bayshore Road	all-way stop	28.9	C	27.6	C	19.0	C	24.4	C
I-680 northbound on-ramp / Industrial Way	1-way stop	0.1	A	0.0	A	13.1	B	19.3	C
I-680 sorthbound off-ramp / Industrial Way	1-way stop	20.3	C	21.9	C	10.2	B	12.2	B
Park Road / Industrial Way	all-way stop	3.9	A	3.7	A	15.2	C	16.8	C
E. Second Street / Industrial Way	signal	23.9	C	8.4	A	10.3	B	11.4	B

Note: Delay = seconds per vehicle.

SOURCE: Benicia Business Park DEIR, January 2007/Valero Improvement Project DEIR, October 2002

Further, cumulative freeway conditions (2030) are expected to operate at or above LOS E, and again the operational phase of the VIP Amendments peak hour traffic (20 a.m. and 20 p.m. peak hour trips) would have no discernable effect on freeway LOS operations. The amended VIP generated traffic from the operational phase (total 40 a.m. and 40 p.m. peak hour trips) would likewise have no meaningful impact to LOS operations under the 2030 cumulative conditions on I-680.

Summary and Conclusion

The VIP Amendments traffic analysis finds that the additional vehicle trips associated with the proposed projects would have no significant impacts beyond those identified in the EIR. The EA traffic analysis relies on the findings documented in the *Benicia Business Park EIR* (City of Benicia, 2007), which includes all of the study area intersections and freeway facilities that were analyzed in the EIR. The *Benicia Business Park EIR* transportation analysis is based on intersection peak period volumes collected in 2006 and on the Solano Transportation Authority's 2005 update of the countywide CMP system of highways and significant arterials.

This review of the VIP Amendments transportation analysis and the *Benicia Business Park EIR* indicates that the proposed VIP Amendments would not be expected to result in any significant traffic impacts beyond those documented in the EIR. The expected 40 a.m. and 40 p.m. peak hour trips would not be sufficient to impact the study area intersections, freeway ramp junctions, or freeway mainline segments from the operating levels documented in the *Benicia Business Park EIR*. The finding of no significance beyond that documented in the EIR is consistent and adequate for short-range operational conditions and for 2030 cumulative conditions.

Construction impacts are estimated to remain consistent with findings in the EIR. The VIP Amendments are expected to have no affect on the level of daily construction workers (200 workers related to VIP projects and 1,800 workers related to turn-around activities) documented in the EIR. Given the consistency between 2002 and 2006 intersection operating conditions and the CMP documented freeway conditions for 2030 Cumulative conditions, the transportation/traffic findings of the EA are reasonable. Further, the mitigation proposed for the EIR would be expected to be adequate for the VIP as amended.

3.2.15 Utilities and Services Systems

Introduction

This section provides a peer review of Section 3.1.15, *Utilities and Service Systems*, of the EA (Valero, 2008). Also presented are the original conclusions from the 2003 VIP EIR, the changes in the baseline that may have occurred since 2003, an independent peer review of the EA, a discussion of cumulative impacts, and a summary of conclusions.

Impacts Conclusion in the EIR

The *Benicia Water Study* prepared in 2002 concluded that City's current water supply was not sufficient to meet existing and planned water demands with the VIP or any other future demands. Based in part on the water study, the EIR concluded that the project would increase demand for raw untreated water from the City in excess of the baseline refinery demand anticipated in the 2001 Urban Water Management Plan (UWMP). In the future, the City's overall water demand would be sufficient in meeting VIP demands in addition to all existing and planned future demands in normal years; however the demand may exceed available supplies from current sources[1] in dry years (ESA, 2003). As a result the EIR concluded that the impact (i.e., the increase in the water demand from the project) would be less than significant in normal years and significant in dry years and reduced to a less-than-significant level with implementation of three mitigation measures:

1. The City would continue its efforts to obtain additional water supplies,
2. The City would pursue projects to generate reclaimed water, which would be used by Valero, and
3. In case of a water shortage, as defined, Valero would take the steps necessary to reduce water consumption at the refinery by an amount equal to or greater than the amount of raw water that is being consumed due to implementation of the VIP.

Changes after EIR certification

The changes that have occurred since the EIR was certified in 2003 are:

- The City of Benicia entered into a Settlement Agreement with the Department of Water Resources to provide an additional 10,500 acre-feet per year (AFY) of firm contracted water supply. The new water supply is currently online and available for use. Therefore, the first mitigation measure has been implemented. The third mitigation measure no longer applies to the project by its own terms now that the new water supply has been secured.
- The Benicia City Council agreed on terminating any further work on the water reuse project in June 2007.

[1] Sources current at the time of the preparation of the EIR.

- The NRU Catalyst Regeneration Facility Project (NRU Project), which was not in the cumulative analysis in the EIR, is listed as a part of the cumulative projects in the EA. The project commenced operation in April 2007.

- Valero now sends its hazardous wastes to the Buttonwillow, California landfill, whereas the EIR had indicated that such wastes were to be sent to the Kettleman Hills landfill.

Environmental Analysis Review

As shown in Table 3.1.15-1 of the EA, the VIP Amendments would cause a reduction in the VIP water demand by 7,630 gpd (or 9AFY), therefore the total VIP water demand would be 208,370 gpd (or 233 AFY; reduction from the original VIP water demand of 242 AFY). As a result of obtaining the new water supply, the City would have surplus water supply (5,903 AFY) as shown in Table 3.1.15-2 in the EA, even after accounting for the "refinery demand" that includes the VIP, amendments, and cumulative projects identified in the EIR. As shown in Table 3.1.15-2, the City's available water supply would be sufficient to provide for the refinery's water demand, notwithstanding cessation of the City's recycled water supply project[2]. Therefore, the peer review concurs with the EA conclusion that the VIP Amendments would result in lower water demand and thus have a less than significant impact.

Please see Section 3.2.10 *Hydrology and Water Quality*, for a discussion of wastewater impacts related to the refinery WWTP.

The VIP Amendments would add 30 new full time employees at the Refinery which would incrementally result in a slight increase in domestic wastewater discharge to the City of Benicia WWTP. As discussed in the EA the impact of this increase would be small and not significantly increase the flows to the Benicia WWTP and would remain with the WWTP capacity.

The EA indicates that the amended project would generate solid wastes at levels above those estimated for the EIR. However, the receiving landfills for solid and hazardous wastes have ample capacity and therefore, although there would be an expected increase in solid waste it would continue to be less than significant.

Cumulative Impact Review

As stated in Section 4.2.15 of the EA, the VIP together with the Cogeneration Project and other refinery projects would increase water demand. Other non-refinery projects may also add to the increase in water demand in the city. Since the VIP Amendments would result in a reduction in the refinery raw water demand from that discussed in the EIR, the VIP Amendments would not contribute to water demand increase from the other non-refinery projects. As shown in Table 3.1.15.2 of the EA and as discussed above, the City's available water supply would have a surplus of 5,903 AFY in 2030 after accounting for existing and projected refinery demand, the city demand and other projected water and operations demands. In addition, water conservation measures instituted under the City Ordinance would reduce water demand should a water shortage occur. To the extent that new development within the City also would be under the use

[2] The table does not include contributions from City's recycled water project.

limitations of the ordinance, water demand would be reduced for those new developments as well as for existing users (ESA, 2003). The impact would be less than significant.

Please see Section 3.2.10 *Hydrology and Water Quality*, for a discussion of cumulative wastewater impacts and the VIP Amendments as related to the refinery WWTP.

As indicated above, the capacity of both the Keller Canyon and Buttonwillow landfills is sufficient to address the cumulative addition of the amended project's solid wastes and this impact would not be cumulatively considerable.

Summary and Conclusions

Based on this peer review, changes in the environmental impacts between the EIR and the proposed amendments would not be significant. Therefore the impacts on water supply from the proposed amendments would be similar to those identified in the EIR. Furthermore, the VIP Amendments would cause a reduction in water demand and the City of Benicia has entered into a Settlement Agreement with the Department of Water Resources and the new water supply is online and available for use. Finally, there would be surplus water available even after accounting for the water demand for the VIP Amendments, other refinery projects, and the water demand in the city. This peer review concurs with the EA's conclusion that the proposed amendments would not result in new impacts beyond those previously identified in the EIR, or any increase in the severity of impacts identified, and no mitigation measures are necessary to reduce any potential impacts to a less than significant level for the proposed amendments. Finally, the peer review also concurs with the EA's conclusions regarding solid and hazardous wastes. Please see Section 3.2.10 *Hydrology and Water Quality*, for conclusions about wastewater and the VIP Amendments as related to the refinery WWTP.

3.2.16 Agricultural Resources

Introduction and Methodology

This section provides a peer review of EA Section 3.1.16, *Agricultural Resources* (Valero, 2008). Also presented are the original conclusions from the 2003 VIP EIR, the changes in the baseline that may have occurred since 2003, an independent peer review of the EA, a discussion of cumulative impacts, and a summary of conclusions.

Impact Conclusions of the EIR

The EIR disclosed that the originally proposed VIP would result in no impacts to agricultural resources (City of Benicia, 2003). Since certification of the EIR, there are no changes to either the physical environment as relates to agricultural resources nor changes to the regulatory environment that would affect conclusions of the EIR.

Environmental Analysis Review

This peer review concurs with, and finds adequate, the conclusions identified in Section 3.1.16, *Agricultural Resources,* of the EA.

Cumulative Impact Review

This peer review concurs with the agricultural resources cumulative impact review located in Section 4.2.16 of the EA. As concluded on EA page 4-14, the amended VIP plus other Refinery and non-Refinery project would not result in significant cumulative impacts to agricultural resources.

Summary and Conclusion

The VIP Amendments, like the originally proposed VIP, would take place within the footprint of the Benicia Refinery. Neither the Benicia Refinery, nor the surrounding vicinity, contains Prime Farmland, Unique Farmland, or Farmland of Statewide Importance. Under the VIP Amendments, no farmland would be converted into a non-agricultural use. Additionally, the VIP Amendments would not conflict with existing zoning of agricultural use, nor would it conflict with a Williamson Act contract. The VIP Amendments would have no impact on agricultural resources.

3.2.17 Mineral Resources

Introduction

This section provides a peer review of EA Section 3.1.17, *Mineral Resources* (Valero, 2008). Also presented are the original conclusions from the 2003 VIP EIR, the changes in the baseline that may have occurred since 2003, an independent peer review of the EA, a discussion of cumulative impacts, and a summary of conclusions.

Impact Conclusions of the EIR

The certified EIR determined that there would be no impacts to the Mineral Resources (City of Benicia, 2003). Since certification of the EIR, there are no changes to either the physical environment as relates to mineral resources nor changes to the regulatory environment that would affect conclusions of the EIR.

Environmental Analysis Review

This peer review concurs with, and finds adequate, the conclusions identified in Section 3.1.17, *Mineral Resources,* of the EA.

Cumulative Impact Review

This Peer Review study concurs with the mineral resources cumulative impact review located in Section 4.2.17 of the EA. The amended VIP plus other Refinery and non-Refinery project would not result in significant cumulative impacts to agricultural resources.

Summary and Conclusion

The VIP Amendments, like the original VIP, takes place within the footprint of the Refinery. No known mineral resource recovery site outlined by any local plan exists within the footprint of the Refinery; nor does a mineral resource that would be of value to the region exist within the footprint of the Refinery. The VIP Amendments would have no impact on mineral resources.

3.2.18 Population and Housing

Introduction

This section provides a peer review of EA Section 3.1.18, *Population and Housing* (Valero, 2008). Also presented are the original conclusions from the 2003 VIP EIR, the changes in the baseline that may have occurred since 2003, an independent peer review of the EA, a discussion of cumulative impacts, and a summary of conclusions.

Impact Conclusions of the EIR

The certified EIR did not include an analysis related to population and housing because this criterion had been focused out in an Initial Study prior to preparation of the EIR. However, since certification of the EIR, there have been no substantial changes to either the physical environment as relates to population and housing nor changes to the regulatory environment that would affect the conclusions of the Initial Study and similarly of the EIR.

Environmental Analysis Review

This peer review concurs with, and finds adequate, the conclusions identified in Section 3.1.18, *Population and Housing,* of the EA. Although the proposed amendments would add an additional 30 permanent personnel to the Refinery, in addition to the 20 added in the certified EIR, the EA concludes that this increase would not represent a new significant impact nor result in population growth in the area for the same reasons found in the certified EIR.

Cumulative Impact Review

This Peer Review study concurs with the population and housing cumulative impact review located in Section 4.2.18 of the EA. The amended VIP plus other Refinery and non-Refinery project would not result in significant cumulative impacts to population and housing.

Summary and Conclusion

The VIP Amendments would have no impact on the demand for housing in the City of Benicia. The small increase in population influx (30 more permanent personnel as a result of the proposed amendment) into the City of Benicia would be less than significant. The proposed VIP Amendments would not involve housing in the City of Benicia and all would take place within the confines of the Refinery. Consequently, there would be no direct displacement of existing persons at project sites, nor an indirect displacement of existing persons in the City of Benicia due to an increase in demand for housing.

3.2.19 Other CEQA Considerations

Introduction

This section provides a peer review of EA Section 4.0, *Other CEQA Considerations* (Valero, 2008), which primarily consists of an analysis related to cumulative impacts. Also presented are the original conclusions from the 2003 VIP EIR, the changes in the baseline that may have occurred since 2003, an independent peer review of the EA, and a summary of conclusions.

Impact Conclusions of the EIR

The EIR found that the VIP would result in no project specific significant unavoidable environmental impacts, nor would it be cumulatively considerable when combined with other cumulative projects in the area. In addition, no growth inducing impacts were identified.

Changes after EIR Certification

Since certification of the EIR, a number of changes have occurred to the list of Refinery and local cumulative projects. These are detailed in the EA but are summarized below.

Projects no longer active (now finished or no longer to be implemented):

- MBTE Phase Out Project (EIR Section 3.6.1.2) is complete;
- Alkylation Unit Modifications (EIR Section 3.6.1.3) are complete;
- Selective Hydrogenation Facilities (EIR Section 3.6.1.3) will no longer be implemented;
- Light Ends Rail Rack Arm Drains project (EIR Section 3.6.1.3) is completed; and
- BAAQMD Reg. 9 Rule 10 NOX Alternate Compliance Plan (EIR Section 3.6.1.3) is completed.

Projects to be added to the Cumulative Projects List include:

- Operation of the NRU Catalyst Regeneration Facility Project (at the Refinery);
- Construction and operation of the proposed Air Liquide Hydrogen Pipeline or the competing Air Products Hydrogen Pipeline;
- The Lower Arsenal Mixed Use Specific Plan;
- Downtown Mixed Use Master Plan; and
- The Marina Area Storm Drain Project.

Projects that are on the EIR Cumulative Projects List for which some change has occurred include:

- Operation (construction is completed) of the Cogeneration Plant.

Environmental Analysis Review

A more detailed peer review of each environmental issue area is provided in Sections 3.2.1 through 3.2.18 of this document. In general, the peer reviewers found no new cumulative impacts as a result of the amended VIP and/or as a result of the changes to the list of cumulative projects considered with the VIP Amendments. In addition, the VIP Amendments would not result in any new significant unavoidable impacts and although there would be a slight increase in labor force for both proposed construction and operation, this incremental increase would not represent a new growth inducing impact, nor would it be inconsistent with the findings of the EIR.

It should be noted that the EA implies that the project identified as "On-going Benicia Refinery maintenance, including future refinery-wide turnarounds," is still part of the cumulative projects list. This peer review does not agree with this treatment of that project. The on-going maintenance never involved any City discretionary approval and is not considered a CEQA project. The EIR identified this work for disclosure purposes but it was not considered a cumulative project for CEQA purposes. The EA should have made this distinction; however, its overall findings regarding significant impacts remain valid.

This peer review also concludes that nothing in the VIP Amendments indicates that any alternative considered in the EIR as infeasible would now be found to be feasible or that the amended project while not an alternative to the VIP would significantly change or reduce any significant effects of the VIP.

Summary and Conclusion

This peer review finds the conclusions of the EA's analysis of cumulative impacts to be adequate and this peer review generally concurs with the EA's findings that with the amendments to the project and changes to the mix of cumulative projects, there are no new significant cumulatively considerable impacts, as well as, no significant unavoidable impacts as a result of the amendments. In addition, no new mitigation measures or changes in the mitigations in the EIR have been identified as part of this addendum and confirmed by this peer review.

3.3 References

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Valero, 2008b. Response to March 14, 2008 Data Request, March 19, 2008.

3.4 Peer Reviewers

Lead Agency

City of Benicia Community Development Department

Charlie Knox, Community Development Director

Consultants

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Environmental Science Associates

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Matt Fagundes	Deputy Project Manager, Air Quality, and Noise
Jennifer Garrison	Biological Resources and Cultural Resources
Rachel Baudler	Aesthetics, Land Use and Planning
Peter Hudson, REG	Geology and Soils
Asavari Devadiga	Hydrology and Water Quality, Utilities and Service Systems
Adam Lenz	Agricultural Resources, Mineral Resources, Population and Housing, Public Services, and Recreation
Robert Vranka, Ph.D.	Public Health and Public Safety
Ron Foster	Traffic and Transportation

IES

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Anna Shimko, Esq. – CEQA Legal Issues
Matt Francois, Esq. – CEQA Legal Issues

Agencies Contacted

Thu Bui of the Bay Area Air Quality Management District (BAAQMD) was consulted a number of times during the peer review of the Addendum.

APPENDIX A
Certified Project Description as Amended

Introduction

The following is provided to show how the Chapter 3 - Project Description of the certified EIR would be changed as a result of the proposed VIP Amendments. Inserted text is shown in red typeface and deleted text is shown in ~~red strikeout~~ text.

To help focus the reader only changed sections of the EIR are presented (3.2, 3.4, 3.5, and 3.7) here, while all other Sections (3.1, 3.3, & 3.6) are unchanged.

It must also be stated that this Appendix is merely an aid to the reader to gain an understanding the changes of the requested VIP Amendments and not part of the EA and peer review for the Addendum. Should any inconsistencies be noted to exist between this Appendix, the EA and/or the peer review, the EA and peer review should be considered to be the correct description or authority.

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CHAPTER 3
Project Description

3.2 Project Objectives and Components

3.2.1 Project objectives

The Valero Benicia Refinery is a modern refining facility that currently processes a limited range of raw materials to produce clean burning gasoline and other fuels for the California market. The Valero Improvement Project, also called the VIP, would implement a series of modifications and additions that are focused on four objectives.

1. Provide ability to process lower grades of raw materials[1].
2. Provide flexibility to substitute raw materials – crude oil instead of gas oil.
3. Optimize operations for efficient production of clean burning fuels.
4. Mitigate project-related impacts to avoid detrimental effects on the community.

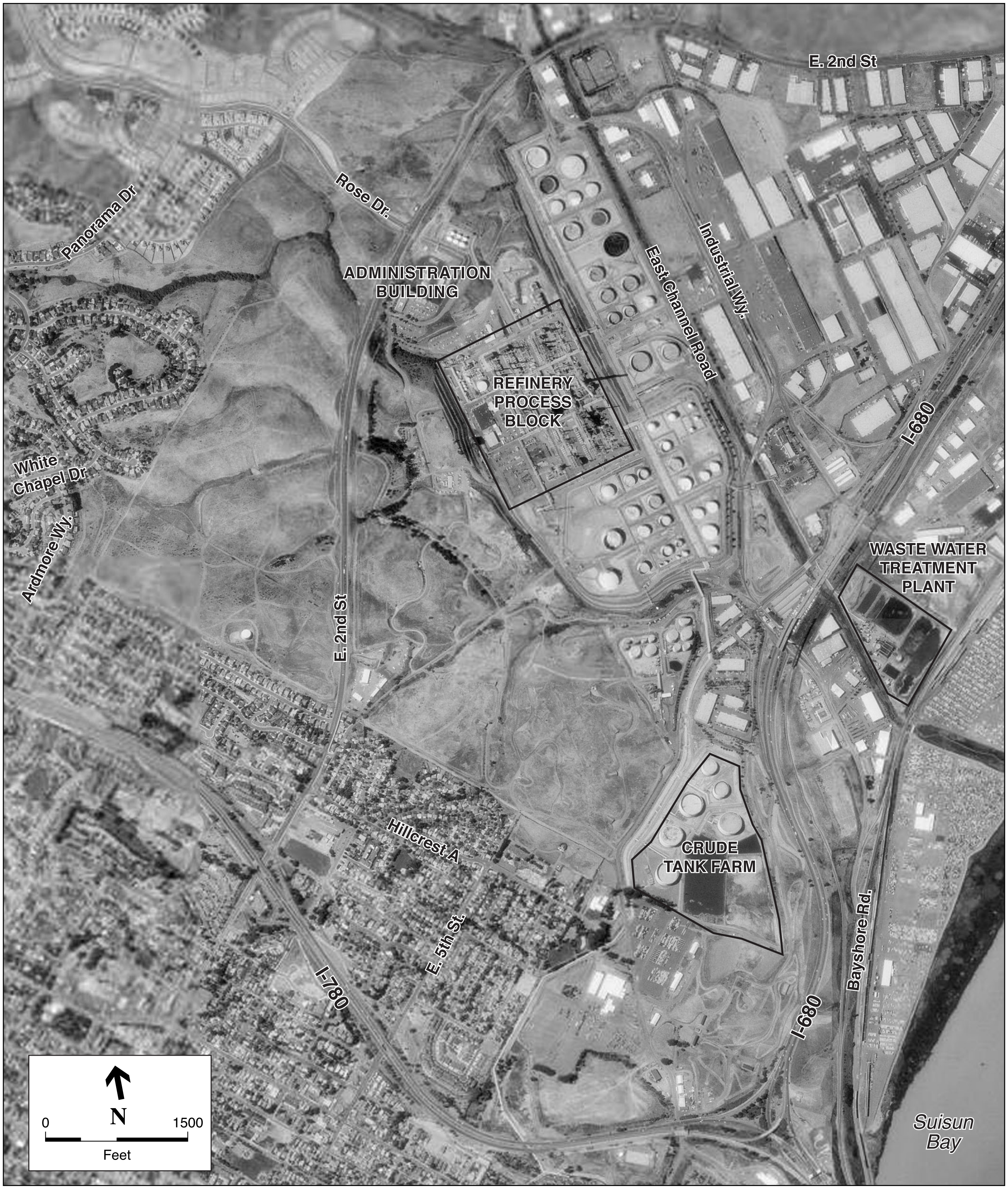
These changes would take place over several years and would include installation of new facilities as well as minor changes to the existing facilities.

As a result of the project, the refinery would be able to continue to efficiently produce clean burning fuels in the California market and would remain economically competitive into the future. The refinery would be able to process a higher percentage of lower grades of crude oil than it presently can process and the refinery would have enhanced flexibility to substitute between crude and gas oil, the two refinery feedstocks. The project would increase the maximum crude oil feed rate now permitted by BAAQMD by about 25% annually. However, the project is expected to result in only a 10% increase in gasoline production capacity. This result is expected because a reduction in gas oil processing would be called for if crude oil processing were to increase substantially.

3.2.2 Project Component list

Valero has applied for permit approval of a project comprised of a number of components whose implementation would provide greater flexibility in refinery operations. The primary goal is to allow Valero to process mixes of crude oils that have not previously been processed in Benicia. These crude oils each have different characteristics, and the project components reflect Valero's planned approach to successfully deal with the differing characteristics of these other crude oils.

1 As used in this document, the term "raw materials" is defined as crude oil and gas oil feedstocks.



SOURCE: Environmental Vision

Figure 3-2
Valero Benicia Refinery

This project would modify and install typical refining equipment—piping, heat exchangers, instrumentation, catalytic reactors, fractionation equipment, pumps, compressors, furnaces, tanks, and their associated facilities. These changes would include installation of new facilities as well as minor changes to existing facilities. The components of the project include the following:[2]

- Pipestill modifications to increase crude oil processing capacity by approximately 25%
- Fluid Catalytic Cracker Unit Feed Flexibility modifications to process different feeds
- Coker Unit modifications to process additional feed
- Increased refinery capacity to remove and recover sulfur
- Scrubber to reduce SO_2 ~~and some NO~~ emissions from the ~~main stack~~ combined FCCU and CKR gases after combustion in process furnaces
- Installing a new Hydrogen Production unit and hydrogen purifier to provide additional hydrogen production to support hydrofining and hydrocracking
- Hydrofining optimization changes
- Modifications to maximize hydrocracking, alkylation, and reforming capacity
- Adding a Guard Reactor to the Hydrotreater
- Modifications to optimize fractionation processes
- Replacing existing Pipestill furnaces with new furnaces to combust CO gas from FCCU and CKR
- New and modified existing combustion sources
- Use of additional quantities of water
- Modifications to the wastewater treatment facility
- Added support facilities and infrastructure
- Added new crude tankage
- Import and export changes

Each of the components of the VIP is discussed in detail in Section 3.4.3.

3.4 Project Components

3.4.1 Introduction

The proposed Valero Improvement Project includes a number of new and modified facilities that are intended to enable Valero to meet the project objectives listed in Section 3.2.1. The expected locations of the project's major components are shown in Figure 3-6, *Expected Locations of VIP Major Components – Process Block* and Figure 3-7, *Expected Locations of VIP Major Components - Crude Oil Tank Farm.* During the time frame of the VIP, Valero would also be constructing other approved, but yet unbuilt, as well as unapproved facilities (assuming they are approved) that were either analyzed in separate CEQA documents, or were otherwise exempt from City approvals, permits and environmental review. In the context of producing reformulated gasoline and other products, Valero wants to be able to respond to market conditions and retain flexibility. Valero wishes to permit all of the new equipment and modifications now, but plans to construct the individual components, as necessary, generally on the schedule described in Section 3.5.1. Valero may alter the schedules and Valero may not construct some units, including the Flue Gas Scrubber, if conditions are not favorable. However, for the purposes of this

2 Valero identifies the first five components listed below as the Main Stack Components, since their exhausts would go to the refinery's main stack.

environmental impact analysis, all of the new units that may be built have been identified and included in this analysis. Environmental controls or measures are linked to each process unit.

The function and the relationships of each of the proposed project components to Valero's existing and other future facilities are shown in Figures 3-8, *Project Component Overview* and Figure 3-9, *Refinery Flow Diagram*. Engineering details will not be completed for several years. However, these descriptions are sufficient to identify the nature of the planned facilities and to assess any potential impacts from the project.

3.4.2 Feed Stock Discussion

The refinery currently imports and processes two primary raw materials – crude oil and gas oil. Currently, about 30% of the refinery feedstocks are lower-grade raw materials, with higher levels of sulfur and higher heavy pitch content. The VIP changes would allow the refinery to purchase and process additional volumes of lower-grade raw materials (crude oils or gas oils). In general terms, the refinery would be able to increase this percentage to about 60%, raising the average sulfur content of the imported raw materials from current levels of about 1 - 1.5% up to future levels of about 2 - 2.5%.

With the increase in maximum crude rate, there would also be an opportunity for the refinery to reduce processing of gas oil when economics favor the substitution of crude oil. Although the project would result in a nominal increase of about 25% in crude oil processing capacity that increase in capacity is expected to result in only a 10% increase in gasoline production. This is because a reduction in gas oil processing would be called for to keep the refinery operations balanced.

It should be further noted that any increase in gasoline production capacity would be contingent upon the availability of optimum crude blends to meet the refinery's capabilities. The refinery purchases crude and gas oil in the market place, and the optimum blends are not always available. The proposed project provides the refinery with the flexibility to utilize diverse qualities of raw materials, especially the lower priced ones that are higher in sulfur content, but it does not necessarily imply that there would be an increase in gasoline production.

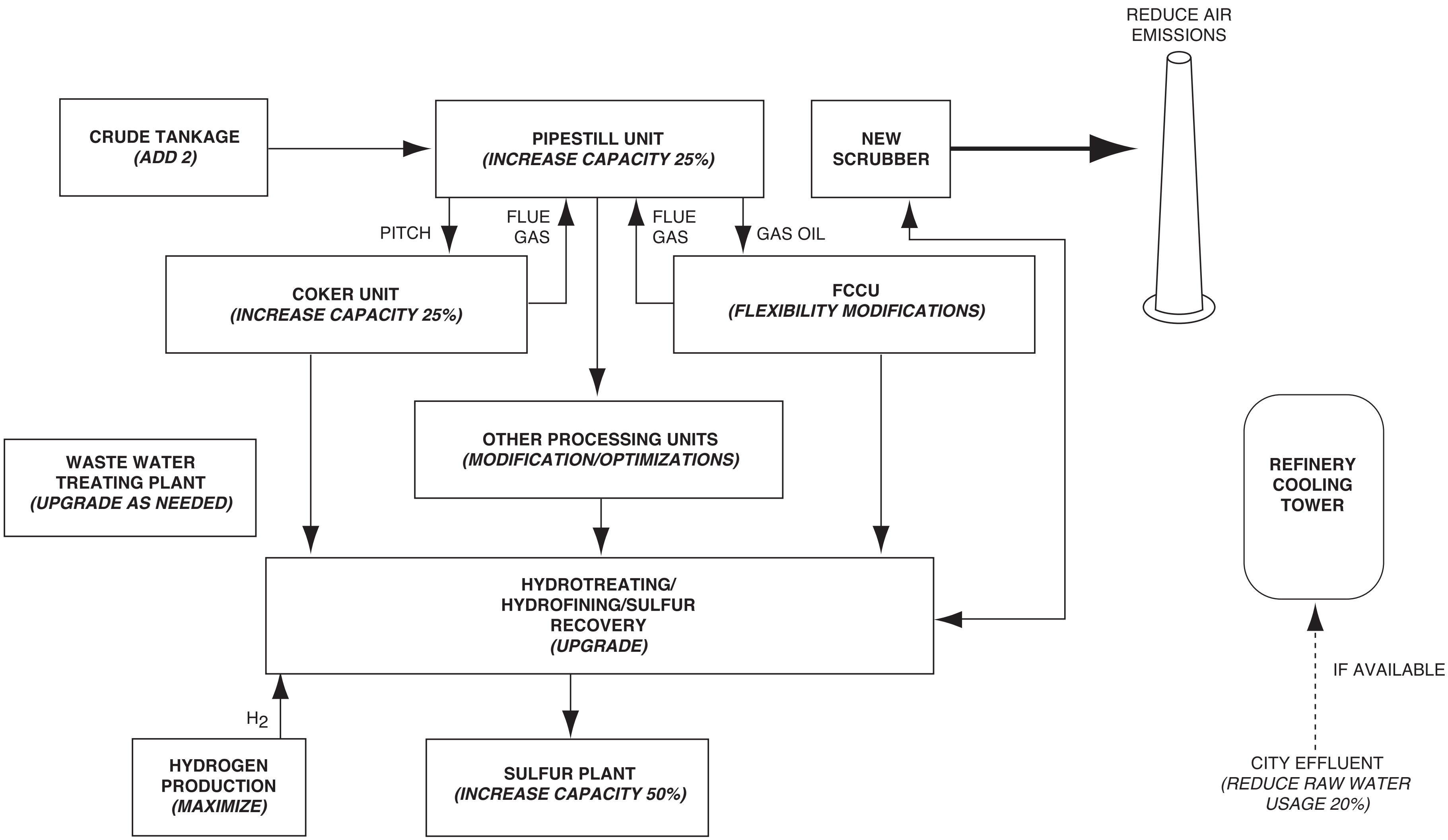
The implications of the differences in crude oil and variations in feedstocks with respect to the operation and equipment changes for the affected refinery units are described and discussed under the descriptions of the project components in Section 3.4.3 that follows. Furthermore, the material changes in the environmental effects that would result from processing the different feedstocks are described in detail in Chapter 4, *Environmental Setting, Impacts and Mitigations*, of this document.

SOURCE: Environmental Vision

Figure 3-6
Expected Locations of the
VIP Major Components - Process Block

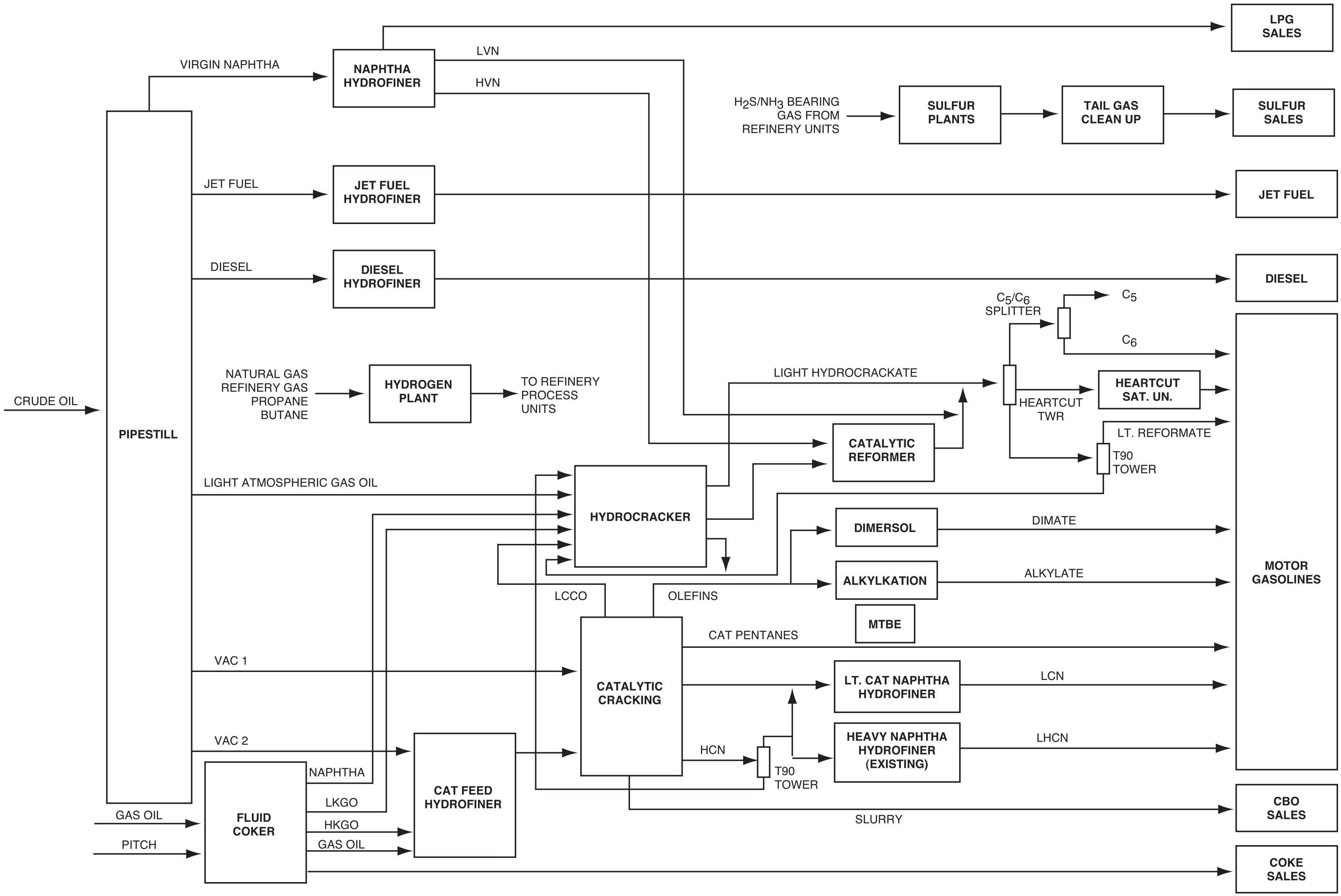
SOURCE: Environmental Vision

Figure 3-7
Expected Locations of the
VIP Major Components - Crude Oil Tank Farm



SOURCE: URS

Figure 3-8
Project Component Overview



SOURCE: Woodward-Clyde Consultants

Figure 3-9
Refinery Flow Diagram

3.4.3 The VIP Components

For each of the VIP components, the relation to the project objectives, a description of current operation, the VIP's proposed changes in operation and equipment (including prominent physical features) and schedule are presented below. Dimensions of the facilities typically are provided only for components of substantial size. All dimensions given are approximate, as final designs for these facilities have not been completed. For most facilities, the location is noted or discussed if it is not close to the related existing facilities. The schedule for each component typically describes essential steps in construction or the relationship to refinery maintenance turnarounds[3], instead of fixed dates, since construction of any component may be delayed or foregone. The best available information on schedule is contained in Section 3.5.1. In the event that the schedule, operational considerations, dimensions of the components or their locations are critical to identifying or mitigating a potential environmental impact of the project, these considerations will be discussed in the related impact analysis or mitigation discussion. Simplified process and flow diagrams (Figures 3-8 through 3-18) identify materials to be processed and produced by new or modified units, as highlighted in Figures 3-6 and 3-7.

See Table 3-1, *VIP Components* for a brief overview of the project components, including physical and operational characteristics, and relationships with other components of the VIP.

3.4.3.1 Expanded Pipestill Crude Oil Processing Capacity

Introduction

Expanding the crude oil processing capacity would provide ability to process lower grades of raw materials and provide flexibility to substitute raw materials – crude oil instead of gas oil in the manufacture of products. It also would help optimize operations for efficient production of clean burning fuels.

The proposed modifications to the Pipestill unit would allow for the processing of a higher flow rate of incoming crude petroleum and the desired flexibility to process crude oil that has higher sulfur content.

Current Operation

Incoming crude oil from storage tanks at the refinery is heated to distill and to separate the crude oil mixture of hydrocarbons into streams, or fractions, with similar physical characteristics. These separated fractions are then directed to other processing areas, or units, in the refinery to continue their transformation from the incoming petroleum mixture to finished products.

Currently, Gas Oil is used as an input feedstock that goes directly to the Fluid Catalytic Cracking Unit. In contrast to crude oil, Gas Oil is a material that has been previously processed in a refinery and is one of the heavier fractions resulting from the initial distillation and separation of crude oil.

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3 A refinery turnaround is a scheduled maintenance action during which some or the entire refinery is shut down. Thus, a turnaround is a suitable time to install new equipment. See Section 3.6.1.1, *Maintenance Activities*.

Proposed Changes

Operational Changes

Presently, the Pipestill unit is permitted by BAAQMD to process a maximum feed rate of 135,000 barrels per day (one barrel is 42 gallons) of crude oil. With the full implementation of the VIP, the Pipestill operations would be permitted by BAAQMD for processing a maximum annual average 165,000 barrels per day. Valero would increase the Pipestill processing rate in steps, depending on the status of other refinery modifications and upgrades that are part of the VIP, as well as the characteristics of the available crude oils.

Equipment Changes

To accomplish the increase in Pipestill processing capacity, existing equipment would be upgraded or replaced. The Pipestill internals would be modified to effectively process the increased flow rate. In addition to modifying the Pipestill itself, other equipment such as pumps, piping, and instruments would be upgraded and new heat exchangers could be added.

Specific changes or equipment identified for replacement include the following: 1) Increased use of the heat exchanger for the Atmospheric Distillation unit, 2) Pipestill crude feed pump, 3) Modification of the internals of Pipestill condensate reflux drum, and 4) Larger piping to carry the Light Atmospheric Gas Oil and the Heavy Atmospheric Gas Oil sent to other units.

Also, for the Pipestill to process crude rates greater than approximately 150,000 barrels per day, the furnace reconfigurations and addition of a new furnace, as described under Section 3.4.3.5, *New Main Stack Flue Gas Scrubber*, would be required.

Schedule

Valero expects to increase the Pipestill capacity in steps. The first step would increase the capacity from the present 135,000 barrels per day to about 145,000 to 155,000 barrels per day. The second would increase capacity to a permitted daily average of 180,000 barrels per day and an annual average maximum of 165,000 barrels per day.

3.4.3.2 FCCU Feed Flexibility

Introduction

The VIP would modify the existing Fluid Catalytic Cracking Unit (FCCU) to improve its effectiveness in processing the heavy components of incoming petroleum (crudes) to be used at the refinery. The equipment modifications would provide more operational flexibility in this refinery unit. The modifications would allow the FCCU to operate at a nominal process rate of 75,000 barrels per day or higher on occasion, as compared to the present rate of 72,000 barrels per day.

TABLE 3-1: VIP COMPONENTS

VIP	Primary VIP components					Other Optimizing and Supporting Components									
Section Ref.	**3.4.3.1**	**3.4.3.2**	**3.4.3.3**	**3.4.3.4**	**3.4.3.5**	**3.4.3.6**	**3.4.3.7**	**3.4.3.8**	**3.4.3.9**	**3.4.3.10**	**3.4.3.11**	**3.4.3.12**	**3.4.3.13**	**3.4.3.14**	**3.4.3.15**
VIP Component	**Increase Pipestill Crude Oil Processing Capacity**	**Crude Oil with High Sulfur Content**	**FCCU Feed Flexibility**	**Coker Expansion**	**Increase Sulfur Removal and Recovery Capacity**	**FCCU/CKR Flue Gas Scrubber**	**Additional Hydrogen Production Capacity**	**Hydrofining Optimization**	**Maximize Hydrocracker, Alkylation / Dimersol and Reforming**	**Hydrotreater Guard Reactor**	**Modifications to Separations Processes for Optimization**	**New and Modified Combustions Sources**	**Water Source**	**Wastewater Treatment**	**Support Facilities and Refinery Infrastructure**	**Additional Crude Tankage**
Description of Equipment and Operations	Pumps, piping and instruments to upgrade Pipestill unit capacity in two steps: 1. Upgrade capacity to 150,000 BPSD. 2. Upgrade capacity to 165,000 BPSD.	Increased percentage of Sulfur in crude oil feedstocks. Install new second stage desalter	Modify equipment, transfer lines, slide valve, heat exchangers. Modify FCCU internals. New regenerator requirement. New, higher feed rate, possibly more than 75,000 BPSD. More Oxygen required from O_2 generator. More Oxygen required from generator/ blower. Direct flue gas to FCCU/CKR scrubber system	Upgrade coker gas compressor and piping. Fractionator / scrubber, instrumentation. Upgrade coker internals. Increase feed rate to 35,000 BPSD. Direct flue gas to FCCU/CKR scrubber system	Add new regeneration tower, amine heat exchangers, amine pumping equipment. Modify existing scrubber tower internals. SRU Upgrade - new O_2 generator, modify existing sulfur thermal reactors, sulfur handling pumps, heat exchangers, piping and pumps. Tail Gas Unit Upgrade - new piping, heat exchanger.	New flue gas scrubber – uses a regenerative amine process. New scrubber tower and regenerator tower, solution storage tanks, heat exchanger, pipes, pumps, instrumentation. Add new waste heat boiler, prescrubber caustic polish column and dedicated exhaust stack Replace existing CO furnaces with 2 new high-pressure furnaces designed to work with the scrubber train.	Install new H2 production unit and high purity PSA Decommission one of the existing H2 production units	Install new, larger catalyst reactors. Add new virgin naphtha hydrofiner. Install new pumps and piping.	Replace pumps, piping drums and heat exchangers. Modify vessel internals. Optimize for new feed. Tower components.	New reactor vessel, with connecting piping.	12 new separation columns. New pumps, piping, drums, heat exchangers.	New types of crude and increased throughput will require more heat. Increase firing rates of existing gas turbines, including GT-702 steam boilers, and process heaters. Add new furnace F-105 and F-106 with SCR for FCCU/CKR flue gas combustion. Decommission existing furnacesF-101 and F-102 and decommission ESPs. New H2 Unit will be more energy efficient.	Use fresh water. The original VIP plan was to use recycled wastewater from the City of Benicia, but that is not now anticipated.	Equipment needs not known now. Possibly, new aeration basins and equalization pond, a new clarifier, metals recovery process, filters and deoiler surge tank Valero to run WWT tests if RWQCB NPDES permit requires it.	Increase steam generation. Tank heaters to lower viscosity of heavy crudes. Coke Silo modifications. Possibly, new boiler feed water Reverse Osmosis unit. More chemicals required; more truckloads of hazardous waste	Add one or two new floating roof tanks.
Equipment Location	Near Pipestill Unit.	Adjacent to existing desalter to operate in series	Within FCCU boundary.	At present location.	Throughout Process Block Area.	New scrubber located adjacent to the Pipestill and FCCU Units.	New H2 plant in former employee parking lot	New equipment close to equipment it replaces.	New equipment adjacent to existing equipment	As close as possible to existing Hydrotreater.	Throughout main process area.	Near existing furnaces, in main process area. The new F-105 and F106 to be located in the Pipestill Process Block		Within wastewater treatment area.	West side of process block.	In crude tank farm area.
Equipment Dimensions (approximate)	Shorter than adjacent existing tall equipment.	Second stage Desalter approx same dimensions as existing desalter	Lower than adjacent existing tall equipment	No change in equipment height	Regenerator tower - approx. 100' tall and 10' diameter. Oxygen compressor - 50' to 100' tall, 50' long, 50' wide.	Prescrubber – about 100' tall and 30' diameter The Waste Heat Boiler – about 72'x15'by 85'tall. The SOx scrubber –about 145' tall and 35' in diameter. The Caustic Polishing column is included with the SOx scrubber. The exhaust stack- extends 100'above the SOx Scrubber and Caustic Polish and be about 15'in diameter. Regenerator column - approx. 100' tall, 10' diameter.	New PSA unit would not extend above existing support catwalks. New H2 reformer furnace about 130' tall no dia given; furnace stack about 150' tall, no dia given	New hydrofiner may be taller than present units.	Lower than existing adjacent tall equipment.	Approx. 40' high structure.	3 towers 250' to 250' tall, 3 towers 100' to 200' tall, 6 towers less than 100' tall.	New furnaces similar in height to existing units - approx. 40' tall.		Size unknown. No tall structures.	Coke silo dimensions similar to existing.	Approx. 50' above grade, 200 - 350' diameter.
Component Initial Installation.	N/L	June 2010	N/L	Jan 2012	Jan 2010	July 2008	July 2008	Jan 2010	Jan 2013	Jan 2013	Jan 2010	Jan 2010	N/L	Jan 2010	Jan 2012	Apr 2007
Estimated Date of Completion	Jan 2009	Dec 2010	July 2009	Mar 2013	July 2011	Dec 2010	July 2010	Mar 2011	Butamer Aug 2008 Others Mar 2014	Mar 2014	July 2011	July 2011	N/L	Mar 2011	Coke Silo Mar 2013	Dec 2008
Interim Operation	Some components of the VIP may be deferred or deleted.					Some of the Other Optimizing and Supporting components of the VIP may ultimately be deferred or deleted, Interim operations could differ little from operations under the full VIP.									
Interim Operation Notes	Pipestill crude rates greater than 150,000 barrels per day would require the furnace reconfigurations and a new furnace (see 3.4.3.5).		FCCU Feed Flexibility and/or Coker Expansion – will require the SOx Scrubber.													
Interim Control Without Main Stack Scrubber	To assure that operation of Main Stack components could not result in an interim air quality impact. Valero proposes a BAAQMD permit condition to require SOx emissions to remain below previously demonstrated emission levels. Valero to treat both CKR and FCCU exhaust to for refinery to emit less than 50 PPM per consent decree with EPA.					No interim controls needed. Operations do not depend on the SOx Stack Scrubber for emission control.									
Primary Long Term Control	Scrubber (3.4.3.5)	Scrubber (3.4.3.5) Source (3.4.3.11) Sulfur (3.4.3.4)	Scrubber (3.4.3.5)	Scrubber (3.4.3.5) Facilities (3.4.3.15)	None.	None.	None.	None.	None.	None.	None.	Limit emissions to existing permit amount. New source controls limit emissions.	None	None.	None.	Permit limits.

SOURCE: Valero, 2002 & 2008

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Current Operation

The FCCU operates by mixing a fluid powder-like catalyst with heavy oil components at elevated temperatures and pressures. The process breaks these larger, heavy oil molecules into the smaller molecules that are blended into gasoline products. The catalyst is separated from the smaller oil molecules in centrifugal separators, called "cyclones", inside the FCCU vessels. The separated catalyst is drawn continuously from the FCCU reactor and circulated to a regeneration vessel where the catalyst is reactivated by burning the carbon deposits off the surface of the catalyst.

Proposed Changes

Operational Changes

Processing the proposed new FCCU input feedstocks would require that more air be provided to the regenerator, to burn more carbon ~~from~~ off the catalyst. Operation of the FCCU unit would be adjusted to use this additional air more efficiently than can be done at present~~. The FCCU modifications would provide the ability to use a catalyst additive (DeSOx catalyst) to reduce the amount of sulfur dioxide (SO_2) in the regenerator gas before it is burned in the Pipestill furnaces.~~

The total FCCU feed rate varies in response to refinery requirements, with typical feed rates of 61,000 to 72,000 barrels per day. Valero proposes to develop the flexibility to process heavier feedstocks and to increase the feed rate to an average of up to 75,000 barrels per day[4] (but higher under some conditions) and there would be only minor changes in product yield relative to past, demonstrated rates. For these reasons, the project requires only minor modifications to the fractionation equipment[5] that lies downstream of the FCCU. See Figure 3-10, *Fluid Catalytic Cracker Unit Process*.

Valero plans to install a new SO_2 scrubber to treat the combined exhausts of the FCCU and the Coker (*see section 3.4.3.3 Coker Expansion and section 3.4.3.5 New FCCU/CKR Scrubber*.)

Equipment Changes

The proposed FCCU modifications include changes to the regenerator equipment, the transfer lines, slide valves, and to the fractionation towers. The changes in the regenerator equipment consist of a new riser, feed nozzles, internal air grid, and stand pipe. The planned changes in the equipment would be inside the existing vessels.

As described in Section 3.4.3.3, *Coker Expansion*, part of the air flow from an existing Coker air blower, C901A, would be diverted to the FCCU regenerator and oxygen from new oxygen generation facilities (described in Section 3.4.3.4, *Increased Sulfur Removal and Recovery*

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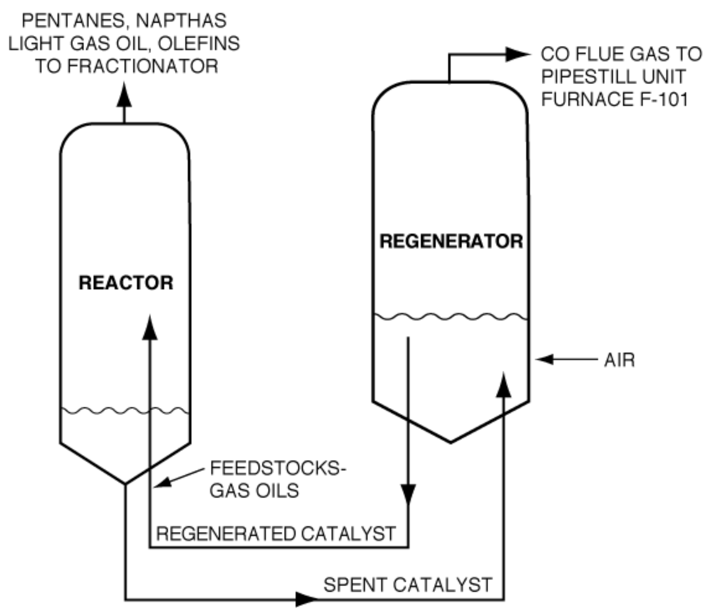
4 The maximum FCCU feed rates now permitted by BAAQMD are 77,200 barrels per day (daily average) and 74,100 barrels per day (annual average). With the project, those rates would become 80,000 and 77,000 barrels per day, respectively.

5 These are also known as the "Cat Light Ends fractionation" facilities.



Valero Improvement Project EIR / 202115
Figure 3-10
Fluid Catalytic Cracker Unit Process

Capacity) would be made available for injection into the FCCU regenerator. In addition, Valero plans on increasing the regeneration air rate of existing air compressor C-702 by increasing the firing rate of existing turbine GT-702 by approximately 70MMBtu/hr.

Modifications to other FCCU equipment include piping, pumps, instrumentation, and heat exchangers. The piping modifications include a revised feed distribution system, expansion joints, and slide valve configuration.

Valero plans to direct the FCCU CO flue gas along with those of the Coker to a new set of PS furnaces, F-105 and F-106. The existing furnaces F-101 and F-102 will be decommissioned.

Schedule

The modifications to the internal FCCU equipment are scheduled for the upcoming major turnaround, because the FCCU vessels must be empty to install new equipment. The changes to the FCCU piping, pumps, instrumentation, and heat exchangers are presently scheduled to follow the major turnaround. It is not expected that these changes could be brought into operation immediately, because they require other support equipment and emission controls to process heavy sour crudes. However, under very limited circumstances, these changes could be utilized.

3.4.3.3 Coker Expansion

Introduction

A key characteristic of the new petroleum crude blends to be processed at the Valero Benicia Refinery is a higher percentage of heavier hydrocarbons than in the crude mix now processed at the refinery. In addition, Valero proposes to develop the flexibility to increase the average production rate in the refinery. The Coker is a part of the refinery that transforms the heaviest hydrocarbon compounds into smaller, more useable compounds. Valero would modify equipment in the Coker to operate at a higher production rate to process the increased fraction of pitch that results from the higher throughput of heavier crudes.

Current Operations

The refinery's existing Coker Unit currently operates with the heaviest portion of crude oil to convert, or "crack", using heat, the heavy compounds into smaller compounds in a process called thermal cracking. To accomplish this cracking, the Coker Unit circulates granular coke, a solid carbon material similar to coal, in with the feedstock of heavy hydrocarbons. After being partially burned, the coke provides a high temperature surface for the reactions that make the desired smaller hydrocarbons. Following the reaction, centrifugal ("cyclone") separators are used to separate the solid coke from the Coker reaction products, which in turn, are sent to a fractionator that separates and extracts the desired reaction products for use.

Proposed Changes

Operational Changes

Valero proposes no fundamental operational changes for the Coker. Rather, the proposed changes would increase the production capacity of the Coker from the existing heavy feed capacity of approximately 30,000 barrels per day to a new heavy feed capacity of up to approximately 35,000 barrels per day. Valero proposes to supply more air to the Coker, to improve the ability to separate solid coke from Coker reaction products, and to increase fractionation efficiency and accommodate the higher processing rates in the Coker. See Figure 3-11, *Fluid Coker Process*.

The Coker modifications, once implemented, would increase the heavy feed capacity of the unit and would improve the ability to separate the individual Coker reaction products – naphtha and gas oils.

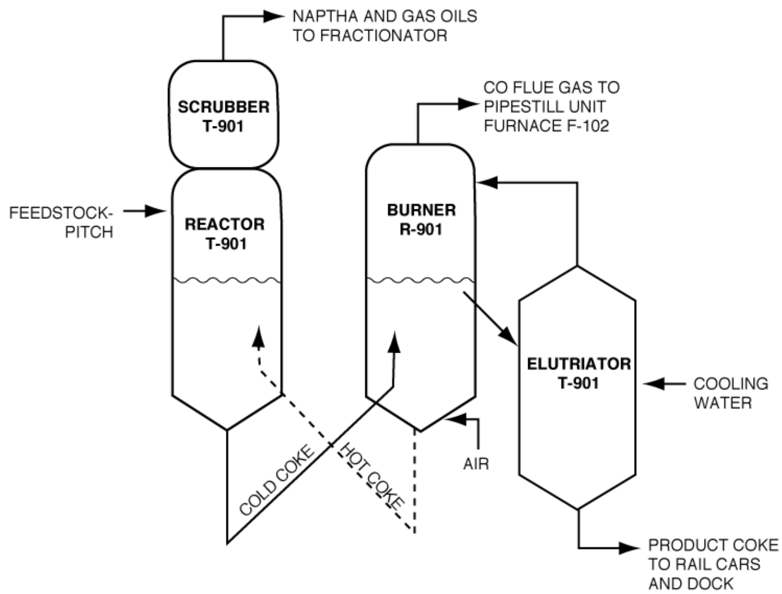
Valero plans to install a new SO_2 scrubber to treat the combined exhausts of the FCCU and the Coker (*see section 3.4.3. FCCU Feed Flexibility and section 3.4.3.5 New FCCU/CKR Scrubber).*

Equipment Changes

The proposed equipment changes to the Coker reactor include the installation of additional cyclone separators. A new air grid that distributes air evenly inside the Coker burner would be installed to support the higher operating rates.

Other Coker equipment that would be modified are the fractionator/scrubber, gas compressor, piping upgrades, instrumentation, Coke drums, heat exchangers., and the Coker air blower. All modifications would be designed to accommodate the higher Coker processing rates.

Valero plans to direct the FCCU CO gas along with that of the Coker to a new set of PS furnaces, F-105 and F-106. The existing furnaces F-101 and F-102 will be decommissioned.



Valero Improvement Project EIR / 202115
Figure 3-11
Fluid Coker Process

Fractionation modifications include: tray replacement with shed rows, additional pump-around capacity, relocated mid-pump-around draws, and redesigned fractionator liquid-gas distributors. These fractionation modifications are intended to accommodate higher flow rates and additionally to provide better separation of the products (–naphtha and gas oils) formed in the Coker.

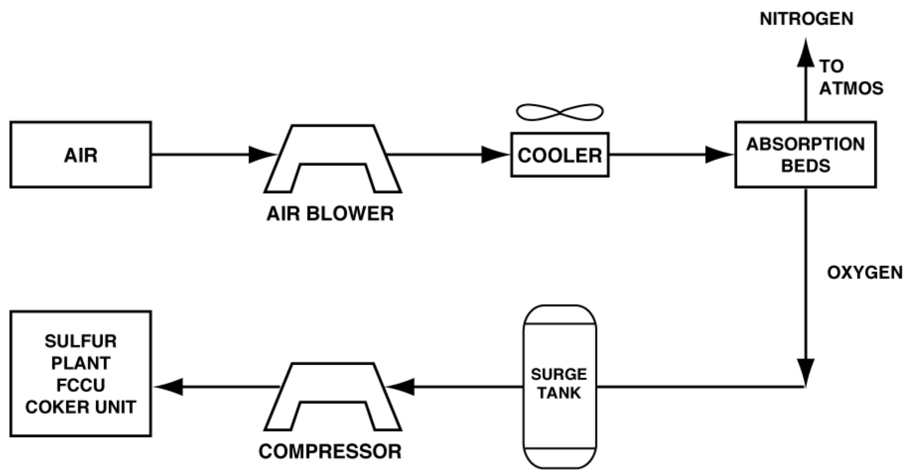
The Coker gas compression facilities would also be upgraded to allow higher flow rates.

Several changes are proposed for the Coker air blower. Since the present air blower, C901A, is proposed to be shared with the FCCU regenerator[6], Valero proposes to use the present standby Coker air blower, C901B, to provide air to the Coker and, also, to convert the steam turbine driver to an electric driver. In the case that the C901B blower does not provide sufficient air to the Coker, Valero proposes to augment Coker air with oxygen from the new O_2 generator.[7] See Figure 3-12, *Oxygen Generator Package Unit*.

6 See Section 3.4.3.2 FCCU Feed Flexibility.
7 Described in Section 3.4.3.4, Increased Sulfur Removal and Recovery.

Schedule

The equipment changes that require modifications to the inside, or internals of the Coker and the Coker unit equipment, namely the addition of cyclones and air grids, the changes to the Coker gas compressor, the changes to the Coker air blower and its associated piping, are planned to be completed during a turnaround.



Valero Improvement Project EIR / 202115
Figure 3-12
Oxygen Generator Package Unit

Those portions of the work that are intended to optimize the unit operation would be constructed outside of the turnaround.

3.4.3.4 Increased Sulfur Removal and recovery

Introduction

The VIP would enable the refinery to process lower cost petroleum feedstocks (crudes) that could contain up to twice the sulfur content of the crudes presently processed at the refinery. Thus, there would be an increased amount of sulfur in the refinery streams. The refinery needs to modify or upgrade the existing sulfur removal equipment to increase the ability to process the increased amount of sulfur that results from the higher throughput of sour crudes.

Current Operations

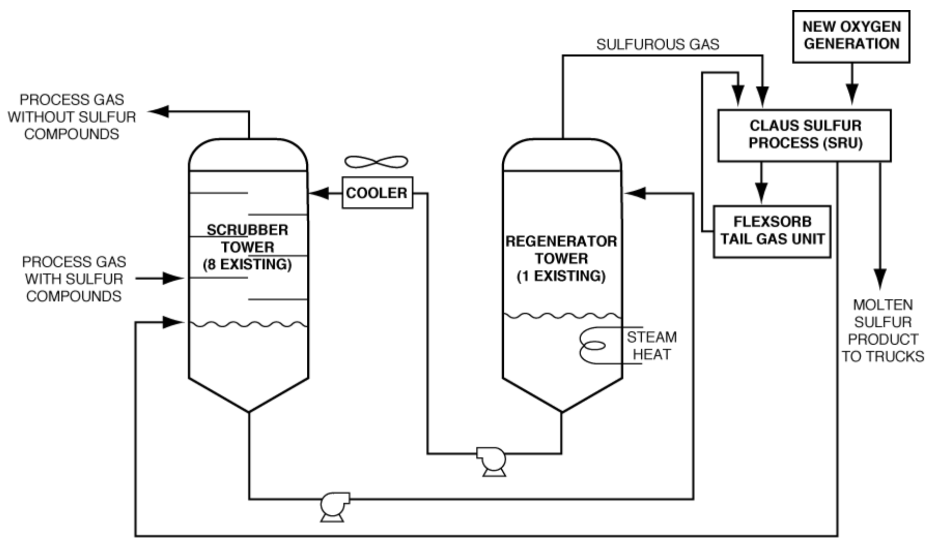
At present there are several existing scrubbing systems in the refinery that, like the proposed ~~Main Stack~~ FCCU/CKR Scrubber, use an amine to remove sulfur from gaseous and liquid streams. After the sulfur compounds are removed by an amine system, they are transferred to the refinery's existing Sulfur Recovery Unit (SRU). This unit converts the extracted sulfur compounds into elemental sulfur for export as a byproduct. The SRU uses the Claus Process to convert SO_2 into molten elemental sulfur. That elemental sulfur is trucked from the refinery and sold to an offsite chemical plant, as a byproduct.

Presently, Valero completes sulfur processing in a Tail Gas Unit (TGU), which removes residual sulfur after SRU processing prior to venting the treated exhaust to the atmosphere. The TGU would require relatively minor modifications after the SRU expansion to optimize its operation and to treat the increased output of the modified SRU.

Proposed Changes

Operational Changes

The primary changes in the existing sulfur removal operation relate to the increased quantities of sulfur that would be processed. With the anticipated higher levels of sulfur in the new crudes, these existing sulfur removal systems would be upgraded to provide sufficient capacity to process the increased quantities of sulfur in each barrel of crude. Valero proposes to modify the existing SRU to increase the processing capacity of the unit. See Figure 3-13, *Sulfur Removal and Recovery Process*.



Valero Improvement Project EIR / 202115
Figure 3-13
Sulfur Removal and Recovery Process

The existing amine solution sulfur extraction systems would have to absorb more sulfur, so the pumping rate would increase, as would the required amine solution regeneration rate and the related rate of heating and cooling of the amine solution. To insure sufficient contact time for the amine solution to absorb sulfur, more scrubbers may be required.

Valero estimates that with the full build out of the VIP and operation at the higher throughput rate with the higher sulfur concentration in the crudes, the Sulfur Recovery Unit (SRU) would need to be able to process approximately 480 tons per day of sulfur, an increase of about 50% over the present capacity of 320 tons per day. In the Claus Process used in the SRU, sulfur is oxidized to SO_2 using the oxygen available in the air. The refinery's capability to combust and produce the elemental sulfur would be limited by the amount of air that can be injected with existing refinery air blowers. Because air is only about 21% oxygen, with the remainder essentially inert nitrogen, increased combustion can be achieved without substantially increasing the air blower flow rates by increasing the percentage of oxygen in the air. By injecting oxygen, the sulfur combustion would still take place, but with lower gas flow velocities in the SRU equipment.

Valero expects that the existing Tail Gas Unit (TGU) can provide the capacity for the VIP increased sulfur content. However, the TGU support equipment may need minor modifications to optimize the process.

Equipment Changes

Valero plans on modifying the insides of the scrubber towers of the existing amine systems to circulate faster in order to carry the sulfur away from the vaporized oil streams. By modifying the dimensions and flow openings of the scrubbing tower trays, amine solution would be able to flow more quickly across the tower trays and down the tower. Valero anticipates that several new scrubbing towers would be required to operate in conjunction with the existing scrubbing towers to allow more efficient contact and longer contact time for the amine to absorb sulfur. Each scrubbing tower would be approximately 100 ft in height and 10 feet in diameter, not including the associated piping and equipment, and would be located throughout the refinery's main process area.

In addition to the scrubbing tower modifications, Valero estimates that new, larger pumps and piping would be installed to increase the flow rate of amine solution.

Heating the sulfur-bearing amine solution separates the sulfur from the solution. The amine solution is then cooled and thereby is regenerated and ready to absorb sulfur again. Increasing the flow rate of amine solution would require additional heat exchangers for heating and cooling, as well as additional associated piping. Valero anticipates a new regenerator tower would be installed and run concurrently with the existing regenerators to effectively regenerate the additional flow of amine solution. The new regenerator tower would be approximately 100 feet in height and 10 feet in diameter, not including the associated piping and equipment, and would be located near the existing regenerator. Valero plans to install a new oxygen generator to provide the oxygen needed to combust the increased amount of sulfur that would be produced in the VIP operations. The package system would be approximately 50 to 100 ft in height and 50 feet by 50 ft in plan, not including the associated piping and equipment, and would be located next to the existing nitrogen generator at the north end of the process block. See Figure 3-12, *Oxygen Generator Package Unit*.

Modifications planned for the Tail Gas Unit equipment include the installation of larger piping, new heat exchangers, and new instrumentation to optimize processing requirements. This equipment would be installed at the existing unit.

Schedule

The installation of new equipment and the modifications and upgrades to the existing sulfur recovery equipment are likely to occur at various times during the VIP implementation period. Valero would evaluate when each component must be operational based on the effect of each individual component on the control of sulfur emissions. The schedule also may depend on the scheduling of the refining of crude oil blends with higher sulfur content.

3.4.3.5 ~~NEW Main Stack~~ FCCU/CKR Flue Gas Scrubber

Introduction

The VIP modifications to the refinery would enable the processing of additional lower cost heavy petroleum feedstocks (crudes) with higher sulfur. One characteristic of these crudes is that they could contain about 4% sulfur, up to twice the average sulfur content of the crudes presently processed at the refinery. Though these crudes are not necessarily new to the refinery, there would be more of them processed. Thus, there could be an increased amount of sulfur emitted from the Main Stack of the refinery. To treat and reduce the sulfur oxides emitted from the Main Stack, Valero proposes to install a new sulfur emission removal scrubber for the combined gases from the FCCU and the Coker after they are combusted in a process heater.

Current Operation

The refinery does not have an SO_2 flue gas scrubber. Currently, the main stack is used to collect and exhaust combustion gases from several sources at the refinery, the FCCU, the Coker and the Pipestill. Concentrations of Sulfur Oxides (SO_2) in exhaust gases are controlled at the refinery by a number of methods, primarily by limiting the sulfur content of the basic feedstocks and thus by limiting the concentrations and quantities of sulfur that must be removed.

Various processes are now used at the refinery to remove sulfur compounds from liquid and gaseous process streams. These sulfur compounds are then sent to the existing Sulfur Recovery Unit (SRU) for conversion to elemental sulfur.

Proposed Changes

Operational Changes

Valero proposes to install a new scrubber to remove SO_2 from the combusted CO gases from the FCCU and the Coker. This scrubber would consist~~s~~ of equipment in which exhaust gases are placed in contact with a liquid chosen so that a specific chemical constituent in the exhaust gases, in this case SO_2, is absorbed into the liquid. Emission scrubbers are a proven technology for reducing air pollutant levels in exhaust gas streams.

In the case of the proposed ~~Main Stack~~ FCCU/CKR Scrubber, a chemical solution would absorb the SO_2 produced when refinery gas is burned. Valero plans to install two new combustion furnaces, F-105 and F-106, which can operate at the higher pressures required for the scrubber operation than the existing furnaces F-101 and F-102. These new furnaces will have SCR to remove NO_X generated in the FCCU and CKR and from combustion in the furnaces. To optimize the removal of SO_2 from the furnace flue gases, the flue gas temperature must be reduced prior to scrubbing. Valero plans on installing an unfired waste heat boiler to recover heat in the form of steam from the cooling of the furnace combustion gases. Valero also plans on injecting steam into the combustion gases for soot blowing to avoid solids build up in the SCR units and in the waste heat boiler.

The Scrubber would use a regenerative amine process. To maintain effectiveness of the amine solution, Valero is planning on adding a prescrubber to remove catalyst fines carry over from the FCCU and ash and coke fines carry over from the Coker. The particulate control provided by the prescrubber will eliminate the need to operate the existing electrostatic precipitators (ESPs), which will be decommissioned.

The prescrubber will include quench subcooling to further lower the temperature of the gases entering the scrubber. The circulating pre-scrubber water will pass through a heat exchanger where it will transfer heat to a cooling medium, such as a glycol/water mixture. Air-fin coolers are then used to reduce the temperature of the glycol/water mixture.

After this solids removal step the gases will be directed to the FCCU/CKR SO_2 Scrubber. Amine solution would be sprayed into the scrubber so that it has a large surface area to contact the sulfur-bearing furnace flue gases to remove sulfur oxides. The amine solution that contains the sulfur oxides would then be collected and pumped to a regenerator tower where it would be boiled, using steam heat, to liberate the sulfur oxides from the amine solution. The regenerated solution would be reused in the scrubber, while the sulfur oxides would then be routed to the existing sulfur plant for conversion to elemental sulfur (see Figure 3-14, *Flue Gas Scrubber Process*).

The SO_2 recovered within the regenerator would be sent, as are other sulfur compounds, to the existing Sulfur Recovery Unit (SRU) for conversion to elemental sulfur, a refinery by-product.

Valero plans on installing a caustic scrubber on top of the SO_2 scrubber to insure adequate SO_2 emission reductions are maintained. In this scrubber, a solution of sodium hydroxide will be circulated and will contact, or "polish" the exhaust gases. Gases exiting the caustic polisher will have hot air added to minimize visible water-vapor plumes and condensate forming on the exhaust stack walls. After hot air injection, the gases will be directed to the new FCCU/CKR SO_2 scrubber exhaust stack which will be installed on top of the SO_2 scrubber~~. The gas that flows through the scrubber would then be exhausted through the refinery's existing main stack, which would continue to be used. No new exhaust stack would be required, although a new exhaust stack heater may be added, which would reheat the flue gas downstream of the scrubber to minimize visible water-vapor plumes that could be emitted from the Main Stack. The basic relationship between the scrubber and other Main Stack components is shown in Figure 3-15, *Main Stack Scrubber and Furnace Configuration*.~~

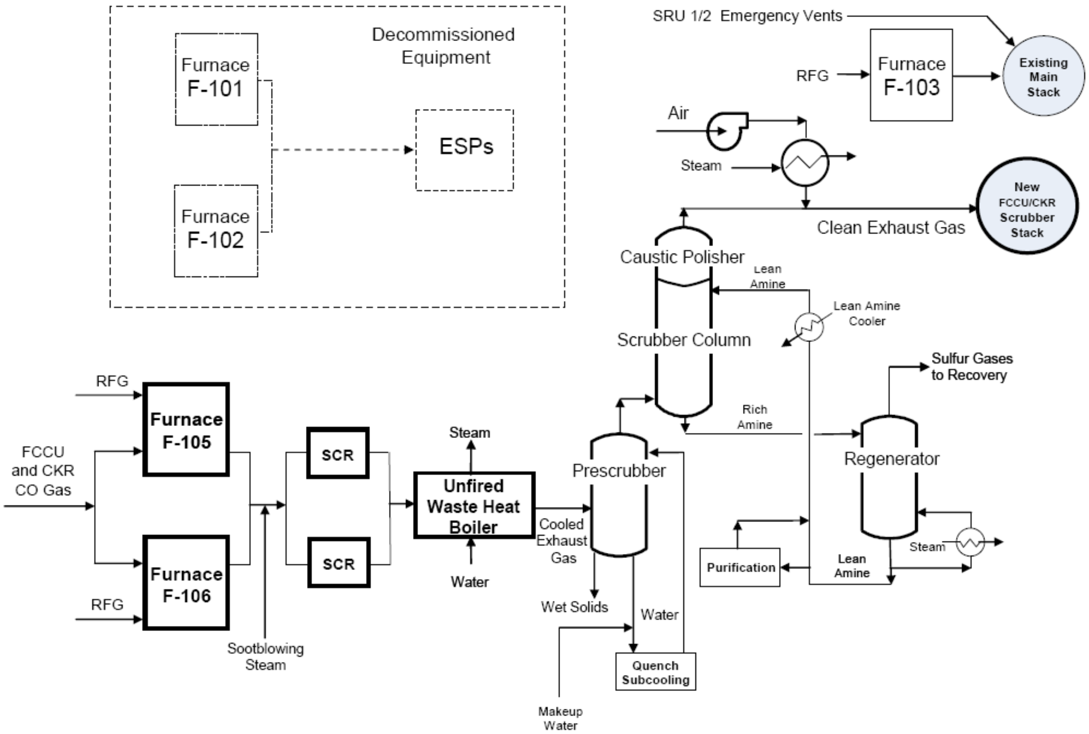


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Figure 3-14
Flue Gas Scrubber Process

~~Some of the Main Stack components could be partially operational prior to the time that the Scrubber is in operation. Specifically, the crude rate for the refinery pipestill could be raised above the current level and/or the additional air blower could be utilized to the FCCU or Coker Unit. To assure that this could not result in interim air quality impact, Valero has proposed to the Bay Area Air Quality Management District that it include a permit condition to require that Main Stack emissions be controlled to remain below previously demonstrated levels. The District has confirmed its intent to impose this condition, along with other conditions.[8]~~

~~Main Stack~~ FCCU/CKR Scrubber Equipment

The ~~Main Stack~~ FCCU/CKR Scrubber equipment would include the new furnaces and their associated SCR equipment, integrated soot blowing equipment an unfired waste heat boiler, quench subcooling system, prescrubber, scrubber tower, caustic polisher, air dilution system, exhaust stack, the regenerator tower, blowers, small onsite storage tanks for the scrubber solution, air fin heat exchangers, furnace, shell and tube heat exchangers, pumps, piping, structural steel, and instrumentation. The prescrubber will be a vessel 30 feet in diameter and 100 feet tall. The waste heat boiler is planned to have the nominal dimensions of 72 feet by 15 feet with a height of 86 feet. The scrubber tower would be the largest piece of equipment, a cylindrical scrubber vessel having approximate dimensions of 145~~50 to 200~~-ft in height by ~~25~~ 35-ft in diameter. The exhaust

~~[8] Doug Hall, Sr. Engineer, BAAQMD, Personal communication, August 8, 2002.~~

stack will have a diameter of 15 feet and a height of 100 feet and will be located on top of the scrubber and caustic polisher. The regenerator tower would be a smaller cylindrical vessel, but with approximate dimensions of 100-ft in height by 10-ft in diameter. Other pieces of equipment would be much smaller in scale than either the scrubber or regenerator.

The new FCCU/CKR Scrubber system equipment would be installed close to the existing refinery process block. ~~main exhaust stack. Valero would locate the equipment within the existing Pipestill Unit plot, adjacent to the main stack, and to locate some of the associated equipment across the refinery street to the east of the existing main stack.~~

~~To reduce flue gas temperature prior to scrubbing, Valero would modify two existing furnace boxes and install a third furnace box upstream of the scrubber. This new furnace also would be located in the Pipestill Unit, adjacent to the two existing furnace boxes.~~

~~The Scrubber would use a regenerative amine process. Pumps, piping and a storage tank would be required to store and process the Amine solution.~~

~~Although designed to make substantial reductions in air emissions of SO_x, the Scrubber also is expected to allow additional NO_x emissions reductions by absorbing excess ammonia that is not consumed in the Thermal DeNOx System. If detailed design data indicates that the Thermal DeNOx System reductions by the scrubber would not be adequate to meet the refinery's NO_x targets, low-NO_x burners would be installed on the Powerformer Furnaces F2901-4 to keep the total refinery NO_x emissions in compliance.~~

Maintaining the amine scrubbing solution would require added (makeup) water use and also would produce wastewater. ~~Valero proposes to use reclaimed water for makeup water, if available. Otherwise, it would use the same water that is used for the refinery's cooling tower makeup. Annual average water consumption for the scrubber) is expected to be about 150 gallons per minute or 0.22 million gallons per day.~~

Discharges from the FCCU/CKR Scrubber and its associated equipment will have an impact on ~~The Main Stack Scrubber process would be designed to minimize its effect on~~ the refinery's wastewater treatment operation. To maintain control of the chemistry of the amine solution, a purge water stream must continuously remove undesirable compounds that would otherwise build up within the scrubber. In the preliminary design of the project, Valero estimates that this purge stream would be a flow of about ~~50~~ 6 gallons per minute. To prevent the purge water from entering the refinery wastewater system, Valero proposes to consume it fully in other refinery equipment; an example would be to use the scrubber purge to cool the product coke at the Coker Unit.

The Prescrubber, Caustic Polisher, and the blowdown from Unfired Waste Heat Boiler will be directed to the Refinery's wastewater treatment system. These streams would total 55 gallons per minute.

Schedule

~~During the major turnaround, Valero plans to install the Scrubber slide gates that will allow on-line commissioning of the Scrubber. Installation of the rest of the Scrubber would follow the major turnaround, with completion of the Main Stack Scrubber installation by the end of 2004. However, it is possible some project components required to make the Main Stack Scrubber operational will not be completed until the 2009 refinery wide turnaround. The new sulfur removal equipment (see Section 3.4.3.4) appears to be needed before the highest sulfur crudes can be processed at the Valero Benicia Refinery.~~

3.4.3.6 Additional Hydrogen Production Capacity

Introduction

Additional hydrogen would be needed to support the increased hydrofining and hydrocracking operations proposed in the VIP.

Current Operation

Hydrogen is produced by the controlled reaction of water and refinery gases followed by the separation of the hydrogen from the oxides of carbon, such as CO_2. The separating, or purifying, of hydrogen from the gas mixture is accomplished by contacting the gas mixture with a fluid that preferentially absorbs the CO_2, and leaves hydrogen. The equipment in the refinery that produces hydrogen gas is called a hydrogen train. The hydrogen produced is used in many refinery units.

Proposed Changes

Operational Changes

Because more hydrogen would be needed to treat the higher sulfur content of the new crudes, Valero proposes to increase hydrogen production from the present 160 million standard cubic feet per day (SCFD) to approximately 190 million standard cubic feet per day.

Valero proposes to meet this new demand by replacing one of the refinery's existing Hydrogen Production units with a new, more efficient Hydrogen Production Unit (H2U) and a Hydrogen purification process known as Pressure Swing Adsorption (PSA). Because it will be based on more modern technology, the new equipment will be more thermally efficient than the unit it will replace. In addition, the new H2U furnace will be installed with SCR technology to reduce combustion NO_X.

The PSA unit uses the differential absorption of hydrogen on a special sieve to collect hydrogen from the H2U at one pressure and then discharges the concentrated hydrogen gas at another pressure. The PSA tailgas, containing impurities such as CO, CO_2, and hydrocarbons, is fed to the reformer furnace, where it is mixed with RFG and burned as fuel.

Valero has not decided which existing H2U it will decommission. The unit that remains operational will normally be operated at a minimum turndown rate so that it can be used when the new H2U cannot meet Refinery demands, is shut down for periodic maintenance, or operational problems.

The new H2U will be fed primarily with desulfurized RFG and tailgas from the refinery's hydrogen consumers. When RFG is not available in sufficient quantities, the balance of the feed to the new H2U will include natural gas. The H2U feed will have a sulfur content less than 10 parts per million by volume (ppmv) ~~develop the flexibility to operate the existing equipment to improve the purity of the hydrogen produced. Valero plans to add a hydrogen absorber to supplement the hydrogen increases obtained by changing operation conditions of the existing hydrogen production trains. See Figure 3-16, *Hydrogen Production Process*.~~

Equipment Changes

~~To meet the need for additional hydrogen production, the existing processes would be optimized and modified to maximize production. To increase production in the existing two hydrogen trains, Valero plans to switch to a new, more efficient CO_2 absorption fluid, whose chemical name is abbreviated as MDEA. This upgrade was originally proposed and permitted for the Clean Fuels Project, but was not completed. This upgrade would be implemented in the VIP. Using MDEA, Valero plans to produce hydrogen with a purity of about 98%.~~

~~Switching absorption fluids would require several hardware modifications, including changing or modifying the tray and packing material inside the tower. Also requiring modification for the new absorption fluid would be piping, pumps, tower internals and heat exchangers. Valero also proposes to upgrade control instrumentation.~~

~~In addition to switching to MDEA, Valero may make additional changes to the equipment to obtain a further increase in the amount of hydrogen produced. Valero is considering changing the product being heated in the top, or convection section, tubes in the top of two furnaces (F301 & F351). Instead of heating water to form steam as is presently done in the convection section of the furnace, Valero would use it to pre-heat the feed coming into the radiant section of the~~

The new H2U and its associated PSA are expected to include the following major equipment:

- Hydrodesulfurizers (2)
- Steam Drum
- Blowdown Drum
- Hot Condensate Separator
- Cold Condensate Separator
- Reformer Furnace with SCR for NO_X Control
- Forced draft and induced draft fans
- PSA

The steam methane reforming furnace at the new H2U is expected to have a maximum capacity of 980 MMBtu/hr. In addition to these major components, the H2U will include pumps and other rotating equipment that is typical of refinery processes

The new H2U will be constructed within an existing employee parking lot to the north of the Refinery Process Block

~~Valero Improvement Project EIR / 202115~~

~~**Figure 3-16**~~

~~Hydrogen Production Process~~

~~furnaces so that additional hydrogen can be created. This change in service would involve piping changes and the replacement of the existing tubes in the reformer. If, when the detailed design of this system is prepared, it is determined that this change in not feasible, then a separate pre-reforming furnace and/or steam-heated exchanger would be used.~~

In addition to these modifications, the refinery's naphtha reforming unit, called the Powerformer Unit, would be modified to maximize hydrogen production. These changes would include use of a different catalyst to preferentially produce additional hydrogen in the reforming process. The Powerformer vessels, heat exchangers, pumps, and piping would be modified.

~~Also, Valero plans to add a Pressure Swing Absorber (PSA) to purify the hydrofining tail gas stream that is blended into refinery fuel. The Pressure Swing Absorber unit uses the differential absorption of hydrogen on a special sieve to collect hydrogen from the tail gas unit at one pressure and then discharges the concentrated hydrogen gas at another pressure. The Pressure Swing Absorber is a skid-mounted stand-alone equipment unit. In addition, Valero would install the interconnecting piping.~~

Schedule

~~Valero proposes to install the tie-ins for the Pressure Swing Absorber to existing piping during a turnaround, while the Pressure Swing Absorber itself would be installed later. The modifications to the existing hydrogen train equipment and Powerformer modifications would be made later in the VIP.~~ Valero plans to build the new hydrogen production unit with PSA beginning July 2008 so that tie-ins can be made during the 2010 turnaround and the unit can startup with the refinery startup.

3.4.3.7 Hydrofining Optimization

Introduction

Because Hydrofining removes sulfur from hydrocarbons, upgrading the existing Hydrofining units would improve the ability to control the sulfur content of products and to reduce sulfur emissions. Improving the efficiency of the sulfur removal of the hydrofiners is important to the refinery to meet product specifications.

Current Operation

Hydrofining, also called hydrotreating, is a process where hydrogen is mixed with petroleum in the presence of heat and a catalyst to remove sulfur from the petroleum. The sulfur is removed from the petroleum products and the sulfur reaction products are stripped out as a gas. The Valero Benicia Refinery presently operates several hydrofining units.

Hydrofining units operate with a batch of catalyst until the catalyst ages to the point that the desired amount of sulfur removal is not achieved. At that time, the unit is shut down and the spent catalyst is removed from the reactor and replaced with fresh catalyst. The length of time between catalyst change outs therefore depends on the amount of sulfur in the petroleum mixture.

To consume the hydrogen gas, the refinery now directs excess hydrogen from one hydrofiner unit to another unit for use, but the quality of the hydrogen mixture degrades as the hydrogen is consumed. This cascading of the hydrogen-mixture results in uneven qualities of the hydrogen-mixture among the hydrofiner units. If excessive hydrogen is used in hydrofining, it can lower the octane rating of the gasoline, which would then require additional processing for the refinery to make high-quality, high-octane gasoline.

Proposed Changes

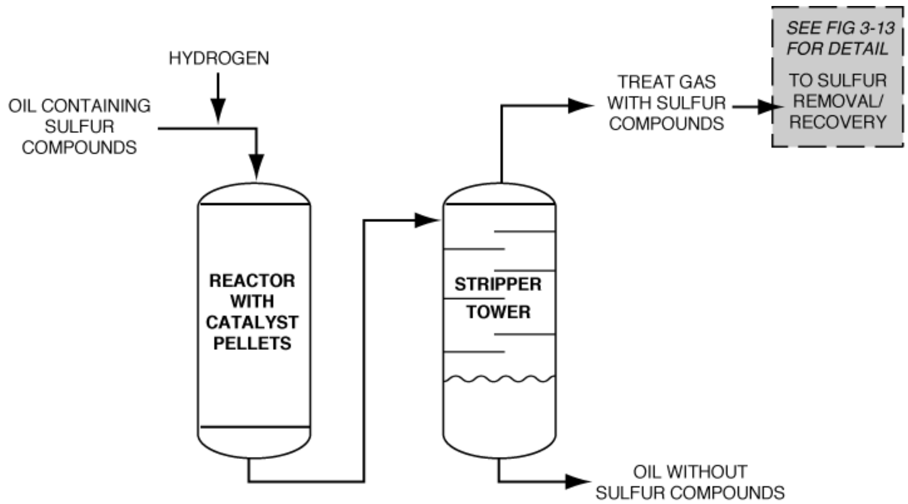
Operational Changes

To adjust to increased sulfur in the new refinery petroleum feedstocks, Valero proposes to modify existing hydrofining units to improve their sulfur removal efficiency while minimizing the hydrogen consumed in hydrofining. One of the modifications planned for hydrofining is to increase the effective amount of desulfurization catalyst in use at the refinery. Valero would evaluate a number of possible changes to hydrofining operations in order to maintain the same length of time between shutdowns to renew catalysts. Some of these options are: 1) changing the feed streams to individual hydrofiners, 2) changing the hydrogen distribution piping so that the hydrogen content of the gas mixtures delivered to each hydrofining reactor is optimized, 3) adding new hydrofining reactors, 4) enlarging the catalyst capacities of the hydrofining reactors, and 5) operating hydrofining reactors at higher temperatures or higher hydrogen content than at present. See Figure 3-17, *Hydrofining Process*.

Equipment Changes

Changing the input feed streams to hydrofining reactors would involve installing pumps and piping to carry the existing feed streams to different hydrofiners. An example of this option is rerouting the coker naphtha feedstock from the Cat Feed hydrofiner, where it is presently treated, to the Hydrocracker hydrofiner; this would require piping changes.

The processing of certain new crudes at Valero could affect the routing of the products to be hydrofined. For example, the processing of one particular new crude raw material would result in additional flow and sulfur load to the Virgin Naphtha Hydrofiner. For that particular crude, Valero’s initial analysis indicates that a larger reactor vessel would be advantageous. However, for another, different, new raw material, the amount of additional flow would not require a larger reactor vessel, but only adjustments to operating temperatures and pressures. In summary, the composition of the new raw materials would determine the specific changes needed to operate the



Valero Improvement Project EIR / 202115
Figure 3-17
Hydrofining Process

refinery. Therefore, the Valero technical staff would assess the optimal changes to the refinery hydrofining units to provide sufficient flexibility to run new raw materials with different characteristics.

Hydrogen distribution piping would also be changed and instrumentation and heat exchangers would be upgraded.

Valero proposes to install additional or larger catalyst vessels to provide more desulfurization catalyst for some of these units. The intent is to provide sufficient catalyst to last until the scheduled turnaround, when it could be replaced without disrupting production.

Schedule

Most of these modifications would be optimizations that would be made later in the project. Valero proposes to make the changes in the hydrofining equipment outside of the major turnaround.

3.4.3.8 Maximizing hydrocracker, Alkylation / Dimersol, and Reforming CapacitY

Introduction

Valero proposes to increase the processing rate of the Hydrocracker by about 3,000 barrels per day to a level of about 40,000 barrels per day. In addition, Valero proposes to optimize the operations of the secondary gasoline component production units, which consist of the Hydrocracking Unit, the Alkylation Unit, the Dimersol Unit and the Reforming Unit. This component of the VIP also provides the refinery with the flexibility to process different raw materials based on their yield characteristics.

Current Operations

In the present configuration, the hydrocracker uses hydrogen from the hydrogen plant and petroleum input streams from the pipestill, from the fluid coker, and from the cat cracker to upgrade the petroleum to better gasoline blending stocks or to condition selected output fractions for further processing in the catalytic reformer, alkylation and dimersol units.

Once the planned changes in the “Alkylation Unit Modifications Project” are completed in 2003, the Alkylation Unit is not likely to undergo any major modifications (see also Section 3.6.1.3). At that point, the unit would be operating with segregated propylene and butylene feed to maximize efficiency.

The Dimersol Unit, which operates in parallel with the Alkylation Unit, is nominally designed for a rate of 5,000 barrels per day.

The Naphtha Reforming Unit is designed to process low octane naphthas and to reform them into aromatics with improved octane ratings. During this process, hydrogen is liberated from the naphtha and is used in the refinery treat gas system, which is part of the hydrogen train.

Proposed Changes

Operational Changes

Valero proposes to concentrate hydrogen in a Pressure Swing Absorber and use this recovered hydrogen in the Hydrocracker, see Section 3.4.3.6. The added hydrogen would permit a petroleum input fraction that is currently directed to the FCCU to be processed and upgraded in the hydrocracker instead.

In the event that the Alkylation unit is not able to process economically all the available propylenes, an increase in Dimersol Unit throughput to as high as 7,000 barrels per day would be needed. This option would provide needed operational flexibility.

As different crude blends are processed in the refinery, there is a potential that additional low octane naphtha would be produced, requiring that the Naphtha Reforming Unit’s operation be maximized. There are also situations when market demand could call for additional volumes of premium grade gasoline, which require higher octane components. Thus, the proposed project includes facilities to sustain the maximized production of this unit.

Equipment Changes

Valero plans to modify some of the existing Hydrocracker internal parts to provide capacity for the processing rate increase, along with the pumps and piping required to transport the input stream to the Hydrocracker.

Minor piping and pump modifications to improve the reliability of the Alkylation Unit and to minimize the use of chemicals are likely to be considered. The focus of these changes would also address improved fractionation.

The Dimersol Unit may require some minor modifications to piping and pumps in order to increase the Dimersol Unit throughput to as high as 7,000 barrels per day.

The Naphtha Reforming Unit's equipment would include primarily piping, pump upgrades, and modifications to heat exchangers for additional duty. The reforming furnace design is adequate, though it may be operated at higher rates than has been historically typical.

Schedule

Valero plans to implement some of the modifications for the Hydrocracker in the 2003 time frame. Most other optimizations are likely to occur in 2005-2009.

3.4.3.9 Hydrotreater Guard Reactor

Introduction

Installing a guard reactor[9] on the feed to the hydrotreater would extend the useful life of Hydrotreater catalyst because the guard reactor would protect the main reactor catalyst from the build-up of flow-restricting particles.

Current Operations

As now configured, the hydrotreater does not have a guard reactor. During normal hydrotreater operation, particles of carbon that are formed in the charge heater plug the porous bed of the catalyst that is located inside the hydrotreater reactor. As the catalyst bed becomes plugged, the efficiency of the hydrotreater degrades. Currently, the catalyst degrades too quickly and Valero must shut down the hydrotreater and recondition or renew the catalyst before the next scheduled turn-around. These hydrotreater shutdowns adversely affect other refinery operations as the other units are still in operation when the hydrotreater must be brought down.

Proposed Changes

Operational Changes

By installing a new "guard" reactor upstream of the main hydrotreater, this new reactor would filter out most carbon particles before they reach the main hydrotreater reactor. When the catalyst bed in the guard reactor becomes plugged, Valero would isolate the guard reactor from the hydrotreater and then shut down the guard reactor. This main hydrotreater would remain operating while the guard reactor catalyst is reconditioned and the guard reactor is brought back on stream.

Equipment Changes

A new hydrotreater reactor and piping, including bypass valves and piping would be installed. The new reactor would be no larger than the existing hydrotreater reactor and would be located in the main process area, adjacent to the existing hydrotreater, to minimize the length of the interconnecting piping.

9 Also referred to as the "Cat Feed Hydrotreater Guard Reactor."

Schedule

Valero proposes to install the tie-ins to existing piping during a turnaround. Valero would then install the new guard reactor later.

3.4.3.10 Modifications to separations Processes for Optimization

Introduction

Processes and equipment are used throughout the refinery to separate mixtures of hydrocarbon into individual fractions, or products. The separation equipment is designed to be sufficiently flexible to separate products and for the varying mixtures of incoming crude oils with their individual characteristics. Valero proposes to install more separation equipment to optimize their operation and to provide greater flexibility in the VIP.

Current Operations

There are three commonly used separation processes used in the refinery. These are called fractionation, scrubbing, and stripping. These processes are discussed in the glossary, Chapter 8, Glossary and Acronyms. Separation equipment in which these separation processes are carried out are cylindrical vertical towers of varying sizes depending on the design basis of the particular separation. Because of the large number of separation towers used in the Valero Benicia Refinery, separation towers are some of the most visible types of equipment seen from outside the refinery. There are 70 towers in the main process block of the refinery; 5 are about 200-250 feet tall, 15 are about 100-200 feet tall, and 50 are 100 feet or less tall. The function of these towers is to separate the hydrocarbon mixtures into fractions, which may be finished products, blending stocks or feeds for other process units. After separation, these fractions are piped to product storage tanks for final blending or to downstream equipment for further processing.

In several downstream processing units, incoming mixtures are chemically transformed into desired new compounds; subsequently, fractionators also are used to separate these into individual products, as well.

Proposed Changes

Operational Changes

With the changes in feed stock characteristics anticipated after the VIP modifications and with the intention to optimize the existing processes, Valero proposes to make adjustments to the fractionation separations in operating units throughout the refinery. Most adjustments would be made without changes in facilities, but some adjustments would require replacement or addition of equipment. While the specific adjustments have not gone through detailed design, the overall scope of the changes to the fractionation equipment are generally known so that potential impacts of these changes can be identified and assessed.

Equipment Changes

The internal equipment in the fractionation towers and the external piping connections would be reviewed and, in some cases, modified. Modifications of fractionator tower interior equipment would consist of exchanging the internal trays for trays with a higher efficiency and of changing the tray dimensions. Other fractionating tower internal equipment that may be modified includes liquid distributor piping and tray baffles.

In some cases, Valero anticipates adding new fractionation and stripping towers or expanding the size of existing towers in order to make a substantial improvement in the capability to separate components. The new towers, with their associated piping, heat exchangers, instruments, and pumps, would be comparable in design to the ones currently operating in the refinery. At this time, Valero plans on adding up to 12 new fractionating and stripping towers; 3 are about 200 - 250 feet tall, 3 are about 100 - 200 feet tall, and 6 are 100 or less feet tall. The new towers are planned to be installed in the main processing block area, where the existing fractionating towers are located.

Additional equipment changes include modifications to the furnaces to increase the heat provided to the towers. Furnaces and heat exchangers can be used to increase the temperature of the crude oil to improve the separation of the product in fractionation columns or towers. Additional pumps would be used to increase the circulation rates in the towers to improve separations.

Schedule

Valero plans to implement these modifications for the Fractionation improvements throughout the duration of the VIP.

3.4.3.11 New and Modified Combustion Sources

Introduction

Combustion sources and their burners may need to be modified to emit lower oxides of nitrogen or to meet the requirements of new process conditions. Valero will require additional and modified combustion sources because more heat will be required by the VIP modifications. The VIP would require more heat provided by combustion because more oil products will be processed than at present and because the VIP new crude blends will consist of heavier components which require more heat for processing, such as fractionation, than the present crude blend.

Current Operations

Combustion of refinery gas is used throughout the refinery to transform crude oil to finished products. Combustion provides heat that is used in process furnaces to heat petroleum streams, in gas turbines to operate mechanical equipment and in boilers to make steam. The combustion sources are located inside the main process area.

Proposed Changes

Operational Changes

Combustion sources for several previously described VIP components, the FCCU Feed Flexibility, the Coker Expansion, and the Sulfur Recovery Unit Expansion, are planned to be modified to use more air or to increase oxygen for use in combustion.

In some specific cases Valero is evaluating if the furnace should be used to heat other streams than are presently heated, for example, if a petroleum product should be heated in the convection, or second, section of the furnace instead of steam.

Valero will be replacing two existing combustion sources, the Pipestill Furnaces F-101 and F-102, with new, high-pressure Pipestill Furnaces F-105 and F-106. This replacement was discussed in more detail in Section 3.4.3.2.

Other than the above, the additional changes would be that the combustion sources, the refinery's existing gas turbines, steam boilers and process furnaces would be required to increase their fired heat rate to a level above typical historic rates, but within their design capacity and demonstrated operation levels. The estimated total VIP additional firing rate would be approximately 400 million Btu/hr.

Equipment Changes

The combustion takes place in burners. Some burners would be modified to reduce emissions. During the detailed design phase, minor modifications to selected boilers and furnaces may be identified as being required. These modifications may include installation of emission control equipment (e.g. low NO_x burners on Pipestill and Powerformer furnaces), improved thermal insulation, or process tube pass configuration for improved efficiency.

For some applications, Valero would consider installing a new furnace rather than modifying the existing furnace, e.g. the Hydrogen Reforming furnace.

The modified or new combustion equipment would be located in the same place as the equipment it replaces or very close to the present location.

Schedule

Valero plans to implement the new and modified combustion sources throughout the duration of the VIP.

3.4.3.12 Water Use

Introduction

The VIP will increase the refinery's consumption of water. ~~Although~~ Additional raw water from the North Bay Aqueduct or other source secured by the city of Benicia would be used if there is no other suitable source. Valero and the City jointly examined the use of reclaimed water from the City of Benicia as the source of incoming water; ~~Valero proposes to employ reclaimed reuse water from the City of Benicia as the source of incoming water for refinery cooling tower;~~ however, the conclusion reached is that water reclamation is not feasible at this times~~, when such water becomes available.~~[~~10~~]

Current Operations

Refineries use water for many purposes. The biggest use is to supply refining processes with cooling water and with water for steam. One of the places water is used in the refinery for cooling is in the cooling towers, in which water is evaporated to then be circulated through the heat exchanger. At present, Valero uses approximately 5 MGD of City of Benicia water from the North Bay Aqueduct for all refinery applications. Valero's use of City raw water could increase when the Valero Cogeneration Project goes online, until Valero has fully implemented the water conservation mitigation measures imposed by the California Energy Commission in approving the Cogeneration Project.

Proposed Changes

Operational Changes

The VIP would increase overall refinery water use by 145 ~~150~~ gpm, which is 0.208 ~~0.216~~ MGD or 233 ~~242~~ acre-feet per year. Use of this additional City raw water from the North Bay Aqueduct will require no operational changes at the refinery.

The use of reclaimed water from the City of Benicia's wastewater treatment plan was evaluated in detail by the PURE committee appointed by City Council. The conclusion reached was that the project was not feasible within the parameters set forth in the Use Permit, subsequent agreements and the PURE charter. Thus, the VIP Amendments do not propose further investigation of the use of reclaimed water at this time.

~~However, Valero also proposes to use treated water from the City of Benicia's wastewater treatment facility for use as the input to the cooling towers when and if this water becomes available. It is estimated that reuse water could offset the use of at least 1 to 1.5 million gallons of water per day of North Bay Aqueduct water. Until such treated water becomes available, Valero would use raw water obtained from the City of Benicia.~~

~~Because the reclamation of the wastewater would be a City of Benicia project and reclamation is not a part of the VIP, the analysis of the VIP is based on the increased use of City raw water from the North Bay Aqueduct.~~

~~10 Valero has proposed to support the City's efforts to develop a wastewater reuse system project. It is expected that the City's project would involve additional treatment (probably filtration and reverse osmosis) of the effluent. Valero intends to provide an easement to allow transfer of the reuse water to the refinery via pipeline. The City's water reuse project is separate from the VIP and would be developed and permitted independently by the City of Benicia. For more information, see Section 3.6.2.3, *City of Benicia Wastewater Reuse Project*.~~

Equipment Changes

Use of additional City raw water from the North Bay Aqueduct will require no equipment changes at the refinery.

Were the City to undertake reclamation of its municipal wastewater, modifications would be required at the City's existing Wastewater Treatment Plant. New water treatment equipment and a dedicated pipeline would be needed on the refinery property. If the City's wastewater reuse project were to be implemented, then the refinery may install additional water purification equipment, a reverse osmosis (R.O.) process, for later applications.

Schedule

The scheduled implementation depends on the City of Benicia's Reuse Water availability. See Section 3.6.2.3 for information on the status of the City of Benicia Wastewater Reuse Project.

3.4.3.13 WasteWater treatment

Introduction

The VIP could increase the wastewater load to the refinery's wastewater treatment facilities. Modifications to these facilities may be needed to control discharges to levels that meet the San Francisco Regional Water Quality Control Board (RWQCB) requirements.

Current Operations

Valero treats all refinery wastewater in processing equipment located close to the water effluent outfall that discharges into Suisun Bay. Treatment in this processing equipment allows the effluent discharge to meet the state discharge regulations. In the future, the refinery also will begin to treat the discharge from the adjacent the Huntway Asphalt Refinery, recently purchased by Valero. See also Section 3.6.1.3, *Planned Independent Refinery Projects / Activities.*

The responsible agency for the refinery wastewater discharge is the RWQCB.

Proposed Changes

Operational Changes

Valero expects ~~only a minor~~ increases in flows and ~~increase~~ in levels of contaminants to be removed as a result of the VIP. Valero anticipates that it may be necessary to make some modifications to the existing wastewater treatment processing, although the extent of the modifications depends on the National Pollutant Discharge Elimination System (NPDES) permit conditions to be imposed by the RWQCB.

Equipment Changes

Valero plans on adding a second stage to the crude desalter to wash salts and solids from crude oil prior to the refinery's first step in separating the crude oil in fractions for further processing. This second stage desalter will be installed downstream of the existing desalter. These two units will act in coordination so that the amount of wastewater will not increase significantly, but more salts and solids will be removed from crude. **See Figure 3.5 (add Figure 2/4-4).**

Depending on the stipulations of new wastewater discharge permit and the detailed design considerations needed to meet these stipulations, existing equipment would be modified or replaced. At this time, Valero anticipates that the equipment to be upgraded may include new Aeration Basins to increase the capacity of the existing Biox Process, new Clarifier Tanks downstream of the Aeration Basins, a new Equalization Tank located adjacent to the Diversion Tanks, Filters, a Metals Removal Train, and a new DeOiler Surge Tank. See Figure 3-18, *Wastewater Treatment Plant Modifications*.

Schedule

Valero would meet the schedule set by the RWQCB to meet wastewater discharge limitations.

3.4.3.14 Support Facilities and Refinery Infrastructure

Introduction

The operation of the VIP would require certain additional infrastructure and support facilities.

The refinery has many support processes, most of which would not require modification to support the operation of the VIP. However, the following areas are expected to require modification.

Tank Heaters

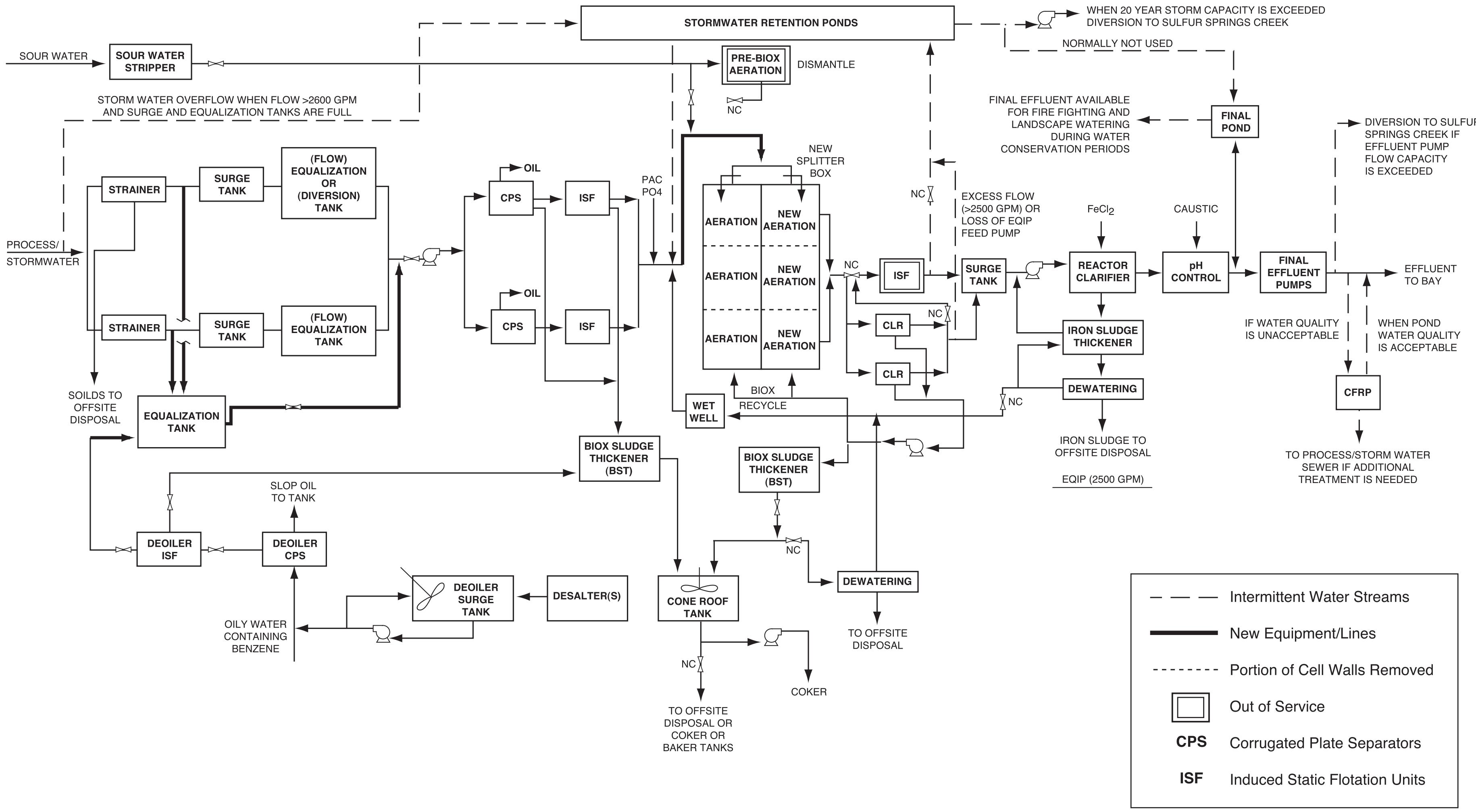
Several tanks that would store heavy feedstocks would need to be fitted with steam heating equipment. By heating the heavy oil, the viscosity would be reduced enough to allow more efficient pumping.

Coke Silos

The existing onsite coke loading silos, located at the west edge of the process block, would be upgraded to handle the increased coke production rate.

Boiler Feed Water

An additional reverse osmosis module, similar to one currently being installed in the refinery for the Cogeneration Unit, may be installed in the raw-water treatment unit to provide additional high purity boiler feed water, if needed in the latter phases of the project. (See also Section 3.4.3.12, *Water Use*.)



SOURCE: URS

Figure 3-18
Wastewater Treatment Plant Modifications

3.4.3.15 Additional Crude Tankage

Introduction

In order to be more flexible in segregating and blending the petroleum mixes used as starting material for the refinery processes, new crude storage tanks would be added in the tank farm, the area where the existing tanks are located.

Current Operations

Crude oils or refinery products to be processed in the refinery are transported to the Benicia refinery by ship or by pipeline. These starting materials are pumped into special storage tanks. The starting material from these tanks is then drawn to process in the refinery. The tanks at the Valero Benicia Refinery are called floating roof tanks because the top of the tank floats on the top of the petroleum stored in the tank. Floating roof tanks are used because the design limits the volume of airspace above the liquid into which volatile hydrocarbon constituents can evaporate and thereby reduces emissions of hydrocarbons from the refinery.

Proposed Changes

Operational Changes

To provide flexibility, Valero proposes to add new crude oil storage tanks. These new storage tanks would allow Valero flexibility in the segregating and blending of feedstocks to be processed in the refinery.

Equipment Changes

Valero proposes to install one or two additional floating roof crude tanks (with capacity of up to 900,000 barrels for one, or 650,000 barrels each for two) within the Crude Oil Field tankage area. The new tank design would include a second containment bottom with an indicator to identify leaks before they reach the underlying soil. Also, the firewall area would be constructed to contain 100% of the contents of the single largest tank for secondary containment in the event of catastrophic failure of a tank. The dikes of the ponds at the tank farm site would be realigned.

Schedule

The tanks would be installed as they are needed.

3.4.3.16 Import and Export Logistics

Introduction

The increased import of crude oil and gas oil and export of refinery products will result in increases in surface transportation.

Current Operations

Crude oils or refinery products to be processed in the refinery are transported to the Benicia refinery by ship or by pipeline. Most products are exported by pipeline.

Proposed Changes

Operational and Equipment Changes

Most of the transportation changes will be operational, requiring changes to the numbers of and scheduled frequencies of shipments. The projected net changes in the numbers of trips and delivery schedules of incoming raw materials and outgoing products follows:

Type of Transport	Change	Estimated Magnitude
1. Crude and Gas Oil dock movements	+	12 ships per year
2. Coke exports over dock	+	12 ships per year
3. Product exports via pipeline sales	+	
4. Truck exports of propane and sulfur	+	11 trucks per day.
5. Truck deliveries/shipments of other materials	+	5 trucks per day.
6. Rail Car exports of butane	+	1 rail car per day.
7. Rail Car imports of isobutane	-	1 rail car per day.
8. Rail Car exports of coke to dock area	+	5 rail cars per day.

BAAQMD Shipping Variant

The BAAQMD proposes to impose approval conditions that place new limits on VIP ship and barge emissions and require monitoring and reporting throughput at the Main Benicia Crude Dock and at the Valero Coke Dock. These new limits on ship and barge emissions are at the emission levels that would occur with the VIP ship movements described in the table above. In the future, the new emission limits could constrain Valero's current ability to choose between shipping and pipeline transport.

The table above provides Valero's best estimate of the VIP's increase in ship traffic. However, it remains possible, whether due to unforeseen effects of the VIP or to other unforeseen circumstances, that Valero may need to increase ship traffic by up to approximately 36 more ships per year, in addition to the VIP increase of 24 ships, to obtain sufficient crude feedstocks.

Valero has requested the District to approve a mechanism to offset shipping-related emission increases above this new limit by making further emission reductions at the main stack, or at other projects to fully offset any increased emissions due to ship traffic in excess of that proposed as part of the VIP.

Schedule

The changes in deliveries would occur as necessary to serve the needs of new or modified equipment, feedstock changes, and production changes during the time frame of the VIP.

3.5 Construction of the Proposed Project

Construction of the proposed Valero Improvement Project would not require the demolition of any existing refinery facilities. However, grading, transport of materials, and building and installation of new equipment would be required. The construction schedule, construction areas, demolition, grading, materials and services, and labor force are discussed below. Some aspects of the construction plan may change slightly as the plan is finalized.

3.5.1 Schedule

~~The Main Stack Components are the heart of the VIP in that they are necessary in order to accomplish the first two objectives of the project—that is, they provide the flexibility to utilize lower priced raw materials and to substitute different raw materials as feeds for refinery processes. These Main Stack Components include the Expanded Crude Oil Processing Capacity, the FCCU Feed Flexibility Modifications, the Coker Expansion, and the Sulfur Removal and Recovery Capacity equipment. Also considered a Main Stack Component is the Scrubber, which is to be installed to limit the air emissions associated with the other Main Stack Components.~~

~~These Main Stack Components will all require that at least some portions of their equipment be installed during one of the refinery turnarounds, which typically last about a month. The FCCU Feed Flexibility and the Expanded Crude components require that some facilities be installed during the refinery-wide turnaround, which occurs only once every 5 years. The next refinery-wide turnarounds are currently planned for February 2004 and then again in 2009. The installation of some of the equipment of the other Main Stack Components will require either the refinery-wide turnaround or else a smaller turnaround that is now planned for 2006. Not all parts of these components must be installed during the actual turnaround period. Only that hardware to be placed inside the major vessels, along with the tie-in valves and slide gates that allow on-line commissioning at a later date, will be installed. Following the turnaround period, the completion of the work can take up to nine months before the equipment will be ready to begin operation. Accordingly, the installation sequence is presented as Valero's current planning basis, although there are many factors that could result in changes and adjustments to this schedule.~~

~~This construction and implementation schedule must consider the project-specific design, construction, and equipment delivery constraints, but the schedule also must consider the basic refinery operating decisions that relate to the characteristics of the raw materials that become available in the market place. For instance, if sour crudes do not carry as high a price discount as expected, less sour crude will be purchased and some of the sulfur removal equipment will be deferred. If heavy crude oil prices are not discounted as expected, less heavy crude will be purchased and some of the Coker Expansion facilities may be deferred.~~

~~With these potential schedule-altering factors in mind, Valero currently plans the following implementation sequence for the VIP.~~

~~2004 Refinery-wide Turnaround~~

- ~~Install internal components of FCCU Flexibility Modifications.~~

- ~~Install Air Blower ducting for on-line commissioning of 3rd air blower.~~
- ~~Install New Furnace F102A or tie-ins to allow on line commissioning.~~
- ~~Install Scrubber slide gates to allow on line commissioning.~~
- ~~Install Sulfur Plant combustor modifications (2) for future oxygen injection, (or plan for one or both to be delayed to 2006).~~
- ~~Install amine circulation system tie-ins to allow on line capacity increase.~~
- ~~Install Coker Expansion internal components (or plan for 2006).~~

~~By Year End 2004~~

- ~~Complete all FCCU Flexibility Modifications.~~
- ~~Complete New Furnace F102A installation.~~
- ~~Complete Main Stack Scrubber installation.~~
- ~~Complete oxygen generator for Sulfur Plant (unless delayed to 2006).~~
- ~~Complete capacity increase facilities for amine circulation, as needed.~~
- ~~Complete Coker Expansion facilities (unless delayed to 2006).~~
- ~~Startup equipment to allow initial steps in increasing sour feedstock.~~

~~If all facilities requiring the refinery-wide turnaround cannot be installed in 2004, some components may be deferred until 2009. There is the potential that some of the Main Stack Components could be partially operational prior to the time that the Scrubber is in operation. Specifically, the crude rate for the refinery could be raised above the current level and/or the additional air blower could be utilized to the FCCU or Coker Unit. To provide certainty that this would not result in an interim impact, Valero has proposed to the Bay Area Air Quality Management District that it include a permit condition that requires, in these situations, that Main Stack emissions be controlled to stay below previously demonstrated levels. The District has confirmed its intent to impose this condition, among others.~~

~~The remaining components of the VIP, other than the Main Stack Components, will be designed and installed throughout the 2003 – 2009 period. For instance, the hydrogen production facilities are expected to be implemented in several steps. The likely first step will involve the installation of the PSA equipment. Subsequent steps, i.e. substitution of MDEA for CO_2 removal, would take place later in the period. The PSA installation could begin in 2003 and by 2004 could provide the hydrogen necessary for either higher Hydrocracker Unit rates, or for additional hydrofining, as dictated by daily operating conditions. Similarly, if a raw material is identified as economically attractive, but would benefit from implementation of part of the Fractionation Optimization component, then that part of the project would proceed, independent of other VIP activities.~~

~~In summary, the components of the project can be roughly divided in two groups - the Main Stack Components and the other optimizing and supporting components. The Main Stack Components are targeted for installation during 2004 and are tied closely to turnaround schedules. The other optimizing and supporting components are to be implemented throughout the project period from 2004 through 2009. Many factors can influence the ultimate schedule for the components.~~

~~The application states that some components of the VIP may ultimately be deferred or deleted. If situations arise that prevent the Main Stack Components from being implemented, there may still be some of the other components that could be implemented. However, within the group of Main Stack Components, the Scrubber cannot be deleted if the FCCU Feed Flexibility, Coker Expansion, and/or the Expanded Crude Oil Processing Facilities are fully implemented – at least, to the extent that the third blower is utilized or to the extent that the crude rate is increased above about 150,000 barrels per day. This is the case because the Scrubber is needed to mitigate the emissions from these components.~~

The original VIP was expected to be completed by 2009. The proposed VIP Amendments would extend this completion schedule until approximately 2014. The revised detailed schedule for all VIP project components, including the VIP Amendments, is provided in the following table. Construction activities related to the proposed VIP Amendments will take approximately three to five years and will use the existing workforce in the area.

3.5.2 Construction areas

Most construction would take place in the process block. Fabrication and laydown areas are existing disturbed areas and are shown in Figure 3-19, *Construction Activity Areas*.

It is anticipated that during the highest construction activity periods, 2003 through 2004, a nearby warehouse facility would be rented in the Benicia Industrial Park to facilitate materials receiving activities and to ensure an orderly material delivery to the construction site. This is the same warehousing approach used for the Clean Fuels Project. The exact location in the industrial park is not known, but it would require delivery trucks to exit from Interstate 680 and truck transfers into the refinery would be through refinery Gate 4. See also Figure 4.13-1, *Transportation Networks* for refinery gate locations.

3.5.3 Demolition, Excavation and Grading

~~No existing equipment must be demolished in order to construct the proposed project. An estimated 20,000 cubic yards of soil would be excavated for the project, with the majority associated with the two new storage tanks and dike realignment. No soil would be imported for the project, and no soil would be exported from the site except if it were legally required to dispose of contaminated soil to a Class I [hazardous] waste facility. At this time, the quantity of soil that would have to be sent to a Class I facility is not known. The remainder of the soil would be used on-site.~~ An existing 6,000 square foot firehouse as well as an existing training building located within the future location of the new H2U will be demolished as part of the VIP Amendments. Portions of the existing CO Furnace structures (F-101/102), the Electrostatic Precipitators (ESPs) and interconnecting ductwork will be demolished after decommissioning. No other new demolition is planned. A retaining wall or other shoring will be constructed at the site of the new H2U.

VIP AMENDMENT PROJECT SCHEDULE

VIP Component[a]	Start Engineering	Order Long Lead Equipment	Begin Site Preparation	Start Construction	Startup
Crude Unit Expansion to greater than 135 MBD	N/A	N/A	N/A	N/A	Jan 2009
Increased firing rates of existing Combustion Sources (3.4.3.11)	N/A	N/A	N/A	N/A	Jan 2009
FCCU Expansion, increased C-702 air rate (3.4.3.2 and Amendments)	N/A	N/A	N/A	N/A	July 2009
Crude Tanks (3.4.3.15)	Jan 2006	April 2007	April 2007	Sept 2007	Dec 2008
FCCU/CKR Scrubber (3.4.3.5 and Amendments)	April 2007	April 2008	July 2008[b]	July 2008[b]	Dec 2010
Hydrogen Unit (3.4.3.6 and Amendments)	Sept 2006	July 2008	July 2008[b]	July 2008[b]	July 2010
HCNHF Diolefin Reactor (3.4.3.7)	Jan 2008	Jan 2009	Oct 2009	Jan 2010	Mar 2011
Wastewater Modifications (3.4.3.13)	Jan 2008	Jan 2009	Oct 2009	Jan 2010	Mar 2011
Increased Sulfur Removal and Recovery (3.4.3.1, 3.4.3.4, and Amendments)	April 2007	July 2009	Oct 2009	Jan 2010	July 2011
Crude Unit Expansion up to 165 MBD and Furnace (3.4.3.1 and 3.4.3.11)	April 2009	July 2009	Oct 2009	Jan 2010	July 2011
Other Hydrofining Towers and Optimization (3.4.3.7)	April 2008	July 2009	Oct 2009	Jan 2010	July 2011
New Fractionation Towers and Fractionation Modifications (3.4.3.10)	April 2007	July 2009	Oct 2009	Jan 2010	July 2011
Expand CKR, Cat Light Ends, and Silos (3.4.3.4, 3.4.3.10, and 3.4.3.14)	Jan 2010	Jan 2011	Oct 2011	Jan 2012	Mar 2013
Butamer (3.4.3.8)	Jan 2008	Apr 2008	July 2008	Oct 2008	Aug 2009
FCCU Expansion, new electric driver for C-702 (3.4.3.2)	Jan 2012	Oct 2012	Oct 2012	Jan 2013	Mar 2014
CFHU Guard Reactor (3.4.3.9)	Jan 2012	Oct 2012	Oct 2012	Jan 2013	Mar 2014
Optimize Hydrocracker, Alkylation, Dimersol, and Reforming (3.4.3.8)	Jan 2012	Oct 2012	Oct 2012	Jan 2013	Mar 2014
RO unit for boiler feed water (3.4.3.13)	Jan 2008	Oct 2009	Jan 2010	Mar 2010	Aug 2012

[a] Sections of the Certified EIR are listed in conjunction with the VIP Amendments
[b] Critical path is receipt of Benicia Land Use permit and BAAQMD authority to construct air permit.

Excavation, grading and/or backfill of soil will be required for the FCCU/CKR Scrubber. One of the scrubber installation schemes will involve the excavation of approximately 26,000 cubic yards of soil, about 90% of which will be reused as backfill and the remainder will be sent off site as clean backfill. In the alternate FCCU/CKR Scrubber installation approach, about 175,000 cubic yards of clean fill will be required to build up the sloped area to about the same level as the Refinery Process Block. Valero will obtain as much usable fill as possible from on-site sources including the North Canyon accumulation area (about 100,000 cubic yards), and from fill material generated from routine maintenance and small projects on site. The remaining amount of backfill will be obtained from off site with up to 40 truck deliveries per day. Short term stockpiling may be required in the North Canyon area. Typical best management practices will be used to reduce any impacts from fugitive dust emissions and runoff. These will include dust suppression water and silt barriers.

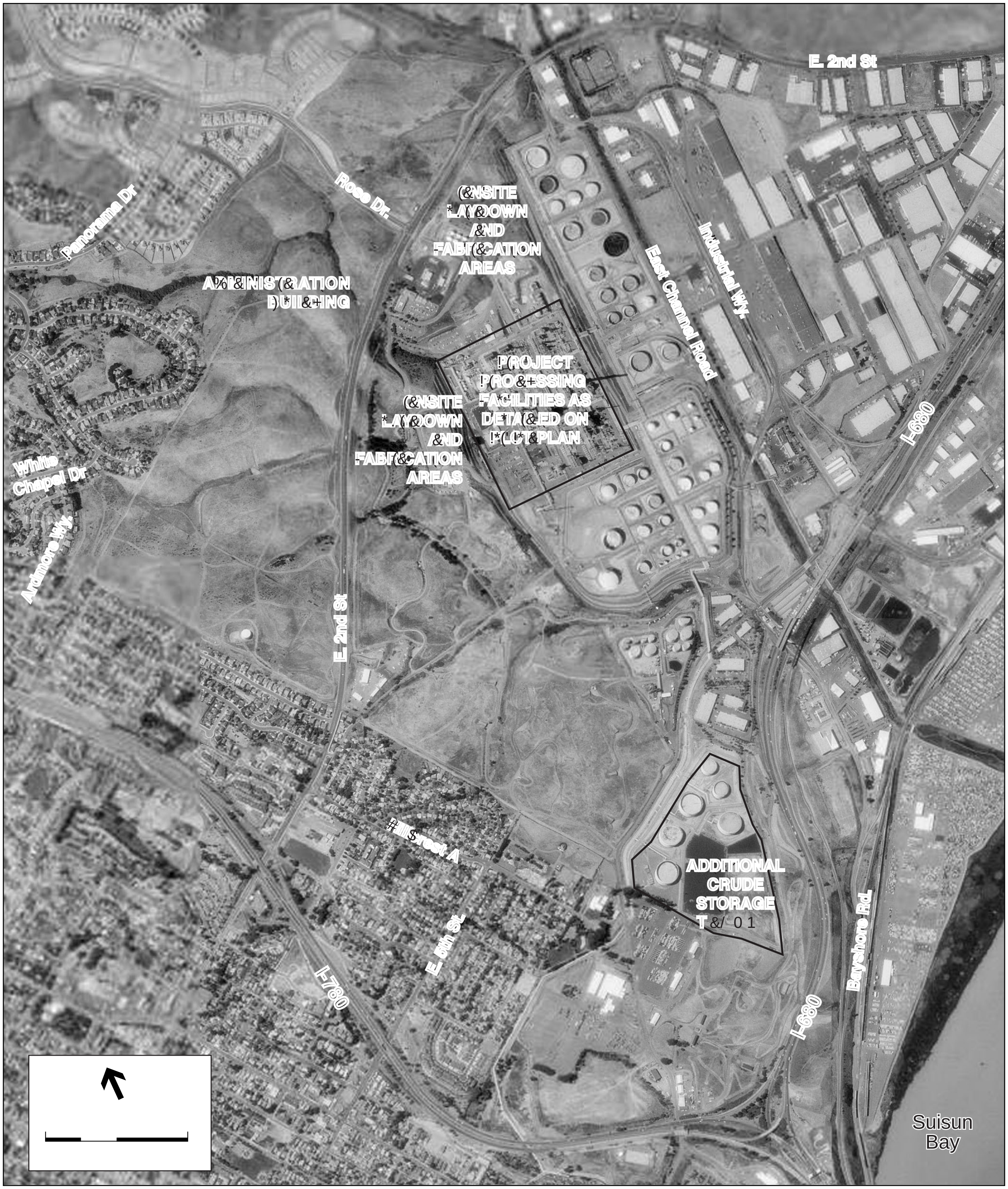
Additional minor amounts of soil excavation may be required for re-grading the H2U site and to create the new parking area that is cut into the hill side. As the construction schedule allows, any excess soil will be used for fill for the alternate FCCU/CKR Scrubber installation approach. If any excess soil is generated beyond the demands of the VIP Amendments, it would preferentially be used on site for other grading purposes or accumulated in the North Canyon area for future projects.

It is expected that most soil will be reused on site. If soil is found to be contaminated and could not be reused, it will be exported from the site for disposal in compliance with legal requirements, at a Class I (hazardous) waste facility for soil classified as hazardous waste, or at a Class II landfill for non-hazardous soil classified as designated waste. At this time, the quantity of soil, if any, that would be required to be sent to a Class I or Class II facility is speculative, but is expected to be relatively small.

3.5.4 Construction Traffic and Parking

Construction worker parking would be at the locations indicated in Figure 3-19. If additional workers are required and parking spaces are not available, Valero would rent off-site parking in the Industrial Park and use buses to transport workers to and from the work site.

Valero proposes to manage traffic in cooperation with the City of Benicia using the same procedures that were used with the Clean Fuels Project and the Cogeneration Project. The traffic management mechanisms proposed include work hour staggering, traffic directors, and use of temporary signs. Valero proposes to hold regular meetings with the City Traffic Engineer and representatives from the Police Department and Public Works Department to ensure that proper results are maintained.



E. 2nd St
Rose Dr.
Panorama Dr
Industrial Wy.
East Channel Road
PROJECT
AREAS
White Chapel Dr
Ardmore Wy.
E. 2nd St
ADDITIONAL CRUDE STORAGE
E. 5th St.
I-780
I-680
I-680
Bayshore Rd.
Suisun Bay

3.5.5 Construction Labor Force

The total refinery construction workforce is expected to peak at about 2,000 workers during the refinery-wide turnaround in 2010 ~~2004~~; about 350 of those workers will be associated with the VIP. The average daily construction work force for the VIP would be about 200. The construction workforce would include cement finishers, ironworkers, pipefitters, welders, carpenters, electricians, riggers, painters, operators, and laborers.

The average total estimated manpower required over the seven-year project construction is expected to be approximately 1.7 million worker-hours.

3.7 Permits and Approvals Required

The City of Benicia Zoning Ordinance, Section 17.32.020, requires a use permit for oil and gas refining. The Valero Benicia Refinery was established prior to the adoption of that requirement and, therefore, future projects at the refinery are reviewed in relation to Section 17.98.070 regarding alteration or expansion of a preexisting use for which a use permit is required. Section 17.98.070 requires a use permit for projects that constitute alteration or expansion of an existing use as defined below:

> "Alteration" is:
>
> A. A change the cost of which equals or exceeds twenty million dollars [adjusted for inflation] or equals or exceeds twenty-five percent of current assessed valuation of the existing facility or structure, whichever is less; or
>
> B. A change which substantially alters the character or operation of the existing use including, but not limited to, hours of operation or scope of activities or services.
>
> "Expansion" is interpreted as enlargement or extension of the use so as to occupy any part of the structure or site, or another structure or site that it did not occupy [before].

The VIP constitutes an alteration of the existing use because its cost, estimated at $140 million, exceeds $20 million adjusted for inflation and because the project will substantially alter the character and operation of the existing use by allowing the refinery to process lower grades of feedstocks and increase production above existing levels.

Thus, under City Ordinance, the VIP would require a land use permit and, because the approval is a discretionary action on the part of the City, environmental review under the California Environmental Quality Act (CEQA) also is required.

In addition to a City of Benicia Use Permit, permits would be required from the Bay Area Air Quality Management District for units included in the VIP. Valero may make separate permit applications to BAAQMD for individual components, or groups of components of the project. The first application was submitted to the BAAQMD on July 22, 2002. The City, as Lead Agency for the EIR, has taken special care to assure that this EIR provides a sound basis for supporting the BAAQMD review of Valero's air permit application.

The facilities in this project are incorporated into the refinery's Regional Water Control Board's NPDES Permit.

It is expected that grading and building permits would be required from the City of Benicia for project components not covered by the annual grading and building permit.

A Caltrans encroachment permit may be needed to implement the traffic mitigation measure.

The VIP Amendments will require City Design Review for the proposed new fire station and the employee parking lot.