4.0 POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

This chapter provides an assessment of potential environmental impacts associated with the ARCO CARB Phase 3 – MTBE Phase Out Project. Both project construction and project operation impacts to the affected environment of each resource discussed in Chapter 3 are analyzed in this section.

Pursuant to CEQA, this section focuses on those impacts, which are considered potentially significant. An impact has been considered significant if it leads to a "substantial or potentially substantial, adverse change in the environment." Impacts from the project fall within one of the following areas:

No impact - There would be no impact to the identified resource resulting from this project. For example, a project constructed at an existing facility, which has previously been surveyed and found to contain no cultural resources would produce no impact to that resource.

Adverse but not significant - Some impacts may result from the project; however, they are judged not to be significant. Impacts are frequently considered insignificant when the changes are minor relative to the size of the available resource base or would not change an existing resource. For example, removal of a small amount of marginal habitat from a species with a widespread distribution would probably not be a significant impact. Similarly, the addition of an industrial structure within an existing industrial facility complex would probably not produce a significant impact on visual resources.

Potentially significant but mitigatable to insignificance - Significant impacts may occur; however, with proper mitigation, the impacts can be reduced to insignificance. For example, a project affecting traffic flow during construction may have mitigation calling for temporary traffic controls that will keep the impacts to within acceptable limits.

Potentially significant and not mitigatable to insignificance - Impacts may occur that would be significant even after mitigation measures have been applied to lessen their severity. For example, a project could require a considerable amount of water during construction. If the additional water required the commitment of all the reserves of a water district even after requiring the project to include all water conservation practices, the impact to this resource could be significant and not mitigatable to insignificance. Under CEQA, a significant impact would require the preparation of a Statement of Findings and a Statement of Overriding Considerations, i.e., the project benefits outweigh the significant damage to the environment, in order for the project to be approved.

Beneficial - Impacts will have a positive effect on the environment. For example, a project may produce a less polluting form of gasoline.

Mitigation measures for adverse significant impacts are also provided in this chapter. Mitigation measures are methods for minimizing or eliminating the effect of a project on the environment. This chapter also provides suggested mitigation for effects that are temporary in duration and will not have a long-term adverse impact on the environment.

4.1 Air Quality

Project-related air quality impacts calculated in this environmental analysis will be considered significant if any of the significance thresholds in Table 4.1-1 are exceeded. Additionally, operational NO_x or SO_x emissions from stationary sources regulated by Regulation XX-RECLAIM, will be considered significant if calculated project operational NO_x or SO_x emissions (RECLAIM criteria pollutants) plus the facility's Annual Allocation for the year the project becomes operational, including purchased RECLAIM trading credits (RTCs) for that year, are greater than the facility's Initial 1994 RECLAIM Allocation plus nontradeable credits (NTCs), as listed in the RECLAIM Facility Permit, plus the maximum daily operation NO_x and SO_x emissions significance thresholds of 55 and 150 pounds per day, respectively as listed in Table 4.1-1. Since the NO_x and SO_x emissions significance thresholds in the table are expressed in pounds per day, the facility's Initial 1994 RECLAIM Allocation plus NTCs and the facility's Annual Allocation for the year the project becomes operational, including purchased RTCs, have been converted to pounds per day by dividing by 365 days per year. Operational NO_x and SO_x emissions from non-RECLAIM sources will be compared to the 55 and 150 pounds per day significance thresholds, respectively.

This section describes the air quality impacts that are anticipated to be associated with the proposed project. It begins with a discussion of the activities that are anticipated to occur during the construction phase of the proposed project, the resulting estimated on-site and off-site air pollutant emissions, and the potential significance of those emissions. It then continues with a discussion of the potential sources of air pollutant emissions during the operational phase of the proposed project and the estimated net change in emissions from LAR and the terminals. The potential significance of changes in operational criteria pollutant emissions is then evaluated by comparison with emission thresholds, and the potential significance of changes in toxic air contaminant emissions is evaluated through a human health risk assessment. The section concludes with a discussion of measures to mitigate potentially significant construction-related and operational air quality impacts.

4.1.1 Construction Emissions

Construction of the proposed project at LAR is scheduled to begin in February 2001, and be completed in October 2002. Construction is anticipated to take place four days per week, Monday through Thursday, from 6:00 a.m. to 5:00 p.m. Occasional night, Friday, or weekend shifts may be required to maintain the construction schedule. For the most part the construction would occur during process turnarounds when the units would be undergoing scheduled maintenance.

The construction activities at the terminals would occur between June 2001 and December 2002. The maximum duration for construction at an individual terminal would be 12 months. Construction activities would occur Monday through Friday, from 6:00 a.m. to 5:00 p.m. Occasional night or weekend shifts may be required to maintain the construction schedule.

Table 4.1-1
Air Quality Significance Thresholds

Criteria Pollutants Mass Daily Thresholds			
Pollutant	**Construction**	**Operation**	**RECLAIM Pollutants**
NO_x	100 lbs/day	55 lbs/day	10,210 lbs/day
VOC	75 lbs/day	55 lbs/day	
PM_{10}	150 lbs/day	150 lbs/day	
SO_x	150 lbs/day	150 lbs/day	10,299 lbs/day
CO	550 lbs/day	550 lbs/day	
Lead	3 lbs/day	3 lbs/day	
TAC, AHM, and Odor Thresholds			
Toxic Air Contaminants (TACs)	Maximum Incremental Cancer Risk ≥ 10 in 1 million Hazard Index ≥ 1.0 (project increment) Hazard Index ≥ 3.0 (facility-wide)		
Odor	Project creates an odor nuisance pursuant to SCAQMD Rule 402		
Ambient Air Quality for Criteria Pollutants			
NO_2 1-hour average annual average	20 μg/m^3 (= 1.0 pphm) 1 μg/m^3 (= 0.05 pphm)		
PM_{10} 24-hour annual geometric mean	2.5 μg/m^3 1.0 μg/m^3		
Sulfate 24-hour average	1 μg/m^3		
CO 1-hour average 8-hour average	1.1 mg/m^3 (= 1.0 ppm) 0.50 mg/m^3 (= 0.45 ppm)		
μg/m^3 = microgram per cubic meter; pphm = parts per hundred million; mg/m^3 = milligram per cubic meter; ppm = parts per million; TAC = toxic air contaminant; AHM = Acutely Hazardous Material			

Construction emissions can be distinguished as either on-site or off-site. On-site emissions generated during construction consist of the following:

- Exhaust emissions (NO_X, SO_X, CO, VOC, and PM_{10}) from heavy-duty construction equipment;
- Fugitive dust (PM_{10}) from grading, motor vehicle travel on paved surfaces, storage pile wind erosion, and general material handling (i.e., dropping soil onto the ground or into trucks during excavation);
- VOC from asphaltic paving; and
- VOC from architectural coating.

Off-site emissions during the construction phase normally consist of exhaust emissions and entrained paved road dust from worker commute trips and material delivery trips to the construction site.

Construction is anticipated to include the following:

1. Modifications to Light Hydro Unit No. 1
2. Conversion of the ISO SIV unit to Light Hydro Unit #2
3. Modifications to the No. 3 Reformer Fractionator
4. Conversion of the No. 1 Naphtha Splitter to a new debutanizer and conversion of the Super Fractionation Integrated Area (SFIA) Depentanizer to a naptha splitter
5. Construction of a new FCCU Rerun Bottoms Splitter
6. Addition of new equipment to the North Hydrogen Plant
7. Conversion of the MTBE unit to an ISO Octene unit
8. Modification of the Cat Poly unit to a Dimerization Unit
9. Modification of the Mid-Barrel unit to a gasoline hydrotreater
10. Modifications to Tank Farm piping
11. Construction of facilities and equipment for pentane off-loading at the Railcar Pentane Loading facility

12. Modifications to transport pentanes by pipeline
13. Construction of facilities for butane loading and off-loading at the railcar polypropylene loading facility
14. Modifications at Marine Terminal 2 for marine tanker ethanol offloading and storage
15. Modifications at Marine Terminal 2 for Pentanes storage and marine tanker loading
16. Modifications at the East Hynes terminal for ethanol storage and blending
17. Modifications at the Vinvale terminal for ethanol storage and blending
18. Modifications at the Hathaway terminal for ethanol storage, blending and shipping by tanker truck
19. Modifications at the Carson terminal for ethanol storage and blending
20. Modifications at the Colton terminal for ethanol storage and blending

Emissions from these activities were estimated using anticipated construction equipment requirements along with the following emission estimating techniques:

- SCAQMD CEQA Air Quality Handbook, November 1993;
- EPA Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition;
- US EPA Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures, 1992;
- California Air Resources Board EMFAC7G on-road motor vehicle emission factor model;
- California Air Resources Board Emission Inventory Methodology 7.9, Entrained Paved Road Dust, 1997; and
- "Open Fugitive Dust PM10 Control Strategies Study," Midwest Research Institute, October 12, 1990.

Details of the emission calculation methodologies are provided in Appendix B.

To estimate the peak daily emissions associated with the construction activities, the anticipated schedule, the types and numbers of construction equipment were estimated. Additionally, estimates were made of the number of daily worker commuting trips and material delivery and removal trips for each of the construction activities. Table 4.1-2 lists the anticipated schedule, peak daily construction equipment requirements, peak daily motor vehicle trips, and estimated daily miles traveled by each motor vehicle. The information in the table was derived from previous experience with refinery and terminal construction.

Table 4.1-2
Construction Schedule, Equipment Requirements and Motor Vehicle Trips

Equipment/Vehicle Type	Number	Hours per Day Operation/Miles per Day per Vehicle
Light Hydro Unit No. 1 Modification (2/22/01 - 10/24/01)		
Tractor	1	2
Crane	1	4
Cherry Picker	1	3
Welding Machine	3	7
Backhoe	1	8
Forklift	1	6
Air Compressor	2	6
Generator	2	4
Light Plant	2	10
Off-site construction commuter	35	50
On-site construction commuter	2	10
Off-site delivery vehicle	10	10
On-site delivery vehicle	5	20
Off-site bus, worker transportation	1	60
On-site bus, worker transportation	1	15
Off-site pickup truck	2	40
On-site pickup truck	2	40
On-site flat bed truck	1	15
ISO SIV Conversion to Light Hydro Unit No. 2 (7/2/01 - 4/29/02)		
Tractor	1	3
Crane	1	6
Cherry Picker	3	6
Welding Machine	10	7
Backhoe	1	8
Forklift	1	6
Air Compressor	4	6
Light Plant	3	10
Concrete Pump	1	4

Table 4.1-2 (Cont.)
Construction Schedule, Equipment Requirements and Motor Vehicle Trips

Equipment/Vehicle Type	Number	Hours per Day Operation/Miles per Day per Vehicle
ISO SIV Conversion to Light Hydro Unit No. 2 (7/2/01 - 4/29/02) - (Cont.)		
Off-site construction commuter	90	50
On-site construction commuter	4	10
Off-site delivery vehicle	20	10
On-site delivery vehicle	10	20
Off-site bus, worker transportation	2	60
On-site bus, worker transportation	2	15
Off-site pickup truck	3	40
On-site pickup truck	3	40
On-site flat bed truck	1	105
No. 3 Reformer Fractionator Modifications (4/9/01 - 10/5/01)		
Tractor	1	3
Crane	1	6
Cherry Picker	1	3
Welding Machine	5	7
Backhoe	1	4
Forklift	1	6
Air Compressor	3	6
Generator	2	4
Light Plant	2	10
Off-site construction commuter	10	50
On-site construction commuter	1	10
Off-site delivery vehicle	5	10
On-site delivery vehicle	3	20
On-site flat bed truck	1	30
SFIA Debutanizer Modifications (3/5/01 - 9/6/01)		
Crane	1	6
Cherry Picker	1	3
Welding Machine	2	7
Backhoe	1	4
Forklift	1	4
Air Compressor	1	6
Generator	1	4
Light Plant	2	10
Concrete Pump	1	1
Front End Loader	1	4

Table 4.1-2 (Cont.)
Construction Schedule, Equipment Requirements and Motor Vehicle Trips

Equipment/Vehicle Type	Number	Hours per Day Operation/Miles per Day per Vehicle
SFIA Debutanizer Modifications (3/5/01 - 9/6/01) - (Cont.)		
Off-site construction commuter	30	50
On-site construction commuter	1	10
Off-site delivery vehicle	5	10
On-site delivery vehicle	2	20
On-site bus, worker transportation	1	15
Off-site pickup truck	1	40
On-site pickup truck	1	40
On-site flat bed truck	1	45
New FCCU Rerun Bottoms Splitter Construction (8/8/01 - 6/17/02)		
Tractor	1	3
Crane	1	6
Cherry Picker	4	5
Welding Machine	8	7
Backhoe	2	8
Forklift	1	6
Air Compressor	4	6
Generator	2	4
Light Plant	5	10
Concrete Pump	1	6
Front End Loader	1	8
Vibratory Roller	1	8
Off-site construction commuter	60	50
On-site construction commuter	3	10
Off-site delivery vehicle	15	10
On-site delivery vehicle	8	20
Off-site bus, worker transportation	2	60
On-site bus, worker transportation	2	15
Off-site pickup truck	3	40
On-site pickup truck	3	40
On-site flat bed truck	2	105

Table 4.1-2 (Cont.)
Construction Schedule, Equipment Requirements and Motor Vehicle Trips

Equipment/Vehicle Type	Number	Hours per Day Operation/Miles per Day per Vehicle
North Hydrogen Plant Modifications (1/2/02 - 5/6/02)		
Tractor	1	1
Crane	1	2
Cherry Picker	1	4
Welding Machine	4	7
Backhoe	1	8
Forklift	1	4
Air Compressor	3	6
Generator	2	6
Light Plant	2	10
Concrete Pump	1	4
Off-site construction commuter	20	50
On-site construction commuter	1	10
Off-site delivery vehicle	4	10
On-site delivery vehicle	2	20
Off-site bus, worker transportation	1	50
On-site bus, worker transportation	1	15
Off-site pickup truck	1	50
On-site pickup truck	1	40
On-site flat bed truck	1	15
MTBE Unit Conversion to Iso Octene Unit (1/1/02 - 9/2/02)		
Tractor	1	2
Crane	1	8
Cherry Picker	1	8
Welding Machine	3	7
Backhoe	1	8
Forklift	1	4
Air Compressor	2	6
Generator	2	6
Light Plant	2	10
Concrete Pump	1	4
Front End Loader	1	4
Vibratory Roller	1	4

Table 4.1-2 (Cont.)
Construction Schedule, Equipment Requirements and Motor Vehicle Trips

Equipment/Vehicle Type	Number	Hours per Day Operation/Miles per Day per Vehicle
MTBE Unit Conversion to Iso Octene Unit (1/1/02 - 9/2/02) - (Cont.)		
Off-site construction commuter	30	50
On-site construction commuter	2	10
Off-site delivery vehicle	10	10
On-site delivery vehicle	5	20
Off-site bus, worker transportation	1	50
On-site bus, worker transportation	1	15
Off-site pickup truck	2	50
On-site pickup truck	2	40
On-site flat bed truck	1	60
Cat Poly Unit Modification to Dimerization Unit (2/25/02 - 10/28/02)		
Tractor	1	3
Crane	2	8
Cherry Picker	2	8
Welding Machine	6	7
Backhoe	2	8
Forklift	1	4
Air Compressor	3	6
Generator	1	6
Light Plant	2	10
Concrete Pump	1	4
Front End Loader	2	4
Vibratory Roller	2	4
Off-site construction commuter	40	50
On-site construction commuter	3	10
Off-site delivery vehicle	12	10
On-site delivery vehicle	6	20
Off-site bus, worker transportation	2	50
On-site bus, worker transportation	2	15
Off-site pickup truck	3	50
On-site pickup truck	3	40
On-site flat bed truck	3	90

Table 4.1-2 (Cont.)
Construction Schedule, Equipment Requirements and Motor Vehicle Trips

Equipment/Vehicle Type	Number	Hours per Day Operation/Miles per Day per Vehicle
Mid-Barrel Unit Modification to Gasoline Hydrotreator (1/1/02 - 8/2/02)		
Tractor	1	2
Crane	1	5
Cherry Picker	1	8
Welding Machine	3	7
Backhoe	1	8
Forklift	1	4
Air Compressor	2	6
Generator	2	6
Light Plant	2	10
Concrete Pump	1	4
Front End Loader	1	4
Vibratory Roller	1	4
Off-site construction commuter	30	50
On-site construction commuter	2	10
Off-site delivery vehicle	10	10
On-site delivery vehicle	5	20
Off-site bus, worker transportation	1	50
On-site bus, worker transportation	1	15
Off-site pickup truck	2	50
On-site pickup truck	2	40
On-site flat bed truck	1	60
Tank Farm Piping Modifications (3/5/01 - 8/3/01)		
Tractor	1	1
Crane	1	2
Cherry Picker	1	3
Welding Machine	3	7
Backhoe	1	2
Forklift	1	2
Air Compressor	2	6
Off-site construction commuter	15	50
On-site construction commuter	1	10

Table 4.1-2 (Cont.)
Construction Schedule, Equipment Requirements and Motor Vehicle Trips

Equipment/Vehicle Type	Number	Hours per Day Operation/Miles per Day per Vehicle
Tank Farm Piping Modifications (3/5/01 - 8/3/01) - (Cont.)		
Off-site delivery vehicle	6	10
On-site delivery vehicle	2	20
Off-site bus, worker transportation	1	60
On-site bus, worker transportation	1	15
Off-site pickup truck	1	40
On-site pickup truck	1	40
On-site flat bed truck	1	15
Pentane Railcar Loading Facility Modifications for Off-Loading (7/2/01 - 1/31/02)		
Tractor	1	1
Crane	1	2
Cherry Picker	1	4
Welding Machine	4	7
Backhoe	1	2
Forklift	1	2
Air Compressor	3	6
Generator	2	6
Light Plant	2	10
Concrete Pump	1	2
Off-site construction commuter	50	50
On-site construction commuter	3	10
Off-site delivery vehicle	15	10
On-site delivery vehicle	8	20
Off-site bus, worker transportation	2	50
On-site bus, worker transportation	2	15
Off-site pickup truck	3	50
On-site pickup truck	3	40
On-site flat bed truck	1	15
Modifications for Pentane Transfer by Pipeline (8/6/01 - 1/3/02)		
Tractor	1	1
Crane	1	2
Cherry Picker	1	3
Welding Machine	5	7
Backhoe	1	6
Forklift	1	2
Air Compressor	2	6

Table 4.1-2 (Cont.)
Construction Schedule, Equipment Requirements and Motor Vehicle Trips

Equipment/Vehicle Type	Number	Hours per Day Operation/Miles per Day per Vehicle
Modifications for Pentane Transfer by Pipeline (8/6/01 - 1/3/02) - (Cont.)		
Off-site construction commuter	20	50
On-site construction commuter	2	10
Off-site delivery vehicle	8	10
On-site delivery vehicle	4	20
Off-site bus, worker transportation	1	60
On-site bus, worker transportation	1	15
Off-site pickup truck	1	50
On-site pickup truck	1	40
On-site flat bed truck	1	45
Polypropylene Loading Facility Modifications for Butane Loading and Off-Loading (8/6/01 - 2/6/02)		
Tractor	1	8
Crane	1	2
Cherry Picker	1	3
Welding Machine	2	7
Backhoe	3	8
Forklift	1	2
Air Compressor	2	6
Concrete Pump	1	6
Front End Loader	1	8
Vibratory Roller	3	8
Off-site construction commuter	50	50
On-site construction commuter	2	10
Off-site delivery vehicle	12	10
On-site delivery vehicle	6	20
Off-site bus, worker transportation	2	60
On-site bus, worker transportation	2	15
Off-site pickup truck	2	40
On-site pickup truck	2	40
On-site flat bed truck	3	90
Marine Terminal 2 Modifications for Ethanol Off-Loading (9/3/01 - 11/5/01)		
Tractor	1	1
Crane	1	2
Cherry Picker	1	4
Welding Machine	2	7
Backhoe	1	4

Table 4.1-2 (Cont.)
Construction Schedule, Equipment Requirements and Motor Vehicle Trips

Equipment/Vehicle Type	Number	Hours per Day Operation/Miles per Day per Vehicle
Marine Terminal 2 Modifications for Ethanol Off-Loading (9/3/01 - 11/5/01) - (Cont.)		
Forklift	1	2
Air Compressor	1	6
Generator	1	8
Concrete Pump	1	2
Off-site construction commuter	5	50
On-site construction commuter	1	10
Off-site delivery vehicle	2	10
On-site delivery vehicle	1	20
Off-site pickup truck	1	50
On-site pickup truck	1	10
On-site flat bed truck	1	15
Refrigerated Pentane Storage Tank Construction at Marine Terminal 2 (8/6/01 - 8/6/02)		
Tractor	1	2
Crane	1	8
Cherry Picker	1	4
Welding Machine	3	7
Backhoe	1	8
Forklift	1	4
Air Compressor	2	6
Generator	2	8
Light Plant	1	8
Concrete Pump	1	4
Front End Loader	1	4
Vibratory Roller	1	4
Off-site construction commuter	40	50
On-site construction commuter	2	10
Off-site delivery vehicle	8	10
On-site delivery vehicle	6	20
Off-site bus, worker transportation	1	50
Off-site pickup truck	2	50
On-site pickup truck	2	10
On-site flat bed truck	1	60

Table 4.1-2 (Cont.)
Construction Schedule, Equipment Requirements and Motor Vehicle Trips

Equipment/Vehicle Type	Number	Hours per Day Operation/Miles per Day per Vehicle
East Hynes Terminal Modifications for Ethanol Storage, Loading and Blending (8/1/01 - 12/31/01)		
Tractor	1	1
Crane	1	2
Cherry Picker	1	4
Welding Machine	2	7
Backhoe	1	4
Forklift	1	2
Air Compressor	1	6
Generator	1	8
Concrete Pump	1	2
Off-site construction commuter	5	50
On-site construction commuter	1	10
Off-site delivery vehicle	2	10
On-site delivery vehicle	1	20
Off-site pickup truck	1	50
On-site pickup truck	1	10
On-site flat bed truck	1	15
Vinvale Terminal Modifications for Ethanol Storage, Off-Loading and Blending (8/1/01 - 9/28/01)		
Tractor	1	1
Crane	1	2
Cherry Picker	1	4
Welding Machine	3	7
Backhoe	1	4
Forklift	1	2
Air Compressor	2	6
Generator	1	8
Light Plant	1	8
Concrete Pump	1	2
Off-site construction commuter	10	50
On-site construction commuter	1	10
Off-site delivery vehicle	2	10
On-site delivery vehicle	1	20
Off-site pickup truck	1	50
On-site pickup truck	1	10
On-site flat bed truck	1	15

Table 4.1-2 (Cont.)
Construction Schedule, Equipment Requirements and Motor Vehicle Trips

Equipment/Vehicle Type	Number	Hours per Day Operation/Miles per Day per Vehicle
Hathaway Terminal Modifications for Ethanol Storage, Loading and Blending (11/1/01 - 1/1/02)		
Tractor	1	1
Crane	1	2
Cherry Picker	1	4
Welding Machine	3	7
Backhoe	1	4
Forklift	1	2
Air Compressor	2	6
Generator	1	8
Light Plant	1	8
Concrete Pump	1	2
Off-site construction commuter	10	50
On-site construction commuter	1	10
Off-site delivery vehicle	2	10
On-site delivery vehicle	1	20
Off-site pickup truck	1	50
On-site pickup truck	1	10
On-site flat bed truck	1	15
Carson Terminal Modifications for Ethanol Storage, Off-Loading and Blending (6/12/01 - 8/8/01)		
Tractor	1	1
Crane	1	2
Cherry Picker	1	4
Welding Machine	2	7
Backhoe	1	4
Forklift	1	2
Air Compressor	1	6
Light Plant	1	8
Concrete Pump	1	2
Off-site construction commuter	5	50
On-site construction commuter	1	10
Off-site delivery vehicle	2	10
On-site delivery vehicle	1	20
Off-site pickup truck	1	50
On-site pickup truck	1	10
On-site flat bed truck	1	15

Table 4.1-2 (Cont.)
Construction Schedule, Equipment Requirements and Motor Vehicle Trips

Equipment/Vehicle Type	Number	Hours per Day Operation/Miles per Day per Vehicle
Colton Terminal Modifications for Ethanol Storage, Off-Loading and Blending (11/1/01 - 12/31/01)		
Tractor	1	1
Crane	1	2
Cherry Picker	1	4
Welding Machine	2	7
Backhoe	1	4
Forklift	1	2
Air Compressor	1	6
Generator	1	8
Concrete Pump	1	2
Off-site construction commuter	5	50
On-site construction commuter	1	10
Off-site delivery vehicle	2	10
On-site delivery vehicle	1	20
Off-site pickup truck	1	50
On-site pickup truck	1	10
On-site flat bed truck	1	15

The information in Table 4.1-2 was used to calculate on-site emissions from construction equipment exhaust and from fugitive dust PM_{10} emissions from grading.

The construction of a retention pond for butane and pentane at the polypropylene rail car loading racks is the only location where major excavation will take place. Minor excavation will occur during construction at other process units to install new foundations.

On-site fugitive dust PM_{10} emission estimates were based on the following estimates of peak daily dust-generating operations:

- Maximum of 1,000 cubic yards of soil excavated per day for the polypropylene railcar facility modifications, based on the total volume to be excavated, a typical excavation rate of 125 cubic yards per hour, and an anticipated eight hour per day excavation duration

- Maximum of 250 cubic yards of soil excavated per day for the remainder of construction, based on a typical excavation rate of 125 cubic yards per hour and an anticipated two hour per day excavation duration

- Maximum storage pile surface area of 0.07 acres for the polypropylene railcar facility modifications, conservatively set equal to the retention pond surface area

- Maximum storage pile surface area of 0.03 acres, conservatively set equal to anticipated area to be excavated at any one time (one-seventh of total of 9,000 square feet)

- Maximum daily on-site vehicle travel as listed in Table 4.1-2.

All estimates of fugitive dust emissions assume that construction activities will comply with SCAQMD Rule 403 - Fugitive Dust, by watering active sites two times per day, which reduces fugitive dust emissions approximately 50 percent.

In addition to the combustion emissions associated with the operation of paving equipment used to apply asphalt materials, VOC emissions are generated from the evaporation of hydrocarbons contained in the asphalt materials. The total area anticipated to be paved during construction at LAR is 0.172 acres (7,500 ft^2). About 0.069 acres (3,000 ft^2) will be paved during construction of the retention pond at the butane/pentanes loading/unloading area, and 0.062 acres (2,700 ft^2) will be paved during construction of the new FCCU Rerun Bottom Splitter. The remaining area to be paved (0.041 acres, 1,800 ft^2) will be located at various process units. It was conservatively assumed that all of the paving would occur during one day.

Architectural coating generates VOC emissions from the evaporation of solvents contained in the surface coatings applied to buildings. A VOC content of 2.40 pounds per gallon was used, based on specifications for Sherwin-Williams Hi-Solids Polyurethane (http://www.sherwinwilliams.com/Builders/industrial/sysguide/), which is the coating that is anticipated to be used during construction. Only touch-up painting will be done on-site, because equipment will be factory-painted. The maximum daily use is anticipated to be 10 gallons.

Panels for the new pentane storage tank at Marine Terminal 2 will also be painted off-site. The seams will be painted on-site, and some touch-up painting will also take place. Since the tank will be insulated, it will be coated with primer only. The primer that will be used will be Carboline Carbozinc 7 WB or equivalent, which is a waterborne potassium silicate inorganic zinc primer, which contains no organic solvents. Therefore, no VOC emissions will be generated by the surface coating at Marine Terminal 2.

The maximum number and length of daily motor vehicle trips anticipated during each construction activity that is listed in Table 4.1-2 were used with the information about those trips in Table 4.1-3 to calculate peak daily emissions from both on- and off-site motor vehicles.

Table 4.1-3
Motor Vehicle Classes and Speeds During Construction

Vehicle Type	Vehicle Class	Speed (mph)
Off-site construction commuter	Light duty truck, cat	35
On-site construction commuter	Light duty truck, cat	15
Off-site delivery vehicle	Heavy heavy-duty truck, diesel	25
On-site delivery vehicle	Heavy heavy-duty truck, diesel	15
Off-site bus, worker transportation	Urban bus	15
On-site bus, worker transportation	Medium heavy-duty truck, diesel	15
Off-site pickup truck	Medium duty truck, cat	35
On-site pickup truck	Medium duty truck, cat	15
On-site flat bed truck	Medium heavy-duty truck, diesel	15

Table 4.1-4 lists the estimated peak daily criteria pollutant emissions during construction for each process unit at LAR and for the construction at each terminal.

Table 4.1-4
Peak Daily Construction Emissions by Process Unit/Activity/Terminal

Process/Activity/Terminal	CO (lb/day)	VOC (lb/day)	NO_X (lb/day)	SO_X (lb/day)	Exhaust PM_{10} (lb/day)	Fugitive PM_{10} (lb/day)	Total PM_{10} (lb/day)
Light Hydro Unit #1 Modifications	58.0	9.5	54.1	3.7	2.7	14.5	17.3
ISO-SIV Conversion to Light Hydro Unit #2	132.4	20.7	107.4	7.2	5.2	32.9	38.1
#3 Reformer Fractionator Modifications	37.3	7.0	53.8	4.6	3.0	7.0	10.1
Debutanizer Modifications in Gasoline Fractionation Area	46.1	7.6	40.4	3.0	2.3	8.7	11.0
New FCCU Rerun Bottoms Splitter	123.7	20.8	127.7	9.1	6.6	32.4	39.0
North Hydrogen Plant Modifications	46.8	7.9	53.5	4.2	2.9	7.8	10.6
MTBE Unit Conversion to Iso-Octene	67.7	11.9	75.0	5.5	4.1	16.2	20.3
Cat-Poly Unit Conversion to Dimerization Unit	105.4	19.3	125.8	9.1	6.7	30.5	37.2
Mid-Barrel Unit Conversion to Gasoline Hydrotreater	65.5	11.1	69.2	5.0	3.7	16.2	19.9
Tank Farm Piping Modifications	28.1	4.9	28.6	2.0	1.4	8.1	9.5
New Pentane Off-Loading Racks at Pentane Rail Car Loading Facility	73.8	11.3	53.2	3.4	2.6	22.8	25.5
New Pentane Transfer Pumps at Pentane Spheres	39.8	6.6	39.6	2.7	1.9	12.9	14.8
Butane Loading Facilities at Polypropylene Loading Facility	102.9	17.3	108.8	7.3	5.1	48.7	53.8

Table 4.1-4 (Cont.)
Peak Daily Construction Emissions by Process Unit/Activity/Terminal

Process/Activity/Terminal	CO (lb/day)	VOC (lb/day)	NO_X (lb/day)	SO_X (lb/day)	Exhaust PM_{10} (lb/day)	Fugitive PM_{10} (lb/day)	Total PM_{10} (lb/day)
Marine Terminal 2 Modifications for Ethanol Off-Loading	20.8	3.7	27.8	2.2	1.5	3.0	4.5
Marine Terminal 2 Modifications for Pentanes Shipping	72.8	12.3	72.4	5.3	3.9	16.0	19.9
East Hynes Terminal Modifications	20.8	3.7	27.8	2.2	1.5	3.0	4.5
Vinvale Terminal Modifications	27.6	4.7	33.3	2.8	1.9	3.2	5.0
Hathaway Terminal Modifications	27.6	4.7	33.3	2.8	1.9	3.2	5.0
Carson Terminal Modifications	20.8	3.7	27.8	2.2	1.5	3.0	4.5
Colton Terminal Modifications	20.8	3.7	27.8	2.2	1.5	3.0	4.5
General Grading	0.0	0.0	0.0	0.0	0.0	2.2	2.2
General Surface Coating	0.0	24.0	0.0	0.0	0.0	0.0	0.0
General Asphaltic Paving	0.0	0.1	0.0	0.0	0.0	0.0	0.0

Because the emission generating activities listed in Table 4.1-4 are not anticipated to all take place at the same time, the overall peak daily construction emissions will not be equal to the sum of the peak daily emissions from all of the construction activities. Therefore, the anticipated overlap of activities was evaluated to determine overall peak daily emissions. First, it was conservatively assumed that the peak daily emissions from each overlapping activity would occur at the same time. Next, the activities that are anticipated to occur simultaneously were identified for each week of the entire construction period (refer to Tables 8-A through 8-G in Appendix B). The peak daily emissions from the construction activities taking place each week were then added together to estimate the total peak daily emissions during each week. Finally, the week with the highest peak daily emissions was identified.

The resulting peak daily emissions are anticipated to occur during a period that includes:

- Modifications to Light Hydro Unit No. 1
- Conversion of the ISO SIV unit to Light Hydro Unit #2
- Modifications to the No. 3 Reformer Fractionator
- Conversion of the No. 1 Naphtha Splitter to a new debutanizer and conversion of the Super Fractionation Integrated Area (SFIA) Depentanizer to a naptha splitter
- Construction of a new FCCU Rerun Bottoms Splitter

- Construction of facilities and equipment for pentane off-loading at the Railcar Pentane Loading facility
- Modifications to transport pentanes by pipeline
- Construction of facilities for butane loading and off-loading at the railcar polypropylene loading facility
- Modifications at Marine Terminal 2 for marine tanker ethanol offloading and storage
- Modifications at Marine Terminal 2 for pentanes storage and marine tanker loading
- General grading
- General surface coating
- General asphaltic paving

The estimated emissions during this period are summarized in Table 4.1-5 along with the CEQA significance level for each pollutant. As shown in the table, significance thresholds are exceeded for all pollutants except SO_X during construction. However, these emissions represent a "worst-case," because they incorporate the assumption that construction activities at each location occur at the peak daily levels throughout the construction period. It is unlikely that the peak daily levels would actually occur at all locations where construction is taking place at the same time.

Table 4.1-5
Overall Peak Daily Construction Emissions Summary (Pre-mitigation)

Source	**CO (lb/day)**	**VOC (lb/day)**	**NO_X (lb/day)**	**SO_X (lb/day)**	**Exhaust PM_{10} (lb/day)**	**Fugitive PM_{10} (lb/day)**	**Total PM_{10} (lb/day)**
Construction Equipment Exhaust	321.9	66.5	608.4	53.7	34.4	0.0	34.4
On-Site Motor Vehicles	98.2	13.3	48.8	0.0	2.3	132.2	134.5
On-Site Fugitive PM10	N/A	N/A	N/A	N/A	N/A	20.0	20.0
Asphaltic Paving	N/A	0.5	N/A	N/A	N/A		
Architectural Coating	N/A	24.0	N/A	N/A	N/A		
Total On-Site	**420.1**	**104.2**	**657.2**	**53.7**	**36.7**	**152.2**	**188.9**
Off-Site Motor Vehicles	**335.8**	**45.2**	**89.0**	**0.0**	**1.6**	**55.1**	**56.7**
TOTAL	**755.9**	**149.4**	**746.2**	**53.7**	**38.3**	**207.3**	**245.6**

Table 4.1-5 (Cont.)
Overall Peak Daily Construction Emissions Summary (Pre-mitigation)

Source	CO (lb/day)	VOC (lb/day)	NO_X (lb/day)	SO_X (lb/day)	Exhaust PM_{10} (lb/day)	Fugitive PM_{10} (lb/day)	Total PM_{10} (lb/day)
CEQA Significance Level	*550*	*75*	*100*	*150*			*150*
Significant? (Yes/No)	**Yes**	**Yes**	**Yes**	No			**Yes**

N/A = pollutant not emitted by this source
Note: Sums of individual values may not equal totals because of rounding

4.1.2 Operational Emissions

This section addresses the air quality impacts due to operation of the new and modified equipment associated with the proposed project. Impacts from indirect sources during operation, such as employee traffic, are discussed in Section 4.1.3.

4.1.2.1 Project Emission Sources

The sources of potential emissions resulting from new equipment and modifications to existing units proposed for the project are discussed below.

Los Angeles Refinery

At the LAR, the following equipment changes result in sources of emissions from fugitive components:

- Modifications to the LHU that include new heat exchangers, piping, pumps, and control systems.
- Conversion of ISO-SIV unit to a hydrotreater that includes new reactors, exchangers, pumps, and control systems.
- Modification of No. 3 Reformer Fractionator and overhead condenser, piping, and control systems including new pumps.
- Conversion of the No. 1 Naphtha Splitter to a new debutanizer and conversion of the Super Fractionation Integrated Area (SFIA) Depentanizer to a naptha splitter including changes to heat exchangers, pumps, and control systems
- New FCCU rerun bottoms splitter including a tower and heat exchanger.

- Alternate feedstock to north hydrogen plant including a new feed drum, pump, and vaporizer.
- Conversion of existing MTBE unit to iso-octene unit including new heat exchangers.
- Modification of existing catpoly unit to a dimerization unit hydrotreater reactor system including new pumps, heat exchangers, vessels, piping, and control systems.
- Modification of mid-barrel unit to gasoline hydrotreater including changes to the feed and product piping, hydrogen supply system, heat exchanger, and control systems.
- Piping modification and substation upgrades to ship pentane to Marine Terminal 2 by pipeline including a new pentane pump.
- New equipment for pentane and butane off-loading at the existing propylene railcar loading facility at Northeast Property.

In addition to these new and modified units, existing tanks at LAR will be converted to a revised service. For purposes of estimating emissions, it was assumed that service would change for tanks 14, 31, 32, 36, 37, 41, 42, 45, 50, 51, 52, 53, 54, 55, 64, 65, 69, and 71, and that ten of these tanks will primarily be converted from MTBE and additive service to other additives. The other eight of the tanks are assumed to change from the current finished product to the proposed product to be shipped to the terminals for final blending with ethanol. This change in service is anticipated to reduce actual VOC emissions from most of the tanks, because most of the new materials that will be stored in the tanks have a lower vapor pressure than the materials that are currently in the tanks. The change in emissions from the storage tanks has been estimated in order to evaluate potential impacts on the physical environment. However, the storage tanks are permitted for materials with higher vapor pressures. Therefore, since the reductions resulting from changes in service do not also include permit modifications limiting emissions to the lower levels, they will not be included in the evaluation of the significance of the project emissions.

The sulfur content of the finished product will also be reduced from its current level. The removal of additional sulfur from gasoline will increase the sulfur recovered by the sulfur plant, which will lead to an increase in SO_X emissions.

The new hydrotreating unit will require additional hydrogen consumption. However, this hydrogen will be imported instead of being produced at LAR. Therefore, fuel use at LAR for hydrogen production will not increase, so the project will not generate additional NO_X emissions.

Marine Terminal 2

At Marine Terminal 2, tanks 233 and 225 will be removed, and a new refrigerated tank of 100,000 barrel (bbl, 42 gallons each) capacity will be installed to store pentane, which will subsequently be loaded into marine tankers for shipment. In addition, two existing tanks will be converted to ethanol service. For purposes of estimating emissions, it was assumed that tanks 220 and 223 will be converted.

The new pentane storage tank, as well as tank and piping modifications to the converted ethanol tanks will result in fugitive emissions from various components. Additionally, emissions will occur during marine tanker pentane loading. The emissions from the demolished tanks will be eliminated when they are removed.

The change in service of the converted ethanol tanks is also anticipated to lead to a reduction in emissions because of differences in the vapor pressures between ethanol and the materials currently stored. This potential reduction has been estimated, but, as in the case of LAR, is not included in the evaluation of the project's significance.

Hathaway Terminal

Ethanol will be brought to the Hathaway Terminal by tanker trucks or pipelines as feasible.

At the Hathaway Terminal, existing storage tanks will be converted to ethanol service, and existing blending skids will be modified to load ethanol into tanker trucks for shipment to other terminals. For purposes of estimating emissions, it was assumed that tanks 103, 106, 109, 30021, 30022, 30023, 30029 will be converted. The equipment modifications will add valves and flanges, which are sources of fugitive emissions. Additionally, emissions will occur during tanker truck ethanol loading.

The change in service of tanks to ethanol is also anticipated to lead to a reduction in emissions because of differences in the vapor pressures between ethanol and the materials currently stored. This potential reduction has been estimated, but as in the case of LAR, is not included in the evaluation of the project's significance.

East Hynes Terminal

At the East Hynes Terminal, one tank will be converted to ethanol service. For purposes of estimating emissions, it was assumed that tank 798 will be converted. The associated tank and piping modifications are sources of fugitive emissions from these components.

Ethanol will be brought to the East Hynes Terminal by pipelines or by tanker trucks from the Hathaway Terminal, as feasible. Two new blending skids with motor operated valves will be installed for ethanol service. These new blending skids would be expected to generate fugitive emissions.

The change in service of a tank to ethanol is also anticipated to lead to a reduction in emissions because of differences in the vapor pressures between ethanol and the materials currently stored. This potential reduction has been estimated, but as in the case of LAR, is not included in the evaluation of the project's significance.

Vinvale Terminal

At the Vinvale Terminal, two tanks will be converted to ethanol service. For purposes of estimating emissions, it was assumed that tanks 940 and 941 will be converted. The associated tank and piping modifications are sources of fugitive emissions.

Ethanol will be brought to the Vinvale Terminal by tanker trucks from the Hathaway or East Hynes Terminals, or via pipelines, as feasible. Two currently permitted offloading pumps will be used for ethanol, and existing blending skids will be modified to handle ethanol. The new pumps and other components added to the blending skids for ethanol service are sources of project emissions.

The change in service of a tank to ethanol is also anticipated to lead to a reduction in emissions because of differences in the vapor pressures between ethanol and the materials currently stored. This potential reduction has been estimated, but as in the case of LAR, is not included in the evaluation of the project's significance.

Carson Terminal

At the Carson Terminal, one tank will be converted to ethanol service. For purposes of estimating emissions, it was assumed that tank 101 will be converted. The associated tank and piping modifications are sources of fugitive emissions.

Ethanol will be brought to the to the Carson Terminal from the Hathaway or East Hynes Terminals by tanker trucks or pipeline as feasible. Existing blending skids will be modified to handle ethanol. Components added to the blending skids for ethanol service are sources of project emissions.

The change in service of a tank to ethanol is also anticipated to lead to a reduction in emissions because of differences in the vapor pressures between ethanol and the materials currently stored. This potential reduction has been estimated, but as in the case of LAR, is not included in the evaluation of the project's significance.

Colton Terminal

At the Colton Terminal, an existing tank will be converted to ethanol service. For purposes of estimating emissions, it was assumed that tank 15 will be converted. The associated tank and piping modifications are sources of fugitive emissions.

Ethanol will be brought to the Colton Terminal from the Hathaway or East Hynes Terminals by tanker trucks. Existing blending skids will be modified to handle ethanol. Components added to the blending skids for ethanol service are sources of project emissions.

The change in service of tanks to ethanol is also anticipated to lead to a reduction in emissions because of differences in the vapor pressures between ethanol and the materials currently stored in them. This potential reduction has been estimated, but as in the case of LAR, is not included in the evaluation of the project's significance.

4.1.2.2 Direct Operational Emission Calculation

Direct operational criteria and toxic air pollutant emission rates were calculated for all new and modified emission sources associated with the project at LAR and at the terminals. A further description of emissions estimates is provided in Appendix B.

ARCO provided expected fugitive component counts, stream types, and composition of process fluids to be utilized or produced as intermediates or end products as a result of the project. These composition data, as well as SCAQMD fugitive emission factors were used to calculate fugitive VOC and air toxic emissions associated with each of the new and modified units and tanks at LAR and the six terminals. The change in emissions was determined by adding the emissions associated with new components to the existing level of emissions and subtracting out the emissions associated with the components to be removed. ARCO estimated the numbers and types of service for components to be added and removed for each LAR process unit and at the terminals. These estimates included a 40 percent contingency factor for new valves and flanges to account for potential increases during detailed design. Additionally, it was assumed for all but four of the units that 75 percent of the new valves would be bellows valves and that none of the removed vales are bellows valves. The exceptions were modifications to the LHU, at the ISP-SIV unit, the No. 3 Reformer Fractionator and the units in the SFIA, for which more detailed design has been completed.

ARCO has in place a SCAQMD-approved inspection and maintenance program to detect and remedy leaks from process components. This program has reduced overall emissions to levels below those that would be calculated using the SCAQMD fugitive VOC emission factors. Therefore, the use of those emission factors to calculate reductions in fugitive VOC emissions from components removed during equipment modifications likely overestimated the extent of the reductions. However, the inspection and maintenance program is also anticipated to reduce emissions from the components that are added during equipment modifications to levels below those that were calculated using the emission factors. Therefore, any estimated net increase or decrease in fugitive VOC emissions from process components is overestimated.

Emissions from the new pentane tank and the tanks that are anticipated to be demolished at Marine Terminal 2, as well as emission changes resulting from changes in service for the existing tanks were calculated using the EPA program TANKS, version 3.1. The existing emissions were calculated using the physical tank data, meteorological data, existing services and throughput quantities for 1998-1999 provided by ARCO. The projected new emissions were calculated using the same physical tank data and meteorological data, as well as revised services and proposed throughput quantities as provided by ARCO. The change in emissions was calculated by comparing the existing and proposed emissions for each tank. The decrease in emissions for the tanks to be removed are based on the actual values reported in the 1998-1999 report to the SCAQMD.

Emissions from the increased pentane loading of rail cars at LAR and marine tanker pentane loading at Marine Terminal 2 were calculated using emission factors from AP-42 and an estimated 99.5% control efficiency for the thermal oxidizer vapor recovery units (VRUs) at the two locations. Emissions from tanker truck loading with ethanol at the Hathaway terminal were calculated using the SCAQMD Rule 462 emission limit of 0.08 lb/1,000 gallons loaded.

Normally, 50 percent of the pentane is anticipated to be shipped by marine tanker at Marine Terminal 2 and the other 50 percent is anticipated to be shipped by railcar from LAR. However, the capacity of a marine tanker, which would be expected to be loaded completely in a single day, is larger than the combined capacities of the railcars that would be loaded in a single day. Because rail cars could potentially be loaded with pentane the same day that a marine tanker is loaded, the estimated peak daily emissions included emissions from both loading operations.

The ethanol that will be loaded into tanker trucks at the Hathaway terminal contains five percent gasoline as a denaturant. Therefore, emissions of toxic air contaminants from the denaturant during this loading were estimated.

The removal of additional sulfur from gasoline will increase the sulfur recovered by the sulfur plant. ARCO estimated that the additional sulfur to be removed will be 1,000 lb/day, based on expected production rates and feed sulfur content. Based on the operational history of the sulfur plant, the recovery efficiency has consistently exceeded 99.5 percent. Therefore, a value of 99.5 percent was used to estimate increased SO_X emissions.

The direct operational criteria pollutant emissions are summarized in Table 4.1-6.

Anticipated changes in peak daily operational emissions of toxic air contaminants are listed in Table 4.1-7A for each new or modified process unit at LAR and in Table 4.1-7B for each of the terminals. Table 4.1-7A shows that both increases and decreases in toxic air contaminant emissions are anticipated at LAR, depending on the individual species and individual process unit. When components (valves, flanges, pumps, etc) are removed during modification of a process unit, emissions of TACs in the process streams associated with those components will no longer

Table 4.1-6
Peak Daily Project Direct Operational Emissions Summary

Source	CO (lb/day)	VOC (lb/day)	NO_X (lb/day)	SO_X (lb/day)	PM_{10} (lb/day)
Los Angeles Refinery					
Fugitive VOC from process components	0.0	-34.1	0.0	0.0	0.0
Rail car pentane loading	0.0	7.1	0.0	0.0	0.0
Sulfur recovery plant	0.0	0.0	0.0	10.0	0.0
Subtotal	**0.0**	**-27.0**	**0.0**	**10.0**	**0.0**
Marine Terminal 2 pentane storage and shipping					
Fugitive VOC from components	0.0	3.1	0.0	0.0	0.0
Pentane storage tank	0.0	17.6	0.0	0.0	0.0
Demolished tanks	0.0	-0.2	0.0	0.0	0.0
Marine tanker loading	0.0	44.6	0.0	0.0	0.0
Subtotal	**0.0**	**65.1**	**0.0**	**0.0**	**0.0**
Marine Terminal 2 Ethanol Storage					
Fugitive VOC from components	**0.0**	**0.8**	**0.0**	**0.0**	**0.0**
Hathaway Terminal					
Fugitive VOC from components	0.0	0.8	0.0	0.0	0.0
Tanker truck loading	0.0	31.0	0.0	0.0	0.0
Subtotal	**0.0**	**31.8**	**0.0**	**0.0**	**0.0**
East Hynes Terminal					
Fugitive VOC from components	**0.0**	**5.0**	**0.0**	**0.0**	**0.0**
Vinvale Terminal					
Fugitive VOC from components	**0.0**	**2.2**	**0.0**	**0.0**	**0.0**
Carson Terminal					
Fugitive VOC from components	**0.0**	**0.9**	**0.0**	**0.0**	**0.0**
Colton Terminal					
Fugitive VOC from components	**0.0**	**0.9**	**0.0**	**0.0**	**0.0**
Total Direct Emissions	**0.0**	**79.6**	**0.0**	**10.0**	**0.0**
Note: Sums of individual values may not equal totals because of rounding.					

Table 4.1-7A
Peak Daily Project Direct Operational Toxic Air Pollutant Emissions Summary, LAR

Species	Emissions (lbs/year)												
	LHU #1	LHU #2	No. 3 Refor-mer Fract-ionator	SFIA De-butanizer	New FCCU Reruns Bottom Splitter	North Hydro-gen Plant	Conver-sion of MTBE Unit to ISO-Octene Unit	Modifi-cation of Cat Poly Unit to Dimeri-zation Unit	Modifi-cation of Mid-Barrel Unit to Gasoline Hydro-treater	Tank Farm Piping Modifi-cations	Pentane Tranfser to Marine Terminal 2	Butane Loading/ Unloading Facilities	LAR Total
Toxic Air Contaminants for Which Health risk Factors Exist													
Benzene[a]	17.8	-1,370.00	-184.8	158.9	70.6	0.0	0.0	-62.3	6.9	17.6	0.0	0.0	**-1,345.2**
1,3-Butadiene[a]	0.0	0.0	0.0	0.0	0.0	0.0	-5.6	0.0	0.0	0.0	0.0	0.0	**-5.6**
Cresol (Mixed)[a]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	**0.4**
Hydrogen Cyanide	0.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.6**
Hydrogen Sulfide[a]	0.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.6**
Methyl Alcohol[a]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Naphthalene	0.1	5.0	0.0	0.0	23.4	0.0	-18.4	265.4	0.0	0.0	0.0	0.0	**275.6**
Phenol[a]	0.0	-0.9	-0.1	0.1	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	**-0.6**
Propylene	1.7	-360.6	0.0	9.6	0.6	0.0	-494.4	-0.6	0.0	0.0	0.0	94.4	**-749.1**
Toluene[a]	19.0	186.5	-1.5	-14.2	296.5	0.0	0.0	-259.4	6.9	0.0	0.0	0.0	**233.7**
Xylenes (Mixed)[a]	63.9	536.8	0.0	-15.3	455.0	0.0	0.0	-361.0	25.9	0.0	0.0	0.0	**705.3**
Other Toxic Air Contaminants													
2,2,4-Trimethyl Pentane	0.0	0.9	0.0	0.0	3.0	0.0	0.0	-2.6	0.0	915.7	0.0	0.0	**917.0**
Cumene	0.0	1.0	0.0	0.0	3.4	0.0	0.0	-2.6	0.0	0.0	0.0	0.0	**1.9**
Ethyl Benzene	0.8	26.1	0.0	-61.2	85.5	0.0	0.0	-69.6	0.0	0.0	0.0	0.0	**-18.5**
Hexane	36.8	-4,234.3	-475.5	443.0	54.4	0.0	0.0	-48.0	13.8	0.0	0.0	0.0	**-4,209.7**

[a] SCAQMD Rule 1401 Carcinogenic Air contaminant

Table 4.1-7B
Peak Daily Project Direct Operational Toxic Air Pollutant Emissions Summary, Terminals

Species	Emissions (lbs/year)					
	Marine Terminal 2	**Hathaway Terminal**	**East Hynes Terminal**	**Vinvale Terminal**	**Carson Terminal**	**Colton Terminal**
Toxic Air Contaminants for Which Health Risk Factors Exist						
Benzene[a]	-3.4	-29.6	-20.7	-12.6	-3.8	-2.4
1,3-Butadiene[a]	0.0	0.0	0.0	0.0	0.0	0.0
Cresol (Mixed)[a]	0.0	0.0	0.0	0.0	0.0	0.0
Hydrogen Cyanide	0.0	0.0	0.0	0.0	0.0	0.0
Hydrogen Sulfide[a]	0.0	0.0	0.0	0.0	0.0	0.0
Methyl Alcohol[a]	0.0	0.0	0.0	0.0	0.0	0.0
Naphthalene	-25.4	-0.1	-5.4	-0.1	0.0	0.0
Phenol[a]	0.0	0.0	0.0	0.0	0.0	0.0
Propylene	0.0	0.0	0.0	0.0	0.0	0.0
Toluene[a]	-17.8	-80.5	-62.7	-44.1	-10.3	-6.3
Xylenes (Mixed)[a]	-30.1	-25.2	-20.5	-14.6	-3.4	-2.1
Other Toxic air Contaminants						
2,2,4-Trimethyl Pentane	-13.5	-313.4	-19.6	-76.7	-1.4	-0.4
Cumene	0.0	-0.1	-0.1	-0.1	0.0	0.0
Ethyl Benzene	-6.8	-5.8	-4.6	-3.2	-0.8	-0.5
Hexane	-5.8	-121.0	-63.0	-27.4	-13.5	-8.5
[a] SCAQMD Rule 1401 Carcinogenic Air contaminant						

occur. When components are added to a modified unit, emissions of TACs in the process streams associated with those new components will be introduced. These decreased and increased in TAC emissions caused by the removal and addition of components can result in either a net increase or a net decrease in emissions of individual TACs, depending on the number of components added and removed and the TACs in the streams associated with those components. Table 12 in Attachment B-2 to Appendix B lists the changes in TAC emissions associated with each refinery stream processed by each process unit. Overall, net decreases in emissions of benzene, 1,3-butadiene, phenol, propylene and ethyl benzene are anticipated. Emissions of cresols, hydrogen cyanide, hydrogen sulfide, toluene, xylenes, 2,2,4-trimethyl pentane and cumene are anticipated to increase. Potential effects on human health of these changes in emissions were estimated as described below in Section 4.1.4.2.

Note that, although the units that are being modified do not process propylene as a feed material, some of the streams that are processed by some of the units contain some propylene. In particular, the ISO-SIV unit currently processes a stream that contains about five percent propylene. This stream will no longer be processed when the ISO-SIV unit is converted to LHU #2, so the propylene emissions will from this stream will be eliminated. Similarly, the MTBE unit currently processes a stream that contains about 18 percent propylene. This stream will continue to be processed when the MTBE unit is converted to an iso-octene unit, but non-bellows seal valves, which generate fugitive emissions, will be replaced with leakless bellows seals valves that do not generate fugitive emissions, and four pumps, which also generate fugitive emissions, will be removed. These modifications will also lead to a decrease in propylene emissions.

Table 4.1-7B also shows that no increases in emissions of any toxic air contaminant are anticipated at any of the terminals.

Table 4.1-8 summarizes VOC emission changes that might occur from changes in storage tank service. The decreases shown are caused primarily by the lower vapor pressures of the new tank service. However, as mentioned previously, the storage tanks are permitted to store materials with higher vapor pressures, so the reductions in the table are not included in the project's anticipated operational emissions.

Table 4.1-8
Anticipated Changes in VOC Emissions from Changes in Storage Tank Service

Source	VOC Emissions Change (lbs/day)
Los Angeles Refinery	-174
Marine Terminal 2	-4
Hathaway Terminal	-73
East Hynes Terminal	-12
Vinvale Terminal	-8
Carson Terminal	-2
Colton Terminal	-1
Total	**-274**

4.1.3 Indirect/Mobile Source Operation Emissions

In addition to the process-related changes that will result from the modifications to LAR and the terminals, emissions from offsite indirect sources will increase. These offsite indirect sources include commuting trips by additional workers at LAR and tanker truck transport of ethanol to the terminals. Emission estimates were based on the following assumptions:

- Ten new employees would be required at LAR;
- A total of 44 daily round trips would be made from the Hathaway Terminal to other terminals by tanker trucks as follows:
  - 18 trips to the Vinvale Terminal
  - 6 trips to the Carson Terminal
  - 8 trips to the Colton Terminal
  - 5 trips to the East Hynes Terminal
  - 7 trips to destinations outside the South Coast Air Basin

Appendix B provides further description of the emission estimating methodologies.

Ethanol will be imported by marine tanker, and pentane will be exported by marine tanker or by rail. MTBE and methanol are currently imported by marine tanker, and these imports will cease when ethanol imports for the proposed project begin. Based on the volumes of ethanol and pentane to be transported, anticipated vessel capacities, and the current frequency of MTBE and methanol shipments, ARCO anticipates that the number of ship calls will decrease by at least 14 each year. Therefore, a net decrease in indirect emissions from marine tankers is anticipated.

Although pentane will be exported by rail car, it is anticipated that only four additional rail cars will leave the refinery each day. This minor increase in rail car movements will not require additional operating time for onsite ARCO locomotives or for offsite common carrier locomotives.

Table 4.1-9 summarizes the indirect source estimated travel resulting from the proposed project. Resulting emissions from these vehicle trips are estimated to be 42, 6, 49 and 57 lbs/day for CO, VOC, NO_X and PM_{10}, respectively.

Table 4.1-9
Offsite Operational Indirect Mobile Sources

Vehicle Type	Maximum Number of Vehicles	Miles/Day (each vehicle)
New employee commuter traffic	10	50
Ethanol tanker, Hathaway to Vinvale	18	28
Ethanol Tanker, Hathaway to Carson	6	20
Ethanol Tanker, Hathaway to Colton	8	120
Ethanol Tanker, Hathaway to East Hynes	5	12
Ethanol Tanker, Hathaway to Outside of South Coast Air Basin	7	100

4.1.4 Significance of Project Operational Emissions

To determine the air quality impacts from the emissions of criteria pollutants from operation of the project, there are two types of significance criteria to which the emissions are compared and analyzed. First, the project operational emissions are compared to specific significance thresholds established for project emissions; and second, the project operational emissions are analyzed through air dispersion modeling to determine if the project may create changes in localized concentrations of air pollutants above the identified human health risk significance criteria. The air dispersion modeling and health risk assessment were only conducted for LAR, because operational emissions of each individual toxic air contaminant are anticipated to decrease at each terminal, as shown in Table 4.1-7.

4.1.4.1 Operational Emissions Summary

A summary of the project's daily emissions from RECLAIM sources are shown in Table 4.1-10. Table 4.1-11 includes the daily totals for both direct project emissions and offsite indirect emissions from non-RECLAIM sources. The summarized project operational emissions are compared to the CEQA significance thresholds. The project operational emissions exceed the significance threshold for VOC.

Table 4.1-10
Project Operational Criteria Pollutant Emissions Summary for RECLAIM Sources

Pollutant	Project Emissions (lb/day)	RECLAIM Allocations[a] (lb/day)	Total (lb/day)	SCAQMD CEQA Threshold (lb/day)	Significant?
NO_X	0.0	7,810	7,810	10,210	No
SO_2	10.0	6,427	6,437	10,299	No

(a) The 1998 facility Allocation for NO_x and SO_x includes purchased RTCs and is converted to pounds per day by dividing 365 days per year.

Table 4.1-11
Project Operational Criteria Pollutant Emissions Summary for Non-RECLAIM Sources

Pollutant	Direct Emissions (lb/day)	Indirect Emissions (lb/day)	Total (lb/day)	SCAQMD CEQA Threshold (lb/day)	Significant?
CO	0.0	41.8	41.8	550	No
VOC[a]	79.6	6.3	85.9	55	**Yes**
NO_X	0.0	49.2	49.2	55	No
SO_X	0.0	0.0	0.0	150	No
PM_{10}	0.0	57.4	57.4	150	No

(a) Does not include emission changes from changes in tank service.

4.1.4.2 Health Risk Assessment

Atmospheric dispersion modeling was conducted to determine the localized ambient air quality impacts from the proposed project. A health risk assessment was prepared for LAR, but not for the six terminals because emissions for every toxic air contaminant are anticipated to decrease at each terminal as shown in Table 4.1-7. Therefore, health risks are not anticipated to increase at the terminals. The modeling follows protocols used in preparation of a prior analysis related to LAR, the 1995 ARCO LAR Health Risk Assessment (HRA).

The atmospheric dispersion modeling methodology used for the project follows generally accepted modeling practice and the modeling guidelines of both the EPA and the SCAQMD. All dispersion modeling was performed using the Industrial Source Complex Short-Term 3 (ISCST3) dispersion model (Version 00101) (EPA, 2000). The outputs of the dispersion model were used as input to a risk assessment using the ACE2588 (Assessment of Chemical Exposure for AB2588) risk assessment model (Version 93288) (CAPCOA, 1993).

This section provides details of the modeling performed and the results of the modeling. Model output listings of model runs are provided in the Air Quality Technical Attachment (Appendix B).

<u>Model Selection</u>

The dispersion modeling methodology used follows EPA and SCAQMD guidelines. The ISCST3 model (Version 00101) is an EPA model used for simulating the transport and dispersion of emission sources in areas of both simple, complex, and intermediate terrain. Simple terrain, for air quality modeling purposes, is defined as a region where the heights of release of all emission sources are above the elevation of surrounding terrain. Complex terrain is defined as those areas where nearby terrain elevations exceed the release height of emissions from one or more sources. Intermediate terrain is that which falls between simple and complex terrain. Terrain areas of all three types exist in the vicinity of the LAR.

<u>Modeling Options</u>

The options used in the ISCST3 dispersion modeling are summarized in Table 4.1-12. EPA regulatory default modeling options were selected except for the calm processing option. Since the meteorological data set developed by the SCAQMD is based on hourly average wind measurements, rather than airport observations that represent averages of just a few minutes, the SCAQMD's modeling guidance requires that this modeling option not be used.

<u>Meteorological Data</u>

The SCAQMD has established a standard set of meteorological data files for use in air quality modeling in the Basin. For the vicinity of the LAR, the SCAQMD requires the use of its Long Beach 1981 meteorological data file. This is the meteorological data file used for recent air quality and Health Risk Assessment (HRA) modeling studies at LAR. To maintain consistency with this prior modeling, and following SCAQMD modeling guidance, the 1981 Long Beach meteorological data set was used for this modeling study.

In the Long Beach data set, the surface wind speeds and directions were collected at the SCAQMD's Long Beach monitoring station, while the upper air sounding data used to estimate hourly mixing heights were gathered at Los Angeles International Airport. Temperatures and sky observation (used for stability classification) were taken from Long Beach Airport data.

Table 4.1-12
Dispersion Modeling Options for ISCST3

Feature	Option Selected
Terrain processing selected	Yes
Meteorological data input method	Card Image
Rural-urban option	Urban
Wind profile exponents values	Defaults
Vertical potential temperature gradient values	Defaults
Program calculates final plume rise only	Yes
Program adjusts all stack heights for downwash	Yes
Concentrations during calm period set = 0	No
Aboveground (flagpole) receptors used	No
Buoyancy-induced dispersion used	Yes
Surface station number	53101
Year of surface data	1981
Upper air station number	91919
Year of upper air data	1981

<u>Receptors</u>

Appropriate model receptors must be selected to determine the "worst-case" modeling impacts. For this modeling, receptors were located: a) along the perimeter of the facility with a spacing of approximately 100 meters; and b) extending from the property line to approximately 500 hundred meters with a spacing of approximately 100 meters. No receptors were placed within the LAR property line. Terrain heights for all receptors were assumed to be zero since the LAR is relatively close to sea level.

<u>Source Parameters</u>

Table 4.1-13 summarizes the source parameter inputs to the dispersion model. The source parameters presented in this table are based upon the parameters of the existing equipment at the facility. The facility has been divided into process areas based on facility operations and are identified by numbers ranging from 30 to 74. The fugitive components were modeled as emissions contributing to the area source in which they are located. Each of the area sources was modeled as a polygon with up to 16 vertices. The coordinate listed in Table 4.1-13 is the first vertex of the polygon. The emission rate used in the ISCST3 model run is in units of g/s-m^2. A unit emission rate of 1 g/s was used, so that the emission rate is the inverse of the area in units of g/s-m^2.

Table 4.1-13
Source Location and Parameters Used in Modeling the Proposed Project

Source ID/Project Units	Source Type	X [m]	Y [m]	Release Height [m]	Sigma z [m]	Area [m^2]	Q [$g/s\text{-}m^2$]
AREA_30/MTBE Unit converted to iso-octene	AREA	198	464	1.5	2.3	15,223	6.569E-05
AREA_44/Cat Poly Unit converted to pentene dimerization	AREA	-365	1341	1.5	2.3	19,321	5.176E-05
AREA_49/North Hydrogen Plant	AREA	-242	1691	1.5	2.3	33,806	2.958E-05
AREA_55/New pentane shipping pumps	AREA	389	700	1.5	6.8	48,102	2.079E-05
AREA_56/Butane railcar loading facility	AREA	393	1367	1.5	2.3	232,378	4.303E-06
AREA_57/LHU No. 1 and Mid-Barrel Unit converted to gasoline hydrotreater	AREA	-522	1312	1.5	2.3	21,486	4.654E-05
AREA_59/No. 3 Reformer Fractionator	AREA	-366	1546	1.5	2.3	18,341	5.452E-05
AREA_60/ISO-SIV Unit converted to LHU No. 2, SFIA Debutanizer, and new FCCU Reruns Bottom Splitter	AREA	20	752	1.5	2.3	31,110	3.214E-05
AREA_65/Tank Farm Piping	AREA	-2493	3126	1.5	6.3	581,646	1.719E-06

Emissions

The modeling was performed using only direct operational emissions associated with the proposed project. These emissions consisted of toxic emissions resulting from the removal and addition of fugitive components in various refinery streams at the LAR. Since the components are associated with a variety of streams, the emissions for some toxic pollutants increased at a specific location, whereas other toxics decreased. Thus, two model runs were created, one for the increase in toxic emissions and one for the decrease. The emission rate used in the ACE model run was in units of g/s which was derived from the annual emission rate in lb/yr assuming continuous operations at 8,760 hours per year.

Health Risks

The potential health risks impacts that are addressed are carcinogenic, chronic noncarcinogenic, and acute noncarcinogenic.

The ACE2588 Risk Assessment Model (Version 93288) was used to evaluate the potential health risks from TACs. The ACE2588 model, which is accepted by the California Air Pollution Control Officers Association (CAPCOA), has been widely used for required health risk assessments under the CARB AB2588 toxic hotspots reporting program. The model provides conservative algorithms to predict relative health risks from exposure to carcinogenic, chronic noncarcinogenic, and acute noncarcinogenic pollutants. This multipathway model was used to evaluate the following routes of exposure: inhalation, soil ingestion, dermal absorption, mother's milk ingestion, and plant product ingestion. Exposure routes from animal product ingestion and water ingestion were not assumed for this analysis.

The 93288 version of ACE2588 incorporates revised toxicity and pathway data recommended in the October 1993 CAPCOA HRA guidance. The pathway data in ACE2588 were modified to include site-specific fractions of homegrown root, leafy, and vine plants. These site-specific fractions were used to maintain consistency with assumptions previously accepted for this particular site location by SCAQMD.

The results obtained based on the CAPCOA HRA guidance are considered to be consistent with those which would be obtained following SCAQMD's Risk Assessment Procedures for Rules 1401 (SCAQMD, 2000) and 212 (SCAQMD, 1997).

Only TACs identified in the CAPCOA HRA guidance with potency values or reference exposure levels have been included in the HRA. The TACs emitted from the proposed project consist of benzene, 1,3-butadiene, cresols, hydrogen sulfide, methanol, naphthalene, phenol, propylene, toluene, and xylenes.

The dose-response data used in the HRA were extracted from the October 1993 CAPCOA HRA Guidelines. The pertinent data are located in Tables III-5 through III-10 of the CAPCOA guidance. For this analysis, naphthalene is considered toxic or carcinogenic for non-inhalation exposures.

Following CAPCOA guidance, the inhalation, dermal absorption, soil ingestion, and mother's milk pathways were included in a multipathway analysis. Pathways not included in the analysis are water ingestion, fish, crops, and animal and dairy products that were not identified as a potential concern for the project setting.

Inhalation pathway exposure conditions were characterized by the use of the ISCST3 dispersion model as previously discussed.

Significance criteria for this EIR is an increased cancer risk of 10 in one million or greater. The established SCAQMD Rule 1401 limits are 1.0 in one million cancer risk for sources without best available control technology for toxics (T-BACT) and ten in one million for those with T-BACT. The significance criteria for noncarcinogenic acute and chronic hazard are indices of 1.0 for any endpoint.

The predicted cancer risks at each of the modeled receptors was compared for the model run using the increased emissions and the run based on the decreased emissions to determine the net cancer risk at each modeled receptor. These net changes ranged from an increase of 0.21 per million to a decrease of 17.6 per million. The peak receptor is located 2 km west of the property boundary and is well below the significance levels of 1.0 and 10 per million. As described previously in Section 4.1.2.2, estimated net changes in emissions are probably somewhat overestimated because of the use of default fugitive VOC emission factors, so the net decreases in cancer risks are probably also somewhat overestimated. The maximum noncarcinogenic acute and chronic hazard indices from the model run based on increased emissions were 0.0005 and 0.0166, respectively. These values are well below the significance level of 1.0. Thus, the HRA results indicate that impacts are below the SCAQMD significance criteria.

4.1.5 Potential Health Risks from Diesel Exhaust Particulate Matter

The project will lead to increased emissions of diesel exhaust particulate matter during construction and operation. In 1998, the CARB listed particulate matter in the exhaust from diesel-fueled engines (diesel particulate matter) as a toxic air contaminant and concluded that it is probably carcinogenic to humans. An Advisory Committee was formed to advise the CARB staff in its preparation of an assessment of the need to further control toxic air pollutants from diesel-fueled engines. The Risk Management Subcommittee was formed to identify the: (1) operating parameters; (2) emission factors; and (3) modeling methodologies recommended for estimating human health risks from diesel-fueled engines. This information will be used to develop the scenarios to evaluate the risks associated with exposure to diesel particulate emissions. The SCAQMD is waiting for this guidance before initiating a requirement for quantitative risk analyses for diesel particulate emissions.

Significant impacts associated with exposure to diesel particulate emissions are not expected during operation of the proposed project. Total tanker truck exhaust PM_{10} emissions from the 44 daily truck round trips are estimated to be only three pounds per day, which occur over a total distance of about 2,300 miles. The maximum emissions at any single location will occur in the vicinity of the Hathaway Terminal, because all of the tanker trucks leave that location. The emission rate for one truck at a speed of 25 mph is about 0.6 grams per mile. Therefore, the total emissions from 88 tanker trucks (44 leaving and 44 returning) travelling over one-quarter mile out of or into the terminal would only be about 13 grams, or 0.03 pounds per day.

4.1.6 Carbon Monoxide Impacts Analysis

Increases in traffic from a project might lead to impacts of CO emissions on sensitive receptors if the traffic increase worsens congestion on roadways or at intersections. An analysis of these impacts is required if:

1. The project is anticipated to reduce the level of service (LOS) of an intersection rated C or worse by one for level, or

2. The project is anticipated to increase the volume-to-capacity ratio of an intersection rated D or worse by two percent.

As indicated in the transportation/traffic impacts analysis (Section 4.6), the volume-to-capacity ratio at the 223rd and Alameda/Wardlow Access intersection, which currently is rated D+, may increase by 0.03 from construction worker traffic leaving LAR at the end of the working day. This increase is a result of increased traffic in the eastbound direction on 223rd Street. This is the only intersection that meets either of the above criteria during either construction or operations.

Figure 5-1 of the SCAQMD CEQA Handbook (1993) defines sensitive receptors as:

- Long-term health care facilities
- Rehabilitation centers
- Convalescent centers
- Retirement homes

- Residences
- Schools
- Playgrounds
- Child care centers
- Athletic facilities

As indicated in the existing land use and planning description (Section 3.4), the area in the vicinity of the intersection is manufacturing, which precludes the presence of any sensitive receptors. Therefore, the potential increase in congestion at this intersection during construction is not anticipated to lead to adverse carbon monoxide impacts on sensitive receptors.

4.1.7 Mitigation Measures

4.1.7.1 Construction Mitigation Measures

As indicated in the previous summary tables, construction activities may have significant unmitigated air quality impacts for CO, VOC, NO_X and PM_{10}. The emissions from construction are primarily from three main sources: 1) on-site fugitive dust, 2) off-road mobile source equipment, and 3) on-road motor vehicles. The mitigation measures listed below are intended to minimize the emissions associated with these sources.

Table 4.1-14 lists mitigation measures for each emission source and identifies the estimated control efficiency of each measure. As shown in the table, no feasible mitigation has been identified for the emissions from on-road vehicle trips. Additionally, no other feasible mitigation measures have been identified to further reduce emissions. CEQA Guidelines §15364 defines feasible as ". . . capable of being accomplished in a successful manner within a reasonable period if time, taking into account economic, environmental, legal, social, and technological factors."

Table 4.1-15 presents a summary of overall peak daily mitigated construction emissions. The table includes the emissions associated with each source and an estimate of the reductions associated with mitigation. The implementation of mitigation measures, while reducing emissions, does not reduce the construction-related CO, VOC, NO_X or PM_{10} impacts below significance.

Table 4.1-14
Construction-Related Mitigation Measures and Control Efficiency

Mitigation Measure Number	Mitigation	Source	Pollutant	Control Efficiency (%)
AQ-1	Increase watering of active site by one time per day[a]	On-Site Fugitive Dust PM_{10}	PM_{10}	16
AQ-2	Wash wheels of vehicles leaving the facility	On-Site Fugitive Dust PM_{10}	PM_{10}	Not Quantified
AQ-3	Remove all visible roadway dust tracked out onto paved surfaces from unimproved areas at the end of the workday	On-Site Fugitive Dust PM_{10}	PM_{10}	Not Quantified
AQ-4	Prior to use in construction, the project proponent will evaluate the feasibility of retrofitting the large off-road construction equipment that will be operating for significant periods. Retrofit technologies such as selective catalytic reduction, oxidation catalysts, air enhancement technologies, etc. will be evaluated. These technologies will be required it they are commercially available and can feasibly be retrofitted onto construction equipment.	Construction Equipment	CO VOC NO_X SO_x PM_{10}	Unknown Unknown Unknown Unknown Unknown
AQ-5	Proper equipment maintenance	Construction Equipment Exhaust	CO VOC NO_X SO_x PM_{10}	5 5 5 5 5
	No feasible measures identified[b]	On-Road Motor Vehicles	CO VOC NO_X PM_{10}	N/A N/A N/A N/A

[a] It is assumed that construction activities will comply with SCAQMD Rule 403 – Fugitive Dust, by watering the site two times per day, reducing fugitive dust by 50 percent. This mitigation measure assumes an incremental increase in the number of times per day the site is watered (i.e., from two to three times per day)

[b] Health and Safety Code §40929 prohibits the air districts and other public agencies from requiring an employee trip reduction program making such mitigation infeasible. No feasible measures have been identified to reduce emissions from this source.

Table 4.1-15
Overall Peak Daily Construction Emissions (Mitigated)

Source	CO lb/day	VOC lb/day	NOx lb/day	SOx lb/day	Exhaust PM10 lb/day	Fugitive PM10 lb/day	Total PM10 lb/day
On-Site Construction Equipment Exhaust	321.9	66.5	608.4	53.7	34.4		34.4
Mitigation Reduction (%)	0%	5%	5%	5%	5%		
Mitigation Reduction (lb/day)	0.0	-3.3	-30.4	-2.7	-1.7		-1.7
Remaining Emissions	**321.9**	**63.2**	**578.0**	**51.0**	**32.6**		**32.6**
On-Site Motor Vehicles	98.2	13.3	48.8	0.0	2.3	132.2	134.5
Mitigation Reduction (%)	0%	0%	0%	0%	0%	0%	
Mitigation Reduction (lb/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Remaining Emissions	**98.2**	**13.3**	**48.8**	**0.0**	**2.3**	**132.2**	**134.5**
On-Site Fugitive PM10						20.0	20.0
Mitigation Reduction (%)						16%	
Mitigation Reduction (lb/day)						-3.2	-3.2
Remaining Emissions						**16.8**	**16.8**
Asphaltic Paving		0.5					
Mitigation Reduction (%)		0%					
Mitigation Reduction (lb/day)		0.0					
Remaining Emissions		**0.5**					
Architectural Coating		24.0					
Mitigation Reduction (%)		0%					
Mitigation Reduction (lb/day)		0.0					
Remaining Emissions		**24.0**					
Total On-Site	**420.1**	**100.9**	**626.8**	**51.0**	**35.0**	**149.0**	**184.0**
Off-Site Motor Vehicles	335.8	45.2	89.0	0.0	1.6	55.1	56.7
Mitigation Reduction (%)	0%	0%	0%	0%	0%	0%	
Mitigation Reduction (lb/day)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Remaining Emissions	**335.8**	**45.2**	**89.0**	**0.0**	**1.6**	**55.1**	**56.7**
TOTAL	**755.9**	**146.1**	**715.8**	**51.0**	**36.6**	**204.1**	**240.7**
Significance Threshold	*550*	*75*	*100*	*150*			*150*
Significant? (Yes/No)	**Yes**	**Yes**	**Yes**	No			**Yes**

Note: Sums of individual values may not equal totals because of rounding

4.1.7.2 Operational Mitigation Measures

The project NO_x, SO_x, CO, and PM_{10} emission increases are below the emissions significance criteria thresholds applied to this project. However, operational VOC emissions are anticipated to exceed the significance criterion. These increased VOC emissions are primarily due to butane and pentane loading into railcars at LAR, pentane loading into marine tankers, the new pentane storage tank at Marine Terminal No. 2, and loading ethanol into tanker trucks at the Hathaway terminal.

Project operational emissions from other sources will be substantially reduced through the application of BACT, which, by definition, is the lowest achievable emission rate. For example, except for the valves exempt from BACT, the new valves to be installed will be of the bellow-seals (leakless) variety.

The VOC exceedance does not include the actual emission reductions that will result from the storage of lower vapor pressure gasoline at the refinery and terminals. Although the actual reductions will occur, the potential emissions that could occur, based on current permit levels, are greater; therefore, the reductions are not considered in this CEQA analysis. It also should be noted that the specific VOCs that increase as a result of the project were evaluated as part of a health risk assessment and, based on their composition, are not anticipated to create localized human health risks.

ARCO will reduce VOC emissions to below the significance threshold. As VOCs are precursor to ozone, and therefore of regional concern, there are a variety of mitigation measures and strategies available. Prior to the operation of the project ARCO will internally develop or purchase emission offsets. This will reduce peak daily operational VOC emissions to 55 pounds per day or less.

4.1.8 AQMP Consistency

CEQA requires that projects must be consistent with regional and local plans. The 1997 AQMP and the 1999 amendments to the AQMP demonstrate that the standards can be achieved within the required timeframes. This project must comply with applicable SCAQMD requirements and control measures for new or modified sources. It must also comply with prohibitory rules, such as Rule 403, for the control of fugitive dust. By meeting these requirements, the project will be consistent with the goals and objectives of the AQMP. Furthermore, the production of CARB Phase 3 RFG will result in emission reductions from motor vehicles throughout the South Coast Air Basin as well as improvements in water quality associated with the removal of MTBE from gasoline.

4.2 Hydrology/Water Quality

Water quality and supply impacts will be considered significant if any of the following conditions are met:

- The project will cause degradation or depletion of ground water resources and surface water substantially affecting current or future uses.
- The project will result in a violation of NPDES permit requirements.
- The project creates a substantial increase in mass inflow to public wastewater treatment facilities.
- The project results in substantial increases in the area of impervious surfaces, such that interference with groundwater recharge efforts occurs.
- The existing water supply does not have the capacity to meet the increased demands of the project, or the project would use a substantial amount of potable water, greater than or equal to five million gallons per day.
- The capacities of existing or proposed wastewater treatment facilities and the sanitary sewer system are not sufficient to meet the needs of the project.

4.2.1 Construction

Potential hydrology and water quality impacts caused by the construction of the proposed facilities are expected to be minimal. Additional water for construction at LAR and the six terminals will be required for the pressure-testing of new storage vessels and for dust control during grading activities.

The new pentane storage vessel at Marine Terminal 2 would have to be pressure tested prior to the start of operations. This will require the one-time use of approximately 4.2 million gallons of water. No additional pressure-testing would be required at LAR or the other terminal sites, as there are no new storage vessels proposed for these locations.

Watering for dust suppression purposes would be required pursuant to SCAQMD and/or local permitting requirements. It is estimated that a total of 833 square yards of grading will be required for the proposed project, with an estimated 484 square yards graded per day, for a total of 2 days of grading. This includes construction of the foundations for the new pentane storage sphere at Marine Terminal 2 and new FCC Rerun Splitter Tower and construction of the retention pond for the butane loading/off-loading area. Assuming that it takes 0.2 gallons per square yard per hour for adequate dust suppression, the “worst-case” water demand can be estimated using the following equation (USEPA, 1992):

Daily Water Usage = 0.2 gal/yd^2-hr x 484 yd2/day x 8 hrs/day = 774 gallons/day

Based on an estimated 2 days of grading, dust control for the proposed project will required 1,549 gallons of water.

Total project water usage is expected to be 4,201,549 gallons. Accordingly, water demand impacts from the proposed project are not significant since the total construction-related water demand does not exceed the SCAQMD's significance criteria of 5 million gallons per day.

All fully piped and assembled process units at LAR will be pressure tested for leaks. The resulting wastewater from these activities will be directed to the LAR wastewater treatment system for cleanup and then recycled for use as process water. Any oil, solids, or grease contained in the wastewater will be recovered for reuse or disposal in accordance with existing LAR procedures. Approximately 168 to 210 gallons of wastewater would be generated at the terminals during construction from the cleaning and pressure testing of small piping systems. The wastewater will be pumped to LAR for treatment and disposal. The total quantity of wastewater discharged from LAR as a result of construction will not exceed the currently permitted discharge rate of 7.5 million gallons per day. Therefore, no significant impacts related to wastewater generation are anticipated for construction.

Sanitary wastes at staging areas, such as construction parking areas, will be collected in portable chemical toilets. These wastes will be removed by a private contractor and disposed of offsite. Construction workers will be required to use portable sanitary facilities maintained by the contractor. Effluents from those facilities are discharged to the municipal sewer. Sanitary wastes at the terminals will be either discharged to existing septic tanks and leach fields located onsite or to local sanitary sewer systems. Sanitary wastes will be minimal and would not create a significant impact to existing sanitary sewer systems.

The proposed construction area encompasses approximately 9,000 square feet within the existing LAR boundaries. Rainfall runoff from the construction areas will be collected in LAR's storm water and wastewater treatment systems. Discharges are expected to be approximately the same as current discharges; therefore, no significant impacts are expected from the storm water discharges during construction.

4.2.2 Operations

Water resources can be affected by either increased water use or disposal, or degradation of water quality. Each of these potential impacts is considered below.

4.2.2.1 Water Supply

Approximately 110,000 gallons per day of additional makeup water will be required for the project, specifically for the refinery's boilers (makeup water is needed for water lost during normal boiler operations), cooling tower, utility water, firewater, and potable water system. This additional water will be purchased from CWS, although ARCO will consider the use of reclaimed water. For the sake of this analysis, it is assumed that all of the required water will be purchased from CWS.

This additional LAR water demand represents roughly a 0.1 percent increase in the current average annual demand for CWS. Over the past several years, CWS has seen a substantial reduction in demand for the water they provide, and expect demand to drop further. This reduction is the result of fewer industrial clients due to plant relocations, more efficient use of water through replacement of water-inefficient processes, and increased use of recycled water. CWS has provided as much as 6.1 to 7.1 million gallons per day in previous years, which is expected to continue to drop. In addition, industrial water users have been encouraged to utilize reclaimed water from the Hyperion Sewage Treatment Plant and other such facilities, or to reclaim and reuse some of their own wastewater to meet their demands (Wittoft, 2000). Based on these considerations, CWS will be readily able to accommodate the increase (Wittoft, 2000) and, therefore, no significant impact to water resources from the project are expected. Since water demand from the project does not exceed the significance criterion of five million gallons per day, water supply impacts are not significant.

The proposed project will not result in an increase in water demand at the terminals because the terminals do not use water for process needs. Water usage at the terminals is for occasional wash-downs, line flushing, and for potable needs. The requirements for wash-downs and line-flushing will not increase with the changes proposed at the terminals. Additionally, since no additional personnel will be added, no increases in potable water use is required. Since no additional water will be required for operational use at the terminals, no significant impacts to water supply are anticipated.

4.2.2.2 Process Wastewater Discharges

Additional process wastewater will result from rail car washings, boiler blowdown, sanitary wastewater, and demineralizer regeneration wastewater. Assuming 17 gallons per minute (gpm) from the LHU, 16 gpm from the Cat Poly Unit, 10 gpm from the Iso-Octene Unit, and a 20 percent contingency, process wastewater volumes are estimated at 74,304 gallons per day for the project. Estimated wastewater quantity was derived as follows:

Source/Unit	Water Rate
LHU #1	2,880 gallons per day
LHU #2	21,600 gallons per day
CAT Poly	23,040 gallons per day
Iso-Octene	14,400 gallons per day
Total	61,920 gallons per day
With 20% contingency	74,304 gallons per day

This process wastewater will be directed to the LACSD for processing and disposal. At present, LAR is permitted to discharge up to 7.5 million gallons per day to the LACSD, although the actual discharge rarely approaches this rate (LACSD Permit No. 543-R3). The project represents less than one percent of the maximum allowable volume and, thus, is expected to be an insignificant amount.

Wastewater generation at the terminals will be limited to minor amounts of oily water from the conversion to ethanol storage during the construction phase. During operation, wastewater is generated at the terminals from the occasional draining of piping and equipment for maintenance purposes or from ballast water from ships (Marine Terminal 2). Additionally, oily water is generated when water is stripped or removed from the existing hydrocarbon storage tanks. Because ethanol is water soluble, the storage tanks converted to ethanol storage will not require stripping. Therefore, the volume of oily water generated from water stripping would likely be reduced.

Oily water is stored in tanks at each of the terminals. Currently, the contents of wastewater tanks from the Colton, Carson, Vinvale and Hathaway terminals are pumped and trucked to Marine Terminal 2 twice a year. Wastewater from East Hynes is piped directly to Marine Terminal 2. Approximately once a month, the wastewater tank from Marine Terminal 2 is pumped to LAR for processing with its oily wastewater. The frequency of wastewater transfer from the terminals to LAR for processing is not expected to change as a result of the proposed project. Due to the fact that minimal wastewater would be generated as a result of the proposed project, no significant impacts will occur.

4.2.2.3 Surface Water Quality

Storm water runoff from the LAR and the terminals will not be impacted as a result of the proposed project. The proposed project will create an additional 833 square yards of impervious surface area. These changes will occur as a result of the new FCC Rerun Splitter Tower and retention pond for the butane loading/off-loading area at LAR, as well as the foundation for the new pentane storage at Marine Terminal 2. Although some existing paving may be removed and replaced during construction, no additional paving will be required at the other terminals.

LAR and its terminals have existing Storm Water Pollution Prevention Plans (SWPPPs) in place and storm water discharge will be handled in accordance with present permit conditions. Because discharge of storm water runoff to local storm water systems is not expected to change significantly in either volume or water quality, no significant impacts are expected to result from storm water runoff associated with operation of the proposed project.

4.2.2.4 Groundwater Quality

In comparison to other components of concern in gasoline, including benzene, toluene, ethylbenzene, and xylenes (BTEX), the available information shows MTBE may pose additional problems when it escapes into the environment through accidental gasoline releases. MTBE is capable of traveling through soil rapidly, is very soluble in water (much more so than BTEX), and is more resistant to biodegradation than BTEX. MTBE that enters groundwater moves at nearly the same velocity as the groundwater itself. As a result, it often travels farther than other gasoline constituents. Therefore, MTBE can be more difficult and costly to remediate than gasoline releases that do not contain MTBE.

Ethanol, which will be substituted for MTBE, is highly soluble in water, and travels in groundwater at about the same rate as MTBE. Ethanol is not expected to persist in groundwater, though, because it biodegrades easily. Thus, ethanol itself does not appear to pose as great a danger to groundwater supplies as MTBE. Ethanol's ability to biodegrade does present another potential issue of concern. Laboratory data and hypothetical modeling indicate that based on physical, chemical, and biological properties, ethanol will likely preferentially biodegrade in groundwater compared with other gasoline components. As a result, the levels of BTEX in water may decline more slowly, and BTEX plumes may extend further than they would without ethanol present. However, BTEX does not migrate as quickly as MTBE. Thus, even with the presence of ethanol, BTEX plumes would not be expected to travel as far as MTBE plumes. Although there are limited data regarding the movement of ethanol and BTEX, a recent U.S. Geological Survey (USGS) report cites several examples of MTBE plumes migrating further than BTEX plumes. At some sites, MTBE has migrated further than other common gasoline components and those long travel distances increase the probability that MTBE will be detected in well water.

Ethanol biodegrades more quickly than MTBE, and therefore appears less likely to contaminate drinking water as often as MTBE, or at the concentrations of MTBE. As a result, EPA does not expect the use of ethanol as a fuel additive to present the same magnitude of risk to drinking water supplies as MTBE (Pirnie, 1998). Recent underground storage tank requirements will further reduce this impact associated with leaks at gas stations. MTBE has a half-life of approximately 1.6 to 1.9 years. By comparison, in a December 1999 report to the California Environmental Policy Council, the authors report that under aerobic conditions, the reported half-life of ethanol in surface waters is from 6.5 to 26 hours (Table 4.2-1). Anaerobic biodegradation in oxygen-limited environments is also expected to proceed at rapid rates. Reported half-lives for ethanol biodegradation under anaerobic conditions range from 1.0 to 4.3 days (Pirnie, 1998). As a result, it is unlikely that ethanol would affect groundwater as often as MTBE or at the concentrations of MTBE (OEHHA, 2000).

Table 4.2-1
Estimated Half-Life of Ethanol in the Environment

Environmental Medium	Half-Life (hours)
Soil (Based upon soil die-away test data)	12.2 – 122
Surface Water (Based upon unacclimated aqueous aerobic biodegradation)	6.5 – 26
Groundwater (Based upon unacclimated aqueous aerobic biodegradation)	13- 52

Source: Pirnie, Malcolm. Evaluation of the Fate and Transport of Ethanol in the Environment, 1998.

There are several processes related to the use of ethanol as a fuel additive which are potential sources of ethanol releases into groundwater. The most common sources are the direct release of ethanol-blended fuels into the subsurface from leaking underground and aboveground storage tanks, or leaks from pipelines. However, several measures are currently in place at LAR and the terminals to reduce or eliminate releases to the subsurface, including leak detection systems on both pipelines and underground storage tanks, and containment berms greater than or equal to 100 percent of the aboveground storage capacity.

4.2.3 Mitigation Measures

No significant adverse impacts to water quality and supply are expected as a result of the proposed project. The existing water supply and disposal systems are adequate to meet the demand of the project. Storm water will be controlled, and neither surface water nor groundwater resources will be significantly impacted. Therefore, no specific mitigation measures are required. ARCO will continue to use existing water conservation measures to reduce the use of potable water and increase the reuse of wastewater. The measures include recycling, reuse, and the use of reclaimed water. LAR and the terminals will also update and modify their SWPPP and MP, NPDES permit, and LACSD permit, as necessary, prior to startup of operations.

4.3 Noise

Noise impacts will be considered significant if any of the following conditions are met:

- The project operation increases the existing CNEL at adjoining residential and non-residential receptors above the “normally acceptable” 65 dBA CNEL for residential land uses or 70 dBA for non residential land uses
- The project operation increases the existing CNEL by more than three dBA in areas where the existing CNEL already exceeds 65 dBA in adjoining residential land uses or 70 dBA in adjoining non-residential land uses
- The project construction causes an incremental increase in the ambient CNEL noise levels by more than three dBA at adjoining residential receptors
- The project operation or construction results in exceedance of noise standards of the local jurisdictions.
- The project operational noise levels exceed the standards designed to address issues related to worker safety.

4.3.1 Incremental Increase Criteria

In addition to the absolute noise level that might occur when a new noise source is introduced into an area, it is also important to consider the level of the existing noise environment. If the existing noise environment is quite low and a new noise source greatly increases the noise exposure (even though a criterion level might not be exceeded), some impact may occur. General rules of thumb for real-life noise environments are that a change of over five dB is readily noticeable and would be considered a significant increase (Van Houton & Associates, 1977). Changes from three to five dB may be noticed by some individuals and would be considered a substantial increase, possibly resulting in sporadic complaints; and changes of less than three dB are normally not noticeable and are considered "insignificant" (Bolt, Beranek and Newman, 1973).

4.3.2 Construction

Table 4.3-1 presents ranges of noise level for various types of construction-related machinery that will be used during the construction phase of the project. Noise levels associated with construction equipment were taken from the ARCO Polypropylene EIR, ARCO Clean Fuels Projects EIR, Electric Power Plant Environmental Noise Guide (Edison Electric Institute), Industrial Noise and Vibration Control (Irwin and Graf), Noise and Vibration Control Engineering (Beranek and Ver), and Noise Control for Buildings and Manufacturing Plants (Hoover and Keith, Inc., 1994).

Table 4.3-1
Noise Levels of Construction Equipment

Equipment Type	Typical Sound Pressure Levels (dBA at 50 Feet)
Tractor	72 – 86
Flat Bed Truck	77
Crane	79 – 86
Cherry Picker	85
Welding Machine	76
Backhoe	85 – 89
Forklift	77 – 82
Air Compressor	81
Generator	71 – 87
Concrete Pump	74 – 84
Front End Loader	85 – 90
Vibratory Roller	75 – 82
Source: Hoover and Kieth, 1994. **Noise Control for Buildings, Manufacturing Plants, Equipment and Products**	

Because of the nature of this activity, the types, numbers, and loudness of equipment will vary throughout construction. Construction activities are planned to occur between 6:00 AM and 5:00 PM Monday through Thursday for LAR and the terminals. Allowing for startup, some downtime, and breaks, the analysis assumes that equipment would be operating and potentially generating noise eight hours per day starting at 6:00 AM.

Noise from project construction at each terminal will be conducted for no more than 12 months at any terminal over a two-year period from February 2001, to December 2002. Terminal construction equipment will be similar to the construction equipment used at LAR, though modifications at the terminals will require significantly less construction than at LAR.

During construction of this project, LAR and the terminals will continue normal operations. For the purpose of this evaluation, it is assumed that current major sources of noise within LAR and the terminals will continue throughout the construction period. Noise from local street traffic will also continue during construction of the project.

Construction noise levels at the nearest noise receptors were estimated from the equipment specified for the particular construction location and it was assumed that approximately half of the equipment would be in operation at any one time. Equipment sound levels were extrapolated to receptor distances using standard free-field hemispheric sound propagation (six dBA of reduction per doubling of distance). The results of these estimates are presented in the following subsections as the maximum noise levels due to construction activities.

4.3.2.1 LAR

Construction equipment that will be used for the proposed project will be similar to, although fewer in number than, the equipment used in the ARCO Polypropylene and Clean Fuels Projects. Therefore, noise estimates from those projects have been used as conservative estimates of the noise impacts for the proposed project. In fact, the ARCO Clean Fuels Project took place over a longer period of time and required significantly more construction modifications than the proposed project. Therefore, data from the Clean Fuels Projects may be considered a "worst-case" scenario for the proposed project.

Table 4.3-2 presents CNEL estimates of total existing noise, traffic and LAR components of the existing noise, predicted LAR proposed project construction noise, and predicted total noise during proposed project construction. These estimates are based on CNEL estimates for the ARCO Clean Fuels Project construction. As indicated in Table 4.3-2, the LAR construction noise is predicted to result in a CNEL of 59 dBA or less at residential and commercial receptors which is less than the existing CNEL. As a result, LAR area CNEL noise levels would be increased by less than one dBA. Therefore, since construction does not increase existing noise by more than three dBA, construction noise impacts are acceptable in regards to land use classification and ambient noise level increase limits.

The sound levels under the column heading "Project Construction" of Table 4.3-2 are the minimum/maximum estimated CNEL sound levels during construction at each of the receptor locations as presented in the ARCO Clean Fuels Project EIR chapter 4.6-2 and 4.6-3.

A discussion and further documentation of these LAR construction CNEL minimums and maximums is presented in the ARCO Clean Fuels EIR Chapter 4.6.1. In that discussion, Tables 4.6-2 and 4.6-3 also present measured existing sound levels at nearby residential and commercial areas. That document describes that the construction CNELs were calculated assuming:

- construction is eight hours/day, Monday through Thursday, beginning at 7 AM
- equipment usage factors from Table 4.6-1
- 6 dBA per doubling of distance plus normal atmospheric absorption
- even distribution of equipment between construction sites

Table 4.3-2
Existing and Estimated CNEL Construction Noise Impacts at LAR (dBA)

Receptor Location	Existing CNEL			Estimated CNEL		
	Total (Ambient)	Traffic	LAR	Project Construction[a]	Total	Increase
1. Residential Area. North of 223rd St., 470 ft west of Lucerne	71	71	49	34/39	71	< 1
2. Spires Restaurant parking lot	74	66	74	47/54	74	< 1
3. Open Commercial Land. 68 ft west of Wilmington, 37 ft south of Watson Center Rd.	71	66	69	51/59	71	< 1
4. Residential/Commercial Area. 75 ft south of Sepulveda Blvd., 68 ft east of Bonita Avenue	65	65	51	28/30	65	< 1

Source: SCAQMD 1993
[a] Based on estimated noise associated with construction for the ARCO Clean Fuels Project

In addition, maximum construction noise at any given period of time (as opposed to overall construction CNELs) is predicted to be 67 dBA or less at commercial receptors and 54 dBA or less at residential receptors (see calculation spreadsheet in Appendix F). This complies with Carson limits for maximum construction noise for long-term daytime construction. This instantaneous maximum construction noise level and those described in the following subsections for the terminal locations were calculated with the following assumptions:

- construction is 8 hours/day, Monday through Thursday, beginning at 7 AM
- average sound level of each piece of equipment (Table 4.3-1)
- construction equipment usage (see "ARCO Maximum Construction Noise Calculation Spreadsheet in Appendix F)

Since construction noise at LAR will be within ordinance limits and will not cause a significant increase in existing sound levels, construction activities for the proposed project are predicted to have no significant noise impacts.

4.3.2.2 Carson Terminal

Construction at the Carson Terminal is limited to storage tank conversion, and piping and metering modifications. The Carson Terminal is remotely located in a heavy industrial zone more than a mile away from the nearest commercial or residential receptors. Construction activities would be significantly less than at LAR. Since LAR construction impacts are predicted to be insignificant and the terminal is further from the receptors than the LAR, Carson Terminal construction noise impacts are predicted to be insignificant.

4.3.2.3 Marine Terminal 2

Construction at the Marine Terminal 2 consists of tank demolition and construction, tank conversion, and piping and metering modifications. The Marine Terminal 2 is located in a mainly industrial zone. The nearest receptor is an area zoned for residential development that is ½ mile away. Maximum construction noise at this residential receptor is predicted to be 63 dBA and is predicted to comply with the "normally acceptable" residential land use class of 60 to 65 dBA and cause no increase in existing ambient noise levels. As a result, Marine Terminal 2 construction noise impacts are predicted to be insignificant.

4.3.2.4 East Hynes Terminal

Construction at the East Hynes Terminal consists of new ethanol blending pumps, an existing tank conversion, as well as piping and metering modifications. The East Hynes Terminal is located in a mainly industrial zone with some nearby residential receptors along Poppy, Curry, and Harding Streets approximately 600 feet northwest of the nearest East Hynes Terminal construction area. Maximum construction noise at this residential receptor is predicted to be 67 dBA, and within the Long Beach noise ordinance specifications for the L_{50}.

Construction noise is predicted to increase the average incremental CNEL by up to two dBA over the existing CNEL (60 to 65 dBA) which is assumed to be insignificant. The resulting CNEL at nearby residential receptors resulting from construction activities should remain in the "normally acceptable" land use class of 60 to 65 dBA. As a result, East Hynes Terminal construction noise impacts are predicted to be insignificant.

4.3.2.5 Vinvale Terminal

Construction at the Vinvale Terminal consists of existing tank conversion, and delivery system, piping and metering modifications. The Vinvale Terminal is located in a mainly industrial zone. The nearest receptors are two mobile home parks along Shull Street, 800 feet north of the Vinvale Terminal. Maximum construction noise at these receptors is predicted to be 65 dBA, which is within the existing ambient CNEL of 60 to 65 dBA and is predicted to comply with the "normally acceptable" land use class of 60 to 65 dBA. As a result, Vinvale Terminal construction impacts are predicted to be insignificant.

4.3.2.6 Hathaway Terminal

Construction at the Hathaway Terminal consists of tank conversion, and piping, metering and truck loading rack modifications. The Hathaway Terminal is located in an area of light industrial, commercial and residential land uses. The nearest receptor is the Bixby Ridge Housing development along Hathaway Avenue, 200 feet southwest of the Hathaway Terminal construction area. If all construction equipment were operating at the same time the activities would generate 77 dBA at the nearby receptors.

As a result, using "worst-case" assumptions, Hathaway Terminal construction impacts are predicted to be potentially significant during portions of the construction period and should be mitigated to reduce potential impacts. Please note however, that potential impacts from the construction would be temporary and actual noise impacts may be either insignificant or significantly less due to the conservative nature of the noise estimate. Additionally, the peak noise generation will occur during the day when receptors are less sensitive to noise.

4.3.2.7 Colton Terminal

Construction at the Colton Terminal consists of existing tank conversion, and piping and metering modifications. The Colton Terminal is located in a mainly industrial zone. The nearest receptors are residences along Santa Ana Avenue, approximately 400 feet west and southwest of the Colton Terminal construction area. If all construction equipment were operating at the same time the activities would generate 71 dBA at the nearby receptors

As a result, using "worst-case" assumptions, Colton Terminal construction impacts are predicted to be potentially significant during the portions of the construction period and should be mitigated. Please note however, that potential impacts from the construction would be temporary and actual noise impacts may be either insignificant or significantly less due to the conservative nature of the noise estimate. Additionally, the peak noise generation will occur during the day when receptors are less sensitive to noise.

4.3.3 Operation

Stationary noise sources for the project include the new and modified mechanical and process equipment that will operate 24 hours per day, seven days per week. The ARCO Products Company Equipment Noise Control Engineering Standard 601-90 will be adhered to for all new mechanical and electrical equipment. This specification limits equipment noise to 85 dBA at a distance of three feet. This requirement is reviewed by ARCO on a project-by-project basis. The specification was primarily designed to address issues related to employee noise exposure. The following subsections analyze potential operational noise impacts at each proposed project site. The Hathaway Terminal is expected to have 44 truckloads of ethanol per day, while the other terminals are expected to have 18 truckloads per day or less. As a result, the Hathaway Terminal was the only terminal that is expected to have the potential for a significant increase in traffic noise.

4.3.3.1 LAR

There are expected to be no significant noise sources associated with the project operation. Modifications to existing operational equipment and new equipment are not expected to cause noise audible over the existing noise at LAR. After completion of the LAR upgrade, additional truck traffic will be negligible (less than five additional truck trips per day) and is expected to result in no measurable increase in traffic noise. Noise levels at the residences along 223rd Street will continue to be dominated by traffic noise. Rail activity will increase by four additional pentane and butane rail cars per day (during three to five hours per day; seven days per week) but will be distributed on the existing rail facilities located on the eastside of LAR away from noise-sensitive area receptors. The restriction of new equipment to 85 dBA at three feet, coupled with the distance of the plant and rail traffic from noise-sensitive receptors, combine to prevent the project from increasing existing noise levels.

4.3.3.2 Carson Terminal

The modifications at the Carson Terminal are not expected to include new noise sources except for approximately six truckloads of ethanol per day. Since the surrounding land uses are mainly industrial and commercial, the additional truck traffic is not expected to cause a significant increase in the overall traffic volume or operational noise. Therefore, operation of the Carson Terminal is not predicted to increase the existing noise levels or have a significant noise impact as a result of the project. An estimate of increased noise from the additional traffic was not calculated for this location due to the insignificant traffic increase.

4.3.3.3 Marine Terminal 2

The modifications at the Marine Terminal 2 are not expected to include new noise sources. All materials will be shipped by pipeline to the site; therefore, there will be no additional truck traffic. Total ship visits will be reduced as discussed in Section 4.1.3. Therefore, operation of Marine Terminal 2 is predicted to have an insignificant noise impact as a result of the project.

4.3.3.4 East Hynes Terminal

The modifications at the East Hynes Terminal are not expected to include new noise sources except for approximately five truckloads of ethanol per day. Since the surrounding land use is mainly industrial, the additional truck traffic is not expected to cause a significant increase in the overall traffic volume. Therefore, operation of the East Hynes Terminal is predicted to have an insignificant noise impact as a result of the project. An estimate of increased noise from the additional traffic was not calculated for this location due to the insignificant traffic increase.

4.3.3.5 Vinvale Terminal

The modifications at the Vinvale Terminal are not expected to include new noise sources except for approximately 18 truckloads of ethanol per day. Since the surrounding land use is mainly heavy manufacturing and commercial manufacturing, and the Union Pacific Railway lies between the Vinvale Terminal and the nearest noise-sensitive receptors, the additional truck traffic is not expected to cause a significant increase in the overall traffic volume or operational noise. Therefore, operation of the Vinvale Terminal is not predicted to have a significant noise impact as a result of the project. An estimate of increased noise from the additional traffic was not calculated for this location due to the insignificant traffic increase.

4.3.3.6 Hathaway Terminal

The modifications at the Hathaway Terminal are not expected to include new noise sources except for an estimated 44 truckloads of ethanol per day. The main truck entrances are on Hathaway Avenue approximately 800 feet northeast of the Bixby Ridge housing development. Maximum noise from a truck delivery at the Bixby Ridge development is estimated to be 63 dBA (30 mph) which is within the existing ambient CNEL of 60 to 65 dBA. Truck noise was calculated using the following empirical equation for heavy truck noise (Hoover and Keith, Inc., 1994):

$$\text{Sound Pressure Level at 50 feet (dBA)} = 24.6\text{Log}(S) + 50.6$$

Where: S = vehicle speed in miles per hour

Sound levels were then reduced by 6 dBA per doubling of distance out to the Bixby Ridge residential receptor at a distance of 800 feet.

Since the area surrounding the Hathaway Terminal is generally light industrial or commercial industrial, the additional truck traffic is not expected to cause either a significant increase in the overall traffic volume or traffic noise at the receptor location. Therefore, operation of the Hathaway Terminal is not predicted to have a significant noise impact as a result of the project.

4.3.3.7 Colton Terminal

The modifications at the Colton Terminal are not expected to include new noise sources except for approximately eight truckloads of ethanol per day. Since the surrounding land use is mainly heavy industrial, the additional truck traffic is not expected to cause a significant increase in the overall traffic volume or operational noise. Therefore, operation of the Colton Terminal is not predicted to have a significant noise impact as a result of the project. An estimate of increased noise from the additional traffic was not calculated for this location due to the insignificant traffic increase.

4.3.4 Mitigation Measures

The following subsections include mitigation measures for potential noise impacts.

4.3.4.1 Construction

Potential significant temporary noise impacts from project construction activities may occur at the Hathaway Terminal and the Colton Terminal. At these terminals, construction noise impacts are potentially significant due mainly to the close proximity of residential receptors to the nearest construction sites at the terminal. These impacts would be reduced or eliminated at construction sites farther away from the receptors, or may be reduced or eliminated due to existing buildings, tanks and equipment acting as noise barriers.

Guidelines are available for minimizing construction noise impacts (Bies and Hansen, 1988). Minimizing construction noise in residential areas requires consideration of the best available equipment during each construction stage. Table 4.3-3 presents mitigation measures that will be used to ensure that the potential construction noise impacts at the Hathaway and Colton Terminals are insignificant. Mitigative measures should first target the most dominant noise sources - the heavy diesel construction vehicles, and assure that they are fitted with adequately functioning mufflers. In addition, air compressors and generators will also have adequate mufflers. “Adequate” is defined as properly operating according to the manufacturer’s specifications. It is also possible that through the finalization of the equipment schedule the impacts will be reduced to below significance. If noise complaints occur as a result of construction activities even though the mitigation measures in Table 4.3-3 are taken, ARCO will modify the construction schedule to be less noise intensive.

4.3.4.2 Operation

The existing and future noise environment for land uses around LAR and the terminals are considered normally acceptable for their respective residential and non-residential uses. The estimated noise from the operation of the proposed project is expected to be insignificant, and at or below the existing background ambient noise levels. No impact from noise is anticipated and no further mitigation is necessary.

Table 4.3-3
Noise Mitigation Measures for Construction

Mitigation Measure Number	Measure	Noise Reduction Efficiency
N-1	Specify that quiet equipment, including functioning muffler devices, be used.	Up to six dBA
N-2	Specify that all mufflers be properly maintained throughout the construction period.	NQ
N-3	Use rubber-tired equipment rather than track equipment where feasible.	NQ
N-4	Keep loading and staging areas away from noise-sensitive land uses to the extent feasible.	Six dBA per doubling of distance to receptor
N-5	Minimize truck traffic on streets adjacent to residential uses, to the extent possible.	NQ
N-6	To the extent feasible prohibit routing of truck traffic through residential areas.	NQ
N-7	Modify construction schedule if noise complaints are received	NQ
NQ - Not Quantified		

4.4 Land Use and Planning

Significance criteria for land use are based on the compatibility of the proposed project with existing and future land uses and with established policies and regulations. Impacts are considered significant if:

- Proposed development is neither compatible nor consistent, in terms of use or intensity, with land use plans, regulations, or controls adopted by local, state, or federal governments.
- The project conflicts with the established recreational, scientific, educational, religious, or scientific uses of the area.

4.4.1 Construction

Construction will occur within the existing property boundaries of LAR and the related terminals. Construction of the proposed project will involve grading, foundation work, and structural modifications to existing refinery and terminal equipment. New equipment for the proposed project would be limited to an FCCU, new pumps, heat exchangers, and railcar loading spots at LAR and the addition of a storage tank and new pumps at the Marine Terminal 2.

Construction of the proposed modifications at the LAR will be staged from a service area located in the Northeast Property through Gate 62 on 223rd Street. Transportation inside LAR between the contractors parking lots and the construction sites will be by bus on existing LAR roads. Construction of the proposed terminal modifications will be staged from various locations within the terminal boundaries, as shown on Figures 2.4-4 through 2.4-9.

Construction at LAR will require approximately 24 months, while length of construction at any one terminal will range from one month to 12 months. Construction at the Carson, Vinvale, Colton, Hathaway, and East Hynes Terminals is expected to take two months of activity within a 12 month period at each location. Due to the potential addition of a new storage tank at the Marine Terminal 2, construction at this terminal is anticipated to last approximately 12 months.

Construction equipment will consist primarily of earthmovers, front end loaders, backhoes, forklifts, cranes, portable welding equipment, air compressors, trucks, and pumps. Potential impacts from dust and noise generated during construction of the project are discussed in Section 4.1, Air Quality, and Section 4.3, Noise.

The modifications to existing equipment for the proposed project are consistent with land uses in the general region of LAR and the terminals, which are located in highly urbanized and industrialized areas. Similarly, the components of the project are generally consistent with the zoning in the area of the LAR and terminals (see Section 3.4 for zoning and land use designations). Thus, no significant impacts to land use or zoning are expected to occur during construction of the proposed project.

4.4.2 Operation

Operation of the proposed project will not alter existing land uses within LAR or at the terminals. Operation of the proposed project will be consistent with existing LAR and terminal land uses. The proposed project will not conflict with land-use patterns delineated by the various General Plan designations for the refinery and terminal areas, so no amendments will be needed. The following text summarizes the review/planning process required by the various cities for modifications at the project sites.

The area at the refinery proposed for additional rail car storage and butane loading racks (Northeast Property), as well as the Carson Terminal site, are included in the City of Carson's Redevelopment Project Area No. 2 (RPA 2). Discussions with city officials have indicated that a project that is located within RPA 2 requires site plan and design review with the City of Carson Planning Commission and Redevelopment Agency for development in this area.

Modifications at the East Hynes Terminal would be limited to the conversion of an existing storage tank, addition of new pumps, and piping modifications. The proposed building plans for this terminal would be subject to plan check review. Because this terminal is a permitted use by right (a use which was lawful before the current zoning ordinance was put into affect) in the IG zone within the City of Long Beach, the proposed modifications would not be subject to planning review (Krupka, 2000).

Modifications at the Marine Terminal 2 would include the addition of a new storage tank, conversion of existing storage tanks, and demolition of existing storage tanks. The proposed modifications are subject to review by the Port of Long Beach Harbor Department.

Modifications at the Vinvale Terminal would also be limited to conversion of existing storage tanks and piping. City of South Gate development standards in effect at the Vinvale Terminal site call for a site plan review of any structural modifications at developed sites with land area greater than 15,000 square feet (Lefever, 2000). Because construction activities would not include excavation, the site plan review by the City of South Gate would not be required.

The proposed changes at the Hathaway Terminal include conversion of existing storage tanks and piping. Because the terminal use is a non-conforming use and operates under a Conditional Use Permit, proposed changes to the terminal are subject to a planning review to determine if the proposed changes would increase non-conformity (Charney, 2000). Because no significant changes to operations and no additional structures are proposed at this site, the proposed modifications are not expected to increase non-conformity at the site.

Modifications at the Colton Terminal would be limited to conversion of an existing storage tank and changes to the existing blending skids. A revised Precise Plan of Design would need to be submitted to the City of Rialto Planning Department for review by the City's Development Review Committee.

Discussions with the planning departments at the various cities indicate that approvals for the proposed project will be primarily ministerial. Proposed modifications on the Northeast Property may be subject to a discretionary review because this portion of the LAR was not included in the original ARCO CUP issued by the City of Carson. Based on the above information and because the proposed project would involve modifications to existing industrial facilities, no land use impacts on a local or regional scale are expected to occur. ARCO will submit the appropriate permit applications and/or site plans to the various Cities to obtain the proper approvals for the proposed project. This will ensure that the applicable construction design standards and/or guidelines will be adhered to.

4.4.3 Mitigation Measures

No significant land use impacts are expected to occur as a result of construction or operation of the proposed project. Therefore, no mitigation is necessary or proposed.

4.5 Hazards

This section addresses potential hazards and risk of upset scenarios associated with the proposed project. It addresses the incremental potential adverse impact that the project may have on the community or environment if an upset were to occur. The major potential hazards that were reviewed included toxic releases, explosions, and fires. Appendix C provides the hazards modeling technical attachment.

The potential for a risk of upset being deemed significant for the project would be dependent on the likelihood of any of the following conditions being met:

- Noncompliance with any applicable design code or regulation
- Nonconformance to National Fire Protection Association standards
- Nonconformance to regulations or generally accepted industry practices related to operating policies and procedures concerning the design, construction, security, leak detection, spill containment, or fire protection
- Increased risk of offsite fatality or serious injury
- Substantial exposure to a hazardous chemical
- Significant exceedance of the EPA risk management exposure endpoints off-site.

The first three conditions above are concerned with design codes, fire standards, and generally accepted industry practices. The project would be designed, operated, and maintained to provide a safe workplace, and to prevent significant adverse offsite impacts. ARCO incorporates modern industrial technology and design standards, regulatory health and safety codes, training, and operating, inspection, and maintenance procedures that will minimize the risk and severity of potential upset conditions.

Examples of regulations and standards governing equipment design include:

- California Code of Regulations, Title 8 - contains minimum requirements for equipment design
- Industry Standards and Practices - codes for design of various equipment

  ANSI - American National Standards Institute
  API - American Petroleum Institute
  ASME - American Society of Mechanical Engineers
  NFPA - National Fire and Protection Association

The standards noted above and other applicable design standards will govern the design of mechanical equipment such as pressure vessels, tanks, pumps, piping, and compressors and do not need to be analyzed further in the hazard analysis. Adherence to codes would be verified by the appropriate local city building inspector for each city where the project is undergoing construction or modification, before the facility becomes operational. This includes:

- City of Carson for the Los Angeles Refinery and the Carson Terminal;
- City of Long Beach for East Hynes Terminal and Marine Terminal 2;
- City of Signal Hill for the Hathaway Terminal;
- City of South Gate for the Vinvale Terminal; and,
- City of Rialto for the Colton Terminal.

The following hazard analyses concentrate on potential upset scenarios that may result in risk of serious injury or substantial chemical exposure. The analyses present the estimated likelihood of occurrence and the potential consequences associated with each scenario. The primary focus is on potential impacts to the environment or the community outside of the facility. The range of the impact beyond the fenceline is estimated for each scenario.

The selection of scenarios was based on previous experience in process engineering, process safety management, and refinery risk analysis. The likelihood of occurrence for the scenarios was based on reliability data available from the American Institute of Chemical Engineers and other published data (see Table 4.5-1).

The proposed project would allow ARCO to phase out MTBE from reformulated gasoline and to produce gasoline that complies with CARB Phase 3 fuel specifications. The project would involve the installation of new units and the modification of existing units at LAR. Also, the project would change the methods of delivery for fuel additives (such as ethanol) and change the operations at five distribution and one-marine terminal. The project would require that ethanol blending and pentane storage be performed at some of the terminal facilities.

For the risk of upset analysis, primary consideration was given to the effect of changes related to the proposed project and its incremental impacts. Incremental impacts were estimated by comparing the results of "worst-case" upsets for the proposed systems with the estimated impacts that could have resulted from upsets for MTBE gasoline production. Increments were estimated for chemical substitutions that were proposed for use in existing pipelines or processes and when new products were proposed for storage in tanks that formerly contained other products. For completely new units or operations, the estimated impact of the new elements were compared to a zero baseline.

4.5.1 Overview of Approach

The hazard analysis addresses only processes that are being added or modified as a result of the proposed project. The analysis has been conducted in five steps:

1. Review Potential Hazards
2. Categorize Risk
3. Select Specific Scenarios
4. Estimate Likelihood of Accidents
5. Assess Consequences

Each step is described in detail in subsequent subsections.

4.5.2 Hazardous Chemicals Associated with the Project

The primary hazardous chemicals associated with the project are pentane, butane, ethanol and assorted catalysts. Pentane and butane are regulated substances under the federal RMP program and the CalARP. There are several other chemicals such as hydrogen, gasoline, and the like, but these would not increase significantly (or at all) or change in the location of their storage, use or mode of transport due to this project. The hazard analysis is concerned with the potential increase of risk due to the project.

One of the main objectives of the project is the replacement of MTBE with ethanol. MTBE is more flammable and reactive than ethanol and almost twice as much MTBE was required to accomplish oxygenation of the fuel as would be required with ethanol. Operations, storage and processes that substitute ethanol for MTBE would be less hazardous than before due to smaller volume, lower flammability and lower reactivity. This would include ship or barge operations, off-loading and transfer by pipeline and storage. For these substituted operations, detailed hazard assessments are unnecessary. For new operations, such as shipping pentane to a new location that did not receive pentane before, the incremental risk of the transfer and storage will be estimated. For transfer of ethanol in a pipeline that did not carry ethanol before, or for storage of ethanol in converted tanks, a comparison was made between the risk of ethanol and the risk of transporting and storing the former products. In general, ethanol has about half the radiant energy output of diesel or gasoline in a fire and up to eighteen percent less range to the explosion endpoint than diesel or gasoline. The following types and quantities of hazardous chemicals and operations involving these chemicals at various locations have been reviewed to define scenarios in order to estimate incremental impacts:

LAR

For the LAR, primary consideration was given to the new hazards associated with project units, related systems, and piping. Risks of each component are described as follows:

- Light hydro unit (LHU #1) and heat exchangers modifications plus new exchangers, piping and pumps (changes involve improving heat exchangers and feed control and would be unlikely to create a major incremental impact off-site).

  This unit currently handles Debutanizer bottoms from the FCC Unit. This is light, refined hydrocarbon material, which is being hydrotreated to reduce its sulfur content level. It will continue to handle similar light hydrocarbon material in the proposed scheme. This would not create any additional risk, either onsite or off-site.

- Conversion of ISO/SIV unit to a hydrotreater plus new reactors, exchangers and pumps (changes involve addition of a reactor and improving heat exchangers and feed control).

  It is proposed to convert this unit to Light Hydro Unit #2. The LHU #2 would handle another portion of the same feed material as the LHU #1 does. This would provide for additional sulfur removal from gasoline without creating any new hazards. This unit was previously handling similar light refined hydrocarbon fractions such as hexane. The magnitude of a "worst-case" upset would not be greater than with current service.

- Modification of #3 Reformer Fractionator and overhead condenser plus new pumps. This unit currently handles a portion of the catalytically reformed gasoline from the No. 3 Reformer. In the proposed scheme, it would continue to handle the same material, which is a light, refined hydrocarbon fraction. There would be no change in the risk factors since it is currently handling very similar light hydrocarbon refinery streams.

- The No. 1 Naphtha Splitter would be converted into a Debutanizer #4 and the Depentanizer tower would be converted into a Naphtha Splitter. Both towers would continue to handle very similar light refinery streams as they did previously and have risks comparable to existing service.

- New fluid catalytic cracking unit (FCCU) rerun bottoms splitter tower, heat exchanger would have comparable risk relative to existing service.

  This new equipment would fractionate a light hydrocarbon liquid into two fractions and concentrate the sulfur into one of the streams. This would allow for further sulfur removal. This unit would handle similar light hydrocarbon streams, as is done currently in the refinery and does not introduce a risk of greater magnitude than is currently typical of similar existing units.

- Alternate feedstock to north hydrogen plant plus new feed drum, pump and vaporizer have comparable risk relative to existing service.

  The alternate feed to the North Hydrogen Plant could be a mixture of vaporized pentane and natural gas/refinery fuel gas in the proposed scheme. This is slightly heavier, but similar to the current feed and poses no new hazards/risks. All of these hydrocarbon components are currently handled in the refinery.

- Conversion of existing MTBE unit to an Iso-Octene Unit. The MTBE reactor would be replaced with a new reactor. Two methanol towers would be converted to new service with comparable risk relative to existing service.

  This change would remove an organic liquid but retain a light hydrocarbon liquid. Processing steps are very similar to existing units in the refinery and somewhat similar to the existing MTBE unit. Operating pressures and operating temperatures are similar and within the limits of normal refining practices. No additional hazards/risks are presented in this process.

- Modification of existing Cat Poly Unit to a Dimerization Unit and piping plus a new hydrotreater reactor system. The system would utilize hydrogen from the existing refinery unit with comparable risk relative to existing service.

  The existing and new operations both involve processing of similar light hydrocarbon liquids at similar temperatures and pressures. Relative risk remains unchanged.

- Modification of Mid-Barrel Unit to Gasoline Hydrotreater plus modification of feed and product piping, gasoline hydrotreater and heat exchanger with comparable risk relative to existing service.

  In this scheme, the existing Mid-Barrel Unit which currently hydrotreats mid-distillates, would be converted into a hydrotreater for a portion of FCC Unit Rerun tower bottoms gasoline. This is the same fraction that both LHU #1 and LHU #2 would process and similar to the mid-distillates. No additional hazard/risk factors are involved here.

- Piping modifications in the tank farm with comparable risk compared to existing service.

  Four tanks, three with floating roofs and one with a dome roof with internal floater, would be used to store refinery blending components such as Alkylate, Isomerate, Mogas and RS-110 Blending Component. These tanks currently store MTBE or

Finished Gas. All of the above stated blending materials are currently being produced and/or handled in the refinery. No new or additional hazards exist.

- Modification of facilities and equipment for pentane off-loading at existing railcar pentane loading facility plus a new repressurizing vaporizer system and two railcar spots. Pentane would be loaded back and forth between tank cars and the storage spheres TK-682, 683 and 684 via a 6-inch line.

  This system is mostly existing already. Two additional railcar-loading spots are being added to the six already existing. There are no new/different materials handled here.

- Piping modification and substation upgrades to ship pentane by pipeline plus a new pentane pump plus the shipment of pentane. The incremental potential impact from upsets involving pentane transfer will be estimated.

- Facilities and equipment for butane off-loading at the existing propylene railcar loading facility at northeast property. Existing propylene equipment at eight loading spots would be modified to handle either propylene or butane. Butane would be loaded back and forth between tank car and the storage spheres TK-73, 76 and 78 via a 6-inch line. Butane impacts are similar to existing propylene impacts. (The impact distance due to a butane explosion is about one percent less than the impact distance from an equivalent volume of exploding propylene. Butane has about 0.4 higher heat of combustion than propylene and about 4 percent less density than propylene. The net effect is slightly less explosive impact for the same volume. The impact distance is proportional to the weight times the heat of combustion raised to the one-third power). No incremental risk analysis is required.

  Butane Offloading facilities will be added near the existing Propylene railcar loading facilities. Also, Pentane Loading Pumps will be added at this location. All three hydrocarbons, Propylene, Butane and Pentane are currently being handled and loaded in the refinery. They do not present any new hazards/risks.

Marine Terminal 2

- Conversion of existing storage tanks from existing service to ethanol. Ethanol has a lower rate of combustion than the existing service and consequently has lower risk of fire or explosion upset. No incremental risk analysis is required due to the reduced risk of ethanol compared with the existing service.

- Off-load ethanol from barge and storage on-site. Reduced risk compared to MTBE barge and storage, because ethanol is less flammable and reactive than MTBE, and approximately half as much ethanol would be required compared to MTBE.

- Transfer of ethanol via existing pipelines to Hathaway. Existing pipelines currently transport gasoline, gasoline components and MTBE. Ethanol has reduced risk compared to existing service because it is less flammable.
- Alternate transfer of ethanol via existing pipelines to East Hynes. Existing pipelines currently transport gasoline, gasoline components and MTBE. Ethanol has reduced risk compared to existing service because it is less flammable. Reduced risk compared to existing service.
- Alternate transfer of ethanol via existing pipelines to Vinvale. Existing pipelines currently transport reformulated gasoline. Ethanol has reduced risk compared to existing service because it is less flammable.
- Construction and new refrigerated pentane tank and storage of pentane – 100,000 BBL and destruction of tetramer and nonene tanks. New incremental risk of fire and explosion to be estimated by comparing increased risk of 100,000 BBL of pentane with 20,000 BBL of nonene.
- Receipt of pentane from LAR via pipeline which currently transfers nonene, tetramers and methanol.. *The distance to the overpressure endpoint of a pentane explosion is modeled to be 10 meters less than that for a nonene explosion. This change in endpoint is insignificant and is within the uncertainty of the modeling technique. Therefore, there is no change in risk from existing service.*
- Transfer of pentane to barge and storage in the barge. This is a new operation with incremental risk of fire and explosion to be estimated. Volume of MTBE is approximately offset by the volume of ethanol plus the volume of pentane. The incremental risk of a barge of pentane versus a barge of MTBE will be calculated to estimate the incremental barge risk for the project.

Hathaway

- Conversion of tanks from existing hydrocarbon and MTBE service to ethanol. Ethanol has reduced risk compared to existing service because it is less flammable. Reduced risk compared to existing service.
- Receiving ethanol via pipeline from Marine Terminal 2. Existing pipelines currently transport gasoline, gasoline components and MTBE. Ethanol has reduced risk compared to existing service because it is less flammable.
- Pumping ethanol internally via pipeline to local truck loading storage tanks and ethanol additive blending tanks plus storage in those tanks. Reduced risk compared to existing gasoline service since ethanol is less flammable.

- Loading 44 ethanol tankers per day @ 8,800 gallons per tanker. This is a new operation with new risk of fire to be estimated.
- Shipping ethanol via tank truck to Vinvale, Colton, Carson and other locations. This is a new operation with new risk of fire to be estimated.

East Hynes

- Conversion of storage tank from existing hydrocarbon service to ethanol. Reduced risk compared to existing hydrocarbon service since ethanol is less flammable.
- Blending gasoline with ethanol does not create a significant risk. Ethanol is less flammable than the gasoline it is added to.
- Receiving ethanol via pipeline from Marine Terminal 2. Existing pipelines currently transport gasoline, gasoline components and MTBE. Ethanol has reduced risk compared to existing service because it is less flammable. Reduced risk compared to existing service.
- Pumping ethanol blended gasoline internally via pipeline to local truck loading five trucks per day. Comparable risk relative to pumping MTBE gasoline internally.
- Shipping ethanol blended gasoline to distribution. Comparable risk relative to current shipping of MTBE-gasoline.
- Shipping of ethanol via tank truck. New operation with new risk of fire to be estimated.

Vinvale

- Conversion of reformulated gasoline tanks from existing service to ethanol. Ethanol has reduced risk compared to reformulated gasoline because it is less flammable.
- Receiving ethanol via tank truck (18 tankers per day). New operation with new risk of fire to be estimated.
- Receiving ethanol via pipeline from Marine Terminal 2. Existing pipelines currently transport reformulated gasoline. Ethanol has reduced risk compared to existing service because it is less flammable.
- Blending gasoline with ethanol. Blending gasoline with ethanol does not create a significant risk. Ethanol is less flammable than the gasoline it is added to.. Comparable risk relative to existing service.
- Pumping ethanol blended gasoline internally via pipeline to local truck loading. Comparable risk relative to currently pumping MTBE-gasoline.

- Shipping ethanol blended gasoline to distribution. Comparable risk relative to shipping MTBE-gasoline.

Carson

- Conversion of a reformulated gasoline tank from existing service to ethanol. Ethanol has reduced risk compared to reformulated gasoline because it is less flammable.
- Receiving ethanol via tank truck (six tankers per day). New operation with new risk of fire to be estimated.
- Blending gasoline with ethanol. Blending gasoline with ethanol does not create a significant risk. Ethanol is less flammable than the gasoline it is added to. Comparable risk relative to existing service.
- Pumping ethanol blended gasoline internally via pipeline to local truck loading. Comparable risk relative to pumping MTBE-gasoline.
- Shipping ethanol-gasoline to distribution. Comparable risk relative to shipping MTBE-gasoline.

Colton

- Conversion of a reformulated gasoline tank from existing service to ethanol. Ethanol has reduced risk compared to reformulated gasoline because it is less flammable.
- Receiving ethanol via tank truck (eight tankers per day). New operation with new risk of fire to be estimated.
- Blending gasoline with ethanol. Blending gasoline with ethanol does not create a significant risk. Ethanol is less flammable than the gasoline it is added to. Comparable risk relative to existing service.
- Pumping ethanol blended gasoline internally via pipeline to local truck loading. Comparable risk relative to pumping MTBE gasoline.
- Shipping ethanol blended gasoline to distribution. Comparable risk relative to shipping MTBE gasoline.

4.5.3 Review of Potential Hazards

Most industrial accidents may be classified within one of several broad categories that have been developed by the American Institute of Chemical Engineers (AIChE, 1989 and AIChE, 1993). These broad categories and their applicability to the proposed project are described in the following subsections.

4.5.3.1 Toxic Gas Release

Toxic gas releases are usually a concern in evaluating potential accidents at petrochemical facilities. Toxic gas releases are evaluated in terms of possible acute exposures, taking into account the potential for the gas to be transported offsite by the wind. The consequences of such potential releases depend on the specific gas released, the rate of release, the duration of the release, and the atmospheric dispersion and transport conditions. For the proposed project, no direct gaseous toxic release scenarios were defined. Although toxic chemicals such as ammonia, hydrogen sulfide, sulfuric acid, etc., are typically present at the refinery, this project does not introduce any new chemicals or modify existing equipment that would incrementally increase the toxic gas risk above the existing risk. New catalysts associated with the project are in solid pellet form and are not a gas release risk. Vapor emissions from a spill of pentane may cause a suffocation risk in the immediate vicinity of a release but should disperse and be an explosion and fire risk within a short distance from the spill. Toxic gas releases are not applicable.

4.5.3.2 Toxic Liquids Release

Toxic liquid can be released in two forms, as a liquid spill or as aerosol droplets. Liquid spills are typically contained within berms, or dikes, or similar containment designed to prevent runoff. Potential offsite hazards could result from evaporation of spilled products and transport of these gases offsite. Consequences of such a spill would depend upon several factors, such as the location of the spill within the property, the surface area of the spill, the surface on which the spill occurs, the concentration of the liquid, and atmospheric conditions such as wind and temperature. Liquids used in this project are flammable and explosive but not notable for their toxicity. No new toxic chemicals or increased usage of existing toxic chemicals are associated with this project. The primary consideration for risk of upset is the explosive and flammable characteristics of the chemicals associated with this project. Vapors from spills of pentane may produce a suffocation risk in the immediate vicinity of a spill but concentrations should disperse within a short distance from the spill and be primarily an explosion and fire risk. Therefore, a toxic release was not considered to be a realistic scenario to model for the chemicals associated with this project.

4.5.3.3 Toxic Solids Release

A spill of toxic solids would have little potential to affect people outside ARCO property as there are few reasonable transport mechanisms for solids. A potential for offsite hazard could occur if the spilled materials were to catch fire, be introduced to the stormwater system, or be carried by wind. Consequences would be determined by characteristics and quantity of the released material and atmospheric conditions. Catalysts for this project are pelletized and non-flammable. No toxic solid impacts were analyzed for this project.

4.5.3.4 Gas Fire

Several combustible, potentially gas-phased materials will be present in the components of the project, including butane (which is a gas at normal temperatures and pressures), refinery gas, natural gas, and hydrogen. The "worst-case" quantities of gas associated with this project are comparable with the existing systems and no incremental impacts were modeled for gas phase material fires. Fires involving chemicals which remain in the liquid state at normal temperatures and pressures are discussed in the next paragraph.

4.5.3.5 Liquid Pool Fire

Combustible, liquid-phase materials that will be present in components of the project include gasoline, refrigerated pentane and ethanol but only if a major storage tank rupture or pipeline rupture occurred and formed a pool. Pentane boils at 98ºF (37ºC). MTBE, which is being replaced, boils at 130ºF (54.4ºC). Ethanol, which is replacing MTBE boils at 170.6ºF (77ºC). A liquid fire would pose impacts to health and the environment due to thermal radiative effects and smoke. Radiative effects might include burns to humans and/or the ignition of nearby structures. The degree of such impacts depends on the proximity to the fire and the shelter available. Large storage tanks from which a prolonged fire could occur usually are surrounded with containment dikes and are usually located at a distance from process units (with ignition sources). The containment and distance serves to minimize the likelihood of a liquid spill igniting. Liquid fires were modeled for storage tank ruptures into containment areas, for unconfined tank truck ruptures, and for unconfined pipeline ruptures.

4.5.3.6 Solids Fire

The potential for fire involving combustible solids is much lower than for liquids and gases, as solids combustion occurs only within a relatively narrow range of conditions. In the event of a fire, consequences are also typically less severe than a gas or liquids fire due to the smaller volumes involved. No solids fires were considered in this analysis, because the proposed project does not include the use of new or increased use of flammable solids.

4.5.3.7 Confined Explosion

A confined explosion would involve the presence of explosive conditions internal to the process equipment or storage tanks. The pentane storage tank at Marine Terminal 2 will be a refrigerated fixed roof tank with control technology and will not contain sources of oxygen or ignition. Consequently, it was not considered as a candidate for a confined explosion. Most refinery systems are closely monitored with alarms or other warnings, which are triggered when the system conditions occur outside predefined tolerances. Process equipment explosions generally require failure in multiple safeguards. Process equipment also contains substantially less product than the storage tanks and so the magnitude of such explosions would be much less than for the non-process unconfined explosions. Confined explosions were eliminated from consideration in this analysis.

4.5.3.8 Unconfined Explosion

An unconfined explosion may occur if a large mass of combustible material is released prior to ignition. These types of explosions occur following the release of flammable gases or mixtures of gases and liquid droplets, which subsequently evaporate. Unconfined explosions occur in ambient air when a release under proper conditions comes in contact with an ignition source. If the ignition occurs shortly after the release, the explosive effects are lessened and the result is a gas or liquid fire. Explosive effects include both thermal radiation effects (described also under fires) and blast effects. Depending on the severity of the explosion and proximity to the source, offsite effects can range from a loud noise to broken windows to possible structural damage. Persons within or near a building suffering such damage are at risk of injury.

Unconfined explosions were modeled for scenarios involving tank ruptures of pentane and tank truck ruptures for ethanol with associated vapor cloud explosions.

4.5.3.9 Dust Explosion

Combustible solids may also lead to explosions if a sufficient mass of fine particles are dispersed in the air and exposed to an ignition source. However, for refinery and petrochemical plants, these risks are much smaller than for potential releases and consequences of liquid and/or gaseous products. No dust explosion potential is associated with the project because the quantities of solid materials are limited compared to the amount of combustible liquid that is present, and because the proposed project does not include the use of new dust producing solids with explosion potential or increase the use of flammable solids.

4.5.3.10 Boiling Liquid Expanding Vapor Explosion

A boiling liquid expanding vapor explosion (BLEVE) is a potentially catastrophic event usually associated with sudden, massive failure of a pressurized storage vessel. The resulting explosion may generate a blast overpressure wave with fragments of the vessel being projected long distances. If the material in the exploding tank is flammable, it may cause an immediate fireball or may form a vapor cloud which later ignites. The thermal radiation generated by a fireball can be considerable, and can be the predominant cause of potential offsite impacts. BLEVE cases were considered for the pentane storage tank proposed for the project.

4.5.4 Categorize the Risk

Risk is judged by identifying both the severity of the potential consequences and the likelihood of occurrence. Criteria for each of these components of risk are discussed in more detail in the following subsections.

4.5.4.1 Severity

Severity criteria must be defined separately for each type of consequence due to the physical differences in the effect of each event. The types of accidents considered in this evaluation included toxic releases, fires, and explosions. These hypothetical accidents could result in potential toxic gas exposure, heat impacts, and blast consequences. For each of these accidents, use was made of the EPA Risk Management Program Offsite Consequence Analysis Guidance to determine the endpoint. Endpoints for each accident category considered in this study are described below. The distance that had to be traversed away from the center of the upset to reach the endpoint was calculated for each accident scenario. This distance represents the maximum separation distance required to reach the edge of the critical zone of the impact. The edge of the critical zone is the outer limit of potentially serious injuries.

Toxic Exposure Endpoint

Toxic exposures are of concern when a process containing an acutely hazardous material releases the material or when an upset causes the formation and subsequent release of a toxic material. For toxic compounds, the EPA has selected the Emergency Response Planning Guidelines (ERPG) (AIHA/ORC, 1988) Level II as its significance criterion. The ERPG II level is defined as follows:

> The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.

No toxic impacts were considered in this analysis.

Heat Evaluation Endpoint

Radiant heat is a potential hazard that can be associated with either fires or explosions. Radiant heat exposures are measured in units of kilowatts per square meter (kw/m^2). A level of five kw/m^2 was selected by the EPA Guidance document as a significance criterion. A heat level of five kw/m^2 for 40 seconds is capable of causing a second degree burn. The same heat dosage produced by five kw/m^2 for 40 seconds was used to determine the endpoint for BLEVEs and Pool Fires.

Blast Evaluation Endpoint

Blast impacts are of concern wherever flammable materials and ignition sources are present, or where processes operate under high temperatures and pressures. Blast impacts are described in terms of overpressure (i.e., shock waves) and are presented in the American Institute for Chemical Engineering Guidelines for Hazard Evaluation Procedures (AIChE, 1993) and V.J. Clancey's Diagnostic Features of Explosion Damage (Clancey, 1972). The endpoint selected by the EPA as a significance criterion is an overpressure of one psi. An overpressure of one psi may cause partial demolition of houses, which can result in serious injuries to people and shattering of glass windows, which may cause skin laceration from flying glass.

4.5.4.2 Likelihood

The likelihood of an occurrence can be expressed as "Frequent," "Periodic," "Occasional," "Improbable," and "Remote." In qualitative terms, a "Frequent" likelihood is an event that would occur more than once a year. A "Periodic" likelihood is one that occurs once per decade. An "Occasional" likelihood is defined as an event that is likely to occur during the lifetime of the project, assuming normal operation, inspection, and maintenance programs (once in 10 to 100 years). An "Improbable" likelihood is considered to occur every 100 to 10,000 years (a major earthquake capable of rupturing pipelines and storage tanks would fall into this category). A "Remote" likelihood represents an event that is not likely to occur at all. Estimates of likelihood for specific scenarios are discussed in Section 4.5.6.

4.5.5 Select Specific Scenarios

The parameters for each upset scenario were selected based on previous experience with similar projects and using design information provided by ARCO. The parameters included pressure, temperature, composition, flow rates, piping and equipment sizes, size, and description of containment, including location within the ARCO facility. If information was missing for specific parameters (e.g., the area of containment dikes for storage tanks that have not been constructed yet), assumptions were made based on typical industry practice.

4.5.6 Estimate Likelihood of Accidents

Table 4.5-1 lists qualitative likelihood estimates for the events that can contribute to the selected hazard scenarios. The table also lists published data when available. The likelihood estimates were developed by ENSR based on experience with similar projects. The likelihoods are categorized as Frequent, Periodic, Occasional, Improbable, and Remote as defined in Section 4.5.5.2.

4.5.7 Assess Consequences

Consequence modeling was performed for the scenarios identified below. The purpose of the modeling was to estimate the offsite consequences of releases of toxic and flammable materials from units that are proposed for installation or modification as the result of the project.

The modeling was based on EPA's RMP Guidance "worst-case" estimates for explosions, fires, and BLEVEs. The EPA equations for these events were programmed into an EXCEL™ spreadsheet and used to determine the size of the impact zone.

Table 4.5-1
Qualitative and Quantitative Estimates of Failures that may Contribute to Hazardous Releases

Scenario	Likelihood (Qualitative)	Frequency
Tank failure (catastrophic)	Improbable/ Remote	The catastrophic pressurized tank failure rate[4] is approximately one per 2,500 years. Failures are primarily due to cracks. Catastrophic failures that result in explosions are estimated to be one in 40 for a combined one per 100,000 years[3]. Fires would be of higher probability but less than one per rupture. (The combined fire and failure rate for pressurized tanks is approximately one per 2,500 years to one per 100,000 years).
Tank failure from earthquake	Improbable/ Remote	The frequency of a maximum probable (6.3 Richter) Newport-Inglewood earthquake is about one per 100 years.[1] Approximately one in ten spherical vessels fail for lateral accelerations >0.2g which can be generated in such an earthquake.[2] (Bullets/tanks are less vulnerable and would fail less frequently). The number of ruptures that result in explosions is approximately one in 40 based on relating data for catastrophic tank failures with explosions from catastrophic tank failures.[3,4] The combined tank failure and explosion probability is estimated to be one per 40,000 years. Fires would be of higher probability but less than one per rupture. (The combined tank failure and fire frequency is approximately one per 1,000 years to one per 40,000 years.)
Pipe failure from earthquake	Improbable	The event frequency is approximately once per 100 years but the pipe may not rupture[1]. Assume the pipe failure rate in a maximum probable earthquake is one in ten as for tanks. The number of pipe failures that result in unconfined explosions is estimated to be one in ten (by relating failures and failures plus explosions) for a combined estimate of one per 10,000 years[3,4]. Fires would be of higher probability but less than one per rupture. (The combined fire and pipe failure rate is approximately one per 1,000 years to one per 10,000 years).
Pipe failure (catastrophic)	Improbable	The catastrophic pipe failure rate[4] is approximately one per 1,000 years. The number of explosions for pipeline failures is estimated to be an average of one per ten failures (by relating failures with failures plus explosions) for a combined one per 10,000 years[3,4].

Table 4.5-1 (Cont.)
Qualitative and Quantitative Estimates of Failures that may Contribute to Hazardous Releases

Scenario	Likelihood (Qualitative)	Frequency
Truck accident	Improbable	Truck accident rates are approximately one per 8.7 million miles[5]. Assuming 16,060 truck deliveries of ethanol per year of an average 26.1 miles, the expected number of truck accidents will be one per 20.8 years. The likelihood of release is one in ten and of a major release one in 40[7]. The expected major release frequency is approximately one per 830 years.
Rail car accident pentane	Improbable	The rail car accident rate is approximately four accidents per one million miles. Of those accidents, the number that result in the release of hazardous materials are about one in 360[8]. The combined likelihood for hazardous material release is one per 90 million miles. Assume that a maximum of 16 tank cars of pentane are shipped per day and travel an average of 100 miles per trip. The likelihood of a tank car accident resulting in a hazardous release is approximately one per 154 years. Prior pentane shipments were 12 tank cars per day with a risk of one release per 206 years. Qualitatively the risks are equivalent.
Truck Connect/ Disconnect Accident	Periodic	Human error rate[6] is about one per 2,000 operations. For 44 ethanol tankers per day there are 88 connect/disconnects or 32,120 per year. A bad connect/disconnect would be expected about 16 times per year. Assume the same release rate as for truck accidents. The likelihood of any connection release (small spill) is one in ten and of a larger (200 gallons) release is one in 40[7]. The approximate larger release rate for connections is about one per 2.5 years.

Frequent - More than once per year (0 to 1 years)
Periodic - Once per decade (1 to 10 years)
Occasional- During the facility lifetime (10 to 100 years)
Improbable - 100 to 10,000 years
Remote - Not likely to occur at all

1 SCAQMD, 1993
2 A.I.Ch.E. "Chemical Process Quantitative Risk Analysis"
3 F. Lees, "Loss Prevention in Process Industries," Vol 1, 1992
4 A.I.Ch.E. "Process Equipment Reliability Data," 1989
5 ENSR 1994 in "Risk of Upset Evaluation, Unocal San Francisco Refinery, Reformulated Gasoline Project
6 T. Kletz, "An Engineers View of Human Error," 1985
7 ENSR 1994
8 USDOT, Federal Railroad Administration, Accident/Incident Bulletin No. 164, CY 1995, Aug. 1996

The upset scenarios modeled for the project are detailed in this section. Appendix C discusses the methodology used to calculate the impacts. The descriptions contain scenario assumptions. Final modeling results of the distance to reach the radiant heat flux, overpressure, or chemical concentration endpoints are listed immediately following the detailed scenario descriptions.

The following accident scenarios were considered in the analysis of offsite impacts:

- Case 1: Rupture of a existing pipeline (#70) converted from general hydrocarbon service to transport pentane to Marine Terminal 2. The pipeline is assumed to be ruptured due to a digging accident or earthquake. The pipeline releases pentane at the flow rate of the pipe for 10 minutes and forms a pool which spreads out to a one centimeter depth until the pump is shut down. (The maximum flow rate of pipeline #70 is about 1,000 barrels per hour). The released pool is assumed to ignite and burn after 10 minutes of spreading. The incremental risk is estimated by comparing a nonene fire of equivalent size to a pentane fire. (Nonene is a typical hydrocarbon currently transported in the pipeline).
- Case 2: A catastrophic failure of the new pentane storage tank at Marine Terminal 2 is assumed to release 100,000 BBL of pentane as a vapor cloud which explodes (EPA "worst-case" assumption). The catastrophic failure was assumed to be caused by a major external event like an earthquake. The incremental risk of 100,000 BBL of pentane was compared with 20,000 BBL of nonene. (The 100,000 BBL pentane tank will replace an existing 20,000 BBL nonene tank, so the incremental impact was modeled).
- Case 3: The contents of the pentane tank (100,000 BBL) are spilled into a dike that is 19.5 feet high and capable of containing the entire contents of the tank plus 10 percent. The liquid in the dike then catches fire. The storage tank failure was assumed to be caused by an external event or degradation of the equipment. The incremental risk was compared with a nonene fire.
- Case 4: A fire in the vicinity of the Marine Terminal 2 pentane tank causes the tank to fail catastrophically resulting in a "fireball" or BLEVE. Ten percent of the contents explode as a vapor cloud. The incremental risk was compared with a nonene BLEVE.
- Case 5: A 300,000 BBL barge of pentane ignites and burns through a 10,000 square foot opening in the deck. The pentane fire is compared with an MTBE fire to estimate the incremental risk of the conversion project. A barge of ethanol is also compared with MTBE under the same conditions.
- Case 6: The contents of an ethanol tank truck are spilled in a vehicle accident. The entire 8,800 gallons spread in an unconfined manner to a depth of one centimeter and ignites.
- Case 7: An ethanol truck is improperly connected/disconnected and releases 200 gallons of ethanol before the emergency shut-off can be activated. The spill spreads in an unconfined manner to a depth of one centimeter and ignites.

- Case 8: The pentane pipeline is ruptured and releases pentane that forms a vapor cloud and explodes after two minutes (1400 gallons released as vapor). The incremental impact is estimated by comparing with an equivalent nonene explosion.

The results of the model runs are summarized in Table 4-5-2.

Table 4.5-2
Distance (meters) to Endpoint from Center to Upset*

Case	Event	Explosion	Pool Fire	BLEVE
1	Rupture Existing Pipeline Pentane	NA	326	NA
1	Rupture Existing Pipeline Nonene	NA	280	NA
2,3,4	Pentane Tank Failure (100,000 BBL)	3,712	344	2,276
2,3,4	Nonene Tank Failure (20,000 BBL)	2,257	132	1,253
5	300K BBL Barge Fire Pentane	NA	193	NA
5	300K BBL Barge Fire MTBE	NA	153	NA
5	300K BBL Barge Fire Ethanol	NA	73	NA
6	Ethanol Truck Fire Unconfined	NA	137	NA
7	Bad Connect/Disconnect	NA	21	NA
8	Rupture Existing Pipeline Pentane (2 Minute Vapor Cloud)	258	NA	NA
8	Rupture Existing Pipeline Nonene (2 Minute Vapor Cloud)	268	NA	NA

* Endpoint – EPA RMP
Explosion endpoint – 1 psi
Fire/BLEVE Endpoint – 5KW/m^2 for 40 seconds or equivalent
NA – Not Applicable

Case 1 compared a pentane pipeline rupture and fire with an assumed nonene pipeline rupture and fire under the same conditions and flow rate. Table 4.5-2 shows that with pentane, the size of the impact zone for an unconfined release and fire increases by approximately 16 percent with pentane. This is an increase in impact distance of about 46 meters, which could be significant depending on the location of the pipeline rupture.

Case 2 assumes a vapor cloud explosion of the entire 100,000 BBL contents of the pentane storage tank. This is a high unlikely event but it is the EPA "worst-case" assumption for pentane. The pentane tank is a new application that replaces smaller product tanks. The largest (20,000 BBL) nonene tank was used as a baseline for pentane tank impacts. (The 100,000 BBL pentane tank replaces the 20,000 BBL nonene tank). The impact distance for the pentane explosion scenario was approximately 3.7 kilometers. The baseline nonene impact distance was about 2.3 kilometers. Pentane has an incremental increase of approximately 60 percent. Figure 4.5-1 shows the relative impact at Marine Terminal 2 which is significantly larger for the pentane tank.

Case 3 again examines the pentane tank with a more realistic but improbable scenario of a tank rupture and spill to containment with subsequent fire. The impact distance was calculated to be 344 meters. The impact distance for a nonene tank fire was 132 meters. The pentane impact is a factor of 2.6 times the nonene impact and is significant.

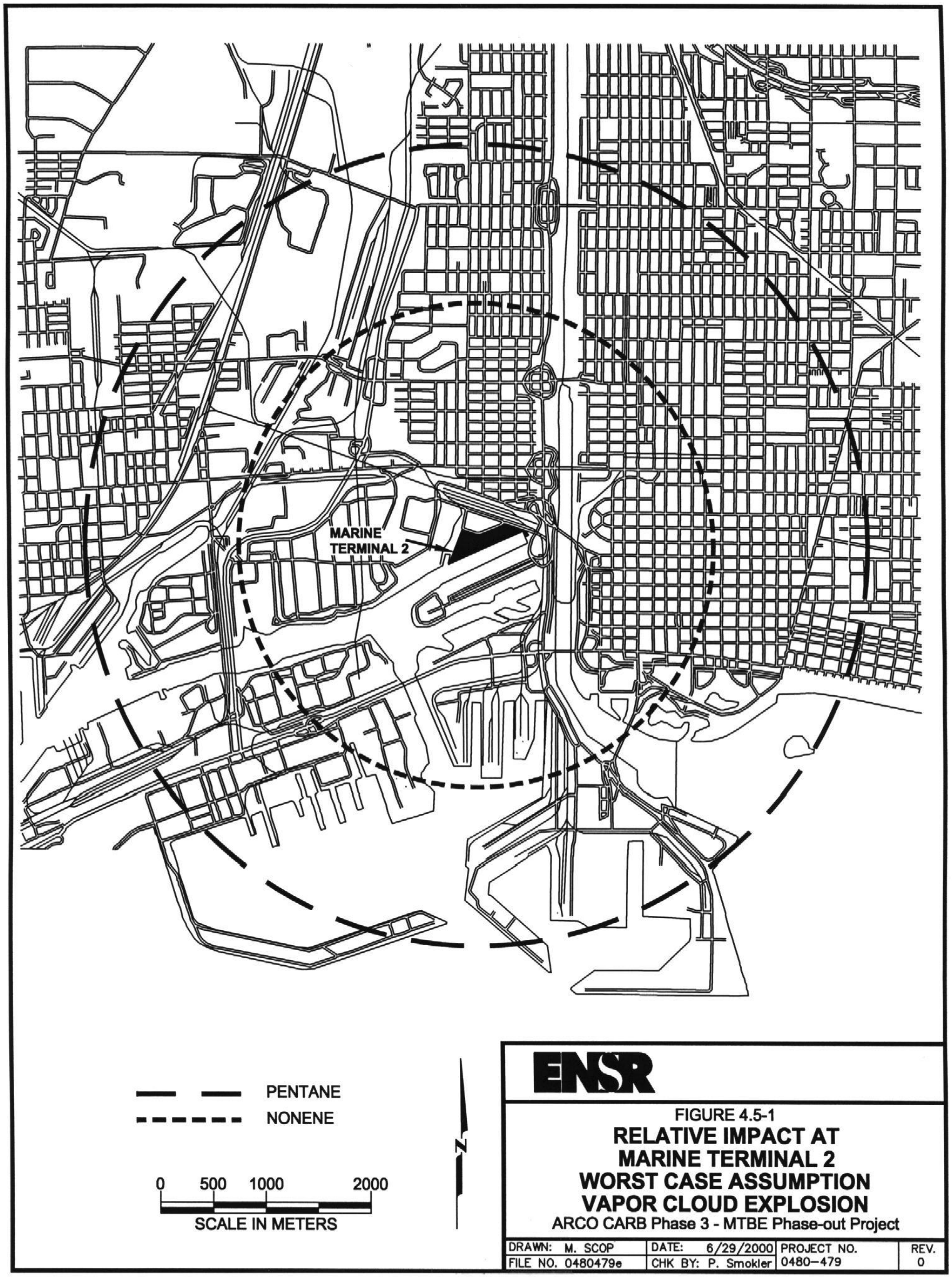
Case 4 assumes that the pentane tank fails catastrophically due to a nearby tank fire which causes the pentane to boil and explode. Using the EPA Guidance equations, the impact of the BLEVE was calculated to be 2,276 meters. This calculation assumed that 10 percent of the pentane in the tank was vaporized and exploded. A similar calculation for nonene estimated the impact to be 1,253 meters. The pentane impact is almost double the nonene impact and is significant.

Case 5 compared the incremental impact of a 300,000 BBL pentane ship fire with a 300,000 BBL MTBE ship fire and a 300,000 BBL ethanol ship fire with MTBE. The volume of the barge shipments of ethanol plus pentane are approximately equivalent to the volume of the MTBE shipments. A large deck area was assumed to have been exposed by an initial event, such as an explosion, to allow a 10,000 square foot opening for a pool fire. The impact of the three pool fires was compared. Table 4-5-2 shows that the ethanol barge will have significantly lower (about 50 percent lower) impact distance than an MTBE barge. The pentane impact distance is about 26 percent larger than for MTBE. The risk is a trade-off. The combined ethanol, pentane risk is lower than MTBE but the individual pentane risk is significantly greater than the former MTBE risk.

Case 6 estimates the impact of the unconfined release of 8,800 gallons of ethanol. The impact distance from a pool fire was estimated to be 137 meters. This could be significant depending on the location of the release.

Case 7 estimates the impact of a partial spill of ethanol due to a bad hose connection or hose rupture during loading or unloading. About 200 gallons was assumed to be released in an unconfined manner and then to ignite. The impact distance was calculated to be approximately 21 meters. This risk would be confined to the local area and is not considered to be significant.

Case 8 assumes that the pentane pipeline is ruptured and releases a cloud of vapor for two minutes which then explodes. The impact was estimated to extend for 258 meters in any direction surrounding the breach. The nonene impact zone is 268 meters, or approximately four percent larger than for pentane. These two scenarios are approximately equivalent and the incremental risk is not significant.


MARINE
TERMINAL 2
PENTANE
NONENE
0 500 1000 2000
SCALE IN METERS
N
ENSR
FIGURE 4.5-1
RELATIVE IMPACT AT
MARINE TERMINAL 2
WORST CASE ASSUMPTION
VAPOR CLOUD EXPLOSION
ARCO CARB Phase 3 - MTBE Phase-out Project
DRAWN: M. SCOP
FILE NO. 0480479e
DATE: 6/29/2000
CHK BY: P. Smokler
PROJECT NO.
0480–479
REV.
0

It should be noted that the upsets that were modeled are not likely to occur and were very conservatively based on EPA RMP "worst-case" and alternate case assumptions. However, in the unlikely event that an upset would occur, it would be significant. The consequences also do not take credit for mitigation measures that ARCO has in place or will have in place when the project is completed. Mitigation measures are discussed in Section 4.5.10.

4.5.8 Potential Risks from Transportation Accidents

The potential for increased risk due to transportation accidents associated with the project was evaluated for train traffic and truck traffic, which are discussed in the following subsections. It is anticipated that there will be an increase in rail traffic due to this project for transport of pentane from the facility and for delivery and removal of butane periodically during the year. Also, truck traffic will increase for the distribution of ethanol.

4.5.8.1 Train Traffic

It is anticipated that the project will increase the number of railcar shipments of pentane at LAR. The current pentane loading capacity is six spots and two additional spots will be added. At maximum utilization, two railcars per slot can be handled per day. The increase in pentane throughput will not increase the severity of a tank car accident but will increase the probability, thereby potentially increasing the incremental risk. Table 4.5-2 estimates the likelihood of a railcar accident based on the assumption that a maximum of 16 railcars will be loaded per day and shipped an average of 100 miles per trip versus a maximum of 12 railcars per day before this project. As shown in Table 4.5-1, the likelihood of an accident with the release of hazardous materials changed from once per 206 years before to once per 154 years afterward (one per 90 million miles divided by 584,000 miles per year). Qualitatively, these risks are equivalent and considered to be “improbable.” The incremental risk is not considered to be significant

For butane, eight existing propylene spots will be modified to handle butane or propylene. The maximum number of railcars that could be loaded per day will not increase. Butane impacts are similar to existing propylene impacts. (The impact distance due to a butane explosion is about one percent less than the impact distance from an equivalent volume of exploding propylene. Butane has about 0.4 higher heat of combustion than propylene and about 4 percent less density than propylene. The net effect is a slightly less explosive impact for butane for the same volume as propylene). The difference in risk between propylene and butane is not significant.

4.5.8.2 Truck Traffic

The project will require the use of approximately 44 tank truck deliveries of ethanol per day. The total number of shipments is expected to be about 16,060 per year. Formerly, MTBE was shipped by pipeline rather than by truck. Truck shipment of ethanol represents a potential new risk. The distance traveled by all ethanol trucks per day was estimated from trip maps to be 1,148 miles per day (an average of 26.1 miles per trip). The estimated annual accidental release rate for all ethanol truck delivery (assuming 419,020 miles per year) is one major release per 830 years. The pipeline accident rate was estimated to vary from once per 1,000 years for major failures to once per 10,000 years for major failures with explosions. Both these likelihoods would be considered as improbable (see Table 4.5-1). MTBE in a 10 minute pipeline release would have a larger impact than a tank truck release of ethanol due to its higher rate of combustion. This risk is not considered to be significant.

4.5.9 Mitigation Measures

The potential incremental increase in risk that will result from the project does not substantially change the expected risk from LAR and other petroleum refineries located in densely populated urban areas. This is based on the low probability of the occurrence of a catastrophic event, the very conservative assumptions used to estimate the worst cases and the implementation of ARCO inspection programs, safety systems and mitigation measures to reduce risk.

Due to the materials stored and refining processes that occur onsite, the risk of large-scale upset conditions is always present to some degree. The primary area that creates the largest increase of risk from the project is related to the new pentane storage tank at Marine Terminal 2.

H-1: As part of the proposed project, ARCO will be required to update LAR's Process Safety Management (PSM) Program and Risk Management Program. Federal OSHA regulations have been promulgated that require refineries to prepare and implement a PSM Program. The federal requirement is identified under Title 29 of the Code of Federal Regulations CFR Part 1910, Section 119 (29 CFR 1910.119) and the California regulation is found under Title 8 of the California Code of Regulations (CCR), Section 5189 (8 CCR 5189). Risk Management Programs are covered under California Health and Safety Codes 25534 and 40 CFR Part 68, Section 112r.

A PSM that meets the requirements of the regulations and is appropriately implemented is intended to prevent or minimize the consequences of a release involving a toxic, reactive, flammable, or explosive chemical. The primary components of a PSM include the following:

- Compilation of written process safety information to enable the employer and employees operating the process to identify and understand the hazards posed by the process.
- Performance of a process safety analysis to determine and evaluate the hazard of the process being analyzed.

- Development of operating procedures that provide clear instructions for safely conducting activities involved in each process identified for analysis.
- Training in the overview of the process and in the operating procedures for both refinery personnel and contractors is required. The training should also emphasize the specific safety and health hazards, procedures, and safe practices.
- A pre-start up safety review for new facilities and for modified facilities where a change is made in the process safety information.

H-2: A pre-start up safety review will be performed for those additions and modifications proposed under the project where the change is significant enough to require a change in the process safety information and/or where an acutely hazardous and/or flammable material would be used. The review will be performed by personnel with expertise in process operations and engineering. The review will verify the following:

- Construction and modifications are in accordance with design specifications and applicable codes.
- Safety, operating, maintenance, and emergency procedures are in place and are adequate.
- Process hazard analysis recommendations have been addressed and actions necessary for start-up have been completed.
- Training of each operating employee and maintenance worker has been completed.

If it is determined during the pre-startup safety review that design and construction techniques alone cannot reduce the risk, further measures will be evaluated.

H-3: An RMP/CalARP will be prepared for any new pentane processes that contain more than 10,000 pounds of pentane. The RMP/CalARP will be completed before the process becomes operational.

The following items are available to reduce the risk of upset from the pentane storage tank to be located at Marine Terminal 2:

H-4: 24-hour per day, seven day per week staffing at Marine Terminal 2.

H-5: Ultra-violet fire detectors

H-6: Manual shutdown of liquid into or out of the tank in case of fire, which will minimize the quantity of release.

H-7: High-pressure fire deluge systems and protective coatings for the pentane tank to reduce the possibility of BLEVEs caused by fires in the vicinity.

H-8: The current monitoring system will apply to the existing and modified pipelines related to this project. Pipelines are currently monitored from a central control room that is staffed 24-hours per day. In the event of a pipeline rupture, the response time for shutdown is estimated to be four minutes. Risk of upset calculations for the pipelines conservatively assumed a ten-minute response time.

H-9: Reduce accident probability through the improvement of hiring policy, driver training, vehicle inspections, and vehicle maintenance.

Based on the increase expected from project traffic compared to the volume of existing traffic, the potential for increased traffic accidents with associated hazardous material spills is not considered to be significant. Ethanol deliveries will increase mileage in the Los Angeles Basin by 1,148 miles per day out of the total daily mileage (all categories of vehicles) of 320,439,000 miles per day in the South Coast Air Basin (California Air Resources Board, Daily Emissions, MVE17G Model, 1998). However, to further reduce this potential, ARCO will adhere to additional selected practices.

Some of these practices have already been implemented for existing transportation onsite and will also apply to the increased number of ethanol deliveries due to the project. The following practices are likely to reduce accident rates rather than release rates and quantities.

- Hiring policies to ensure driver familiarity with flammable material hauling
- Improved driver training
- Enhanced vehicle inspection programs
- Enhanced vehicle maintenance programs

Although the mitigation measures proposed will reduce the likelihood of the occurrence of an upset condition, the off-site impact of such an occurrence remains significant.

4.6 Transportation/Traffic

This section describes the potential impacts of the proposed development upon the surrounding arterial traffic network. Traffic generated by development of the proposed project is added to the existing volumes presented in Chapter 3, and the resulting capacity impacts are assessed.

Impacts to transportation and circulation will be considered significant if the following criteria are met:

- A major roadway or railroad is closed to all through traffic and no alternate route is available.
- Peak period levels on major arterials within the vicinity of LAR and terminals are disrupted to a point where intersections with a LOS of C or worse are reduced to the next lower LOS, as a result of the project for more than four weeks.
- The project will increase traffic to and/or from any one facility or site by more than 350 truck trips per day.
- The project will increase customer traffic to a facility by more than 700 trips per day.
- The volume to capacity ratio increases by two percent for intersections with a LOS rating of E or F for more than four weeks.

4.6.1 Trip Generation

Construction of the proposed project at LAR is scheduled to begin February 2001, and be completed in December 2002. Construction is anticipated to take place four days per week, Monday through Thursday, from 6:00 a.m. to 5:00 p.m. Occasional night, Friday, or weekend shifts may be required to maintain the construction schedule.

The construction activities at the terminals will occur between February 2001, and December 2002. Actual construction time will vary at the terminal sites based on the types of construction and modifications required. The maximum duration for construction at an individual terminal will be twelve months. Construction activities will occur Monday through Friday, from 6:00 a.m. to 5:00 p.m. Occasional night or weekend shifts may be required to maintain the construction schedule.

Table 4.6-1 summarizes the anticipated peak number of construction vehicles at LAR and each terminal site.

An examination of this table indicates that the addition of construction workers will be relatively small at the terminal locations. At the LAR, the construction effort is anticipated to require a peak of 350 daily vehicles or 700 per day vehicle trips during the construction period.

Table 4.6-1
Construction Traffic Summary

Location	Peak Vehicles	Est. Construction Time
Los Angeles Refinery (LAR)	350	24 months
Vinvale Terminal	10	2 months
Carson Terminal	5	2 months
Colton Terminal	5	2 months
East Hynes Terminal	5	3 months
Hathaway Terminal	10	2 months
Marine Terminal 2	45	12 months

Construction activities will occur during a four-day work week at 6:00 AM to 5:00 PM Monday through Thursday. This results in an average construction project AM peak hour (5:30 AM to 6:30 AM) of 160 vehicle trips and an average PM peak hour (5:00 PM to 6:00 PM) of 170 vehicle trips. The AM peak hours of the adjacent street system occurs during the AM peak period of 7:00 AM to 9:00 AM as indicated in the Congestion Management Program (CMP) Guidelines. (The CMP, a state-mandated program to improve mobility and reduce traffic congestion to acceptable levels for Los Angeles County, was adopted by the Metropolitan Transportation Authority in 1992 and is updated biannually. The program was developed in conformance with Proposition 111, the gas tax initiative approved by California voters in 1990.)

Traffic attributable to the construction of the project will arrive at the site before the AM peak period would begin and will not affect the AM peak hour intersection capacity utilization (ICU) values. Therefore, the analysis examines impacts from traffic attributable to the proposed project only during the PM peak hour.

4.6.2 Trip Distribution

Distribution of project generated traffic was derived from observation of existing travel patterns in the vicinity of the project sites. An increase in vehicular movements will occur at the various project sites during the construction period. The anticipated construction traffic at the terminal locations is considered less than significant, ranging from a low of five vehicles to a high of 45 vehicles over a two to three month period. Construction traffic at the refinery is forecast to peak at 350 vehicles. Hence, this analysis is focused on impacts at locations surrounding the refinery (LAR).

Impacts from project construction traffic at the LAR were analyzed using the two parking locations at Gate 16 and Gate 62. It is expected that most of the construction personnel would commute to the site in private automobiles even though ARCO would encourage construction contractor's employees to organize carpools. Construction commuters would enter the construction parking lots from 223rd Street at Gate 16 or Gate 62. Construction commuters would not enter through the Main Gate from Sepulveda Boulevard or Gate 7 from Wilmington Avenue.

Materials required to support the construction effort would be delivered to the refinery by truck and rail. Peak truck and rail usage would correspond to the peak manpower periods. Construction materials, heavy construction equipment, piping, and new equipment would be delivered throughout the construction period. Truck deliveries would be made through Gate 60. Railroad cars carrying heavy equipment would enter the project site from a rail line along Alameda Street.

To estimate the project-related traffic volumes at various points on the transportation system adjacent to the refinery and thereby establish the magnitude and extent of traffic impacts, a three-step process was utilized. First, the amount of traffic which would be generated during construction was determined. Second, the construction traffic was geographically distributed to appropriate residential, commercial, and industrial areas. Finally, the trips were assigned to specific roadways and the traffic increases were evaluated on a route-by-route basis.

The average daily truck traffic at the refinery during construction would be approximately seven trucks per day. Since these would mainly consist of material deliveries, they would be spread throughout the work day with few deliveries occurring during the peak hour. Therefore, their contribution to overall traffic impacts would be negligible. As a conservative or "worst-case" analysis, the maximum expected employees at the construction site was assumed to occur daily.

4.6.3 2000/Existing Plus Project Traffic Impacts

The proposed project would generate short-term impacts on traffic and circulation in the project vicinity during the construction period. The project would temporarily affect the present pattern of circulation of the labor force as well as rail and truck traffic associated with the construction and operation phases of the project.

Construction traffic related to the project would utilize existing parking areas at the refinery during construction. It would not affect the existing refinery facilities or the shipping and receiving facilities at the project site.

Roadways in the vicinity of the project would be impacted by the project's construction-related traffic. Project related construction traffic would contribute less than two percent of the daily traffic volume on these roadways.

To more carefully assess the impacts on the surrounding roadways, an ICU analysis was conducted for the 27 intersections which would be most directly impacted by project construction traffic.

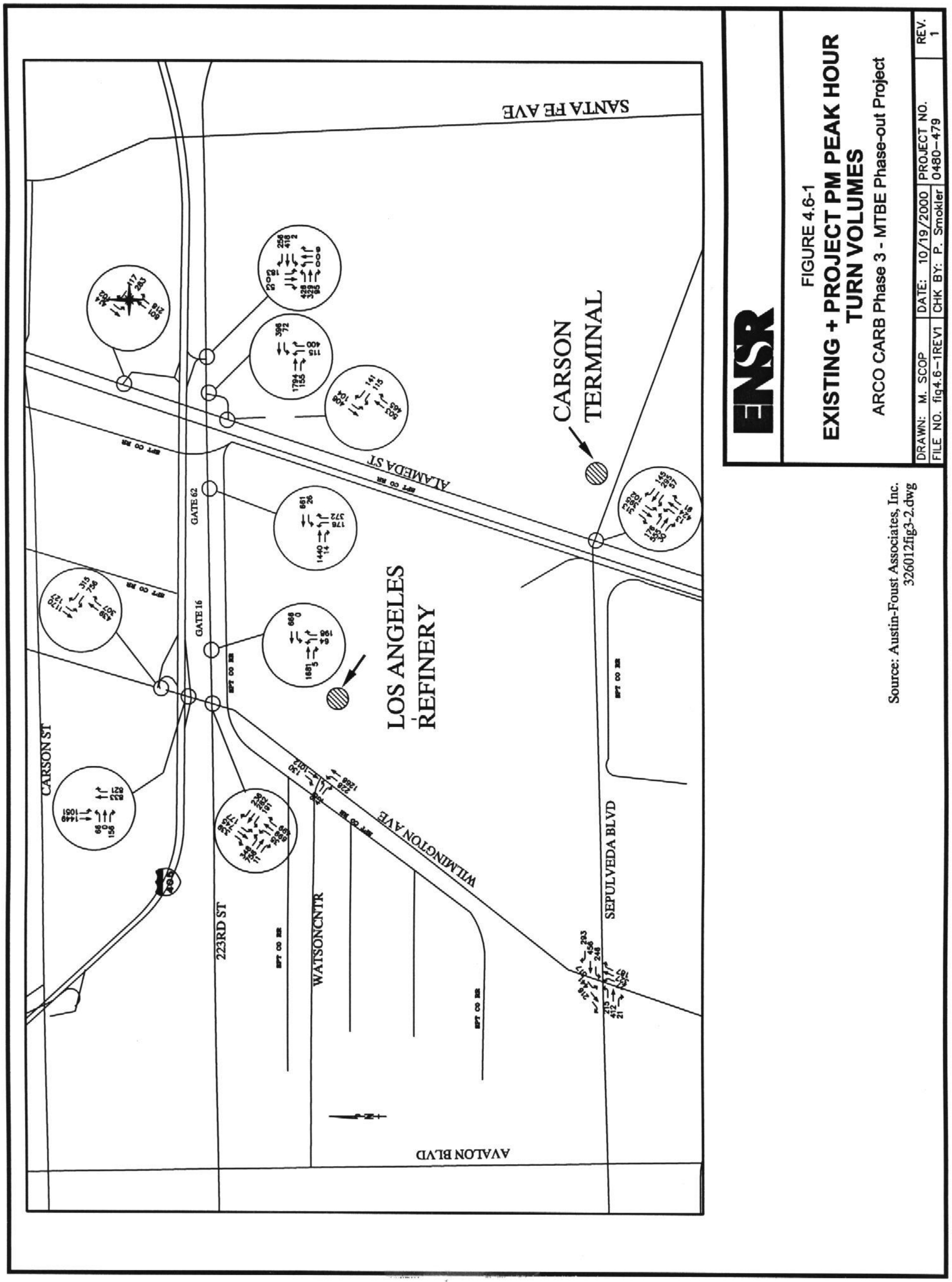
Analysis year-plus-project intersection volumes for the project were generated by adding the project intersection volumes to the existing Year 2000 background intersection volumes. PM peak hour 2000-plus-project turn volumes are illustrated in Figures 4.6-1 and 4.6-2, and corresponding ICUs based on existing lane configurations are summarized in Table 4.6-2. Actual ICU calculations are included in Appendix D). An examination of Table 4.6-1 indicates that the addition of construction traffic to existing intersection volumes would cause a .01 to .06 change in the ICU at some intersection locations around the LAR and the terminals. The additional construction traffic does not result in a significant impact as the level of service at these intersections will remain above LOS E or F.

4.6.4 On-site Circulation and Parking

Sufficient on-site parking is available to accommodate the increased parking demand from construction workers at the five distribution terminals and one Marine terminal. The physical site of the refinery provides parking capacity well beyond the current operational requirements. The main parking lot at Gate 7 has 550 parking spaces. Several smaller parking lots are located within the ARCO property; these lots have a combined capacity of 400 vehicles. The contractor parking lot at Gate 62 has a capacity of approximately 1,300 vehicles for contractor employee use only. The facility currently employs approximately 1,100 people.

A weekday shift of 780 employees operates during typical daylight hours. The swing shift of 115 employees are present during each shift. On any given day, approximately 25 percent of the employees are not on the premises because of rotating shifts, vacations, and sick leave.

No new parking facilities would be needed to accommodate the new permanent employees hired to operate the process units. The largest existing shift includes 780 employees, 25 percent of who are usually not present because of sick leave, vacation, and rotating shifts. The main parking lots include 550 spaces. In addition to the 550 spaces, the project site has 400 parking spaces at the operational offices, maintenance offices, and administrative offices. Because of significant carpooling efforts by ARCO, the average occupancy of worker vehicles is 1.3 employees per car. The addition of 10 employees during the largest shift would not overburden the existing parking facilities at LAR. The addition of 10 employees or less at the terminals would not overburden the existing parking facilities at these locations.



Source: Austin-Foust Associates, Inc.
326012fig3-2.dwg

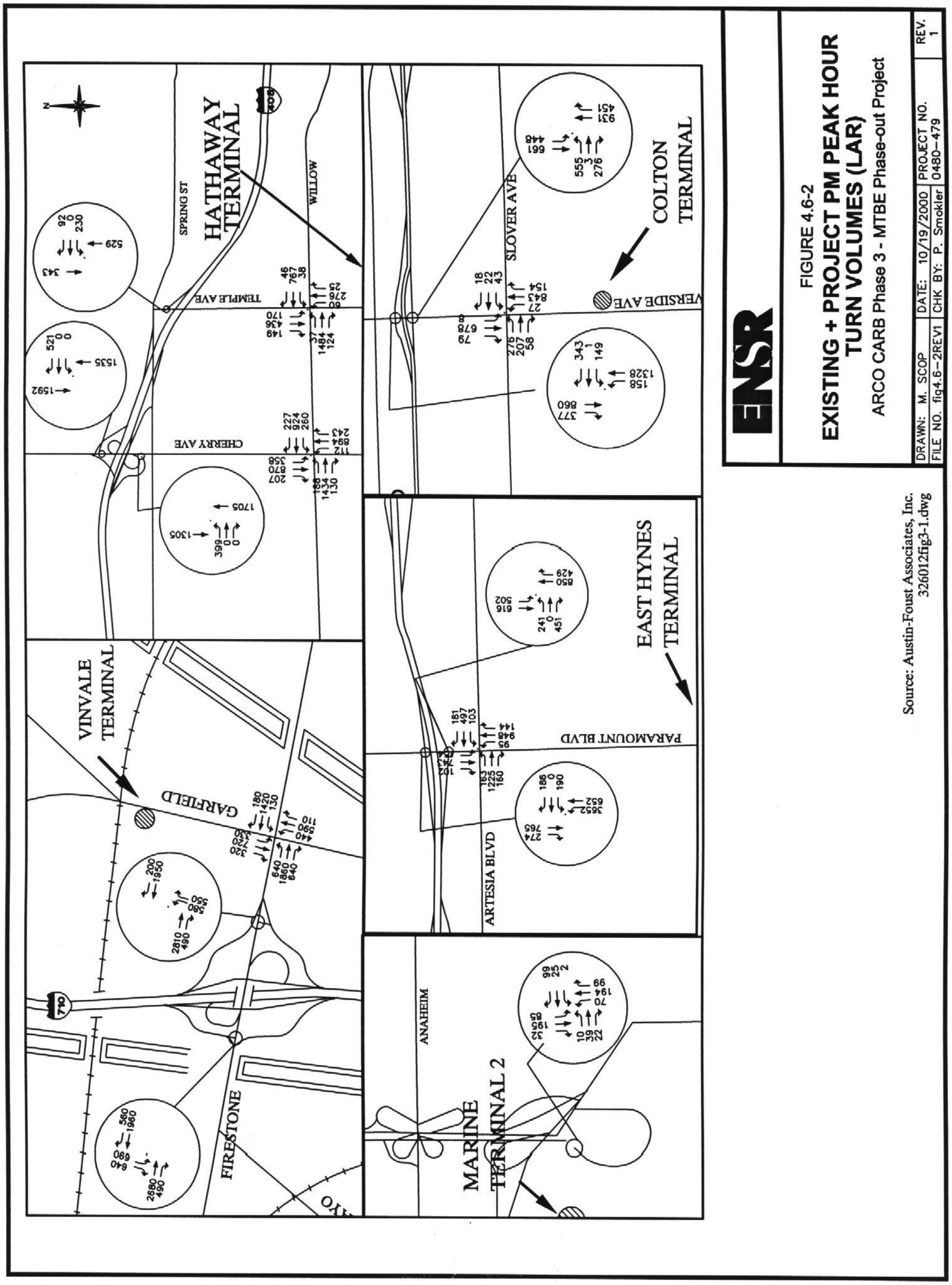

HATHAWAY TERMINAL
COLTON TERMINAL
VINVALE TERMINAL
EAST HYNES TERMINAL
MARINE TERMINAL 2
ENSR
FIGURE 4.6-2
EXISTING + PROJECT PM PEAK HOUR TURN VOLUMES (LAR)
ARCO CARB Phase 3 - MTBE Phase-out Project
DRAWN: M. SCOP
DATE: 10/19/2000
PROJECT NO. 0480-479
REV. 1
FILE NO. fig4.6-2REV1
CHK BY: P. Smokler
Source: Austin-Foust Associates, Inc.
326012fig3-1.dwg

Table 4.6-2
Existing and Forecast Level of Service Summary

Intersection	(2000) Existing PM	Existing+ Project PM	% Chg
LAR and Carson Terminal			
1. Wilmington & I-405 NB on/off	.67	.67	-NC-
2. Wilmington & I-405 SB on/off	1.01	1.01	-NC-
3. Wilmington & 223rd	.79	.79	-NC-
4. Wilmington & Watson Center	.68	.69	.01
5. Wilmington & Sepulveda	.87	.87	-NC-
6. Alameda & I-405 NB	.52	.53	.01
7. Alameda & 223/Wardlow Access	.47	.48	.01
8. Alameda & Sepulveda	.83	.84	.01
9. I-405 SB on/off & 223/Wardlow	.49	.49	-NC-
10. 223rd & Alameda/Wardlow Access	.82	.85	.03
11. Gate 16 & 223rd	.73	.79	.06
12. Gate 62 & 223rd	.72	.78	.06
Hathaway Terminal			
13. Temple & Willow	.67	.68	.01
14. Cherry & Willow	.83	.83	-NC-
15. Cherry & I-405 SB ramp	.76	.76	-NC-
16. Cherry & I-405 NB ramp	.91	.91	-NC-
17. Temple & I-405 NB ramp	.41	.41	-NC-
Vinvale Terminal			
18 I-710 NB off ramp & Firestone	1.03	1.03	-NC-
19. I-710 SB on & Firestone	1.00	1.00	-NC-
20. Garfield & Firestone	1.00	1.00	-NC-
Long Beach Marine Terminal 2			
21. I-710 on/off ramp & Pier B St	.32	.34	.02
Colton Terminal			
22. Riverside Dr & I-10 EB on/off ramp	.53	.54	.01
23. Riverside Dr & I-10 WB on/off ramp	.67	.67	-NC-
24. Riverside Dr & Slover Ave	.45	.45	-NC-
East Hynes Terminal			
25. Paramount & SR-91 EB ramp	.82	.83	.01
26. Paramount & SR-91 WB ramp	.69	.69	-NC-
27. Paramount & Artesia	.93	.94	.01

NC= No Change
Level of service ranges: . 00 - .69 B .70 - .79 C
.80 - .84 D .85 - .89 D+
.90 - .99 E Above 1.00 F

4.6.5 Mitigation Measures

The traffic analysis indicates that the proposed project would cause additional construction traffic to existing intersection volumes near the LAR and the terminals. However, project construction traffic does not significantly change the ICU values at the study locations and no mitigation is required.

No mitigation measures are proposed for the small increase in truck traffic to and from the LAR and terminals related to the transportation of ethanol and components required for blending with the refined gasoline. However, scheduling of truck operations will disperse deliveries throughout the off-peak hours to minimize peak hour traffic impacts.

Adequate off-street parking inside the refinery will be provided to accommodate the peak construction and operating labor force.

The entry point to the refinery for construction, commuter and delivery vehicles minimizes impacts on traffic and circulation patterns on the street system near the refinery, and maintains access for pedestrians, bicyclists, and motor vehicle traffic.

If required, truck operations for the delivery of over-size equipment and materials will be conducted to the maximum extent possible during off-peak hours to minimize traffic impacts. The permits to transport over-sized loads over state highways will be acquired through the California Transportation Department. Deliveries of large or odd size materials and equipment will be shipped into the refinery over existing railroad lines.

4.7 Energy Sources

The impacts to energy and mineral resources will be considered significant if any of the following criteria are met:

- The project conflicts with adopted energy conservation plans or standards.
- The project results in the use of energy in a wasteful manner.
- The project results in substantial depletion of existing energy resource supplies.
- An increase in demand for utilities impacts the current capacities of the electric and natural gas utilities.

4.7.1 Construction Impacts

Project construction would result in the expenditure of non-renewable energy sources, primarily gasoline and diesel fuel. The proposed project is expected to require a total of approximately

210,780 gallons of gasoline and 309,974 gallons of diesel fuel during construction activities at all affected facilities. Gasoline and diesel fuel estimates are calculated in Appendix B.

Year 2000 CEC projections of diesel fuel and gasoline usage for construction activities in California were estimated to be 1,086 million gallons per year and 6,469 million gallons per year, respectively (CEC, 1999). Assuming construction activities in future years would yield similar results, the proposed projects usage of diesel fuel and gasoline are 0.027 percent and 0.003 percent, respectively, of the projected demand.

According to the California Energy Commission's (CECs) *1999 Fuels Report*, California's crude oil demand will be met by a combination of in-State, Alaska, and foreign supplies for all forecasted years. The CEC projections also indicated that these supplies will be sufficient to meet California's fuel demands for all forecasted years (CEC, 1999).

Based on the available supply of diesel fuel and gasoline, and the small percentage of the total demand that the project is expected to consume, the impacts to fuel consumption would not be considered significant.

4.7.2 Operation Impacts

The primary electrical demand from the proposed project would be for pumps at LAR, the pumping of ethanol and pentane at Marine Terminal 2, and the refrigeration of the pentane storage tank at Marine Terminal 2. The project would require the purchase of an estimated additional 707,000 kilowatt hours per year of electricity from Southern California Edison (SCE) over current electricity uses of 690,329,031 kilowatt hours per year. SCE was able to supply 78 billion kilowatt hours to customers in 1999 (Alexander 2000). The increase in electricity for the proposed project (707,000 kilowatt hours per year) represents 0.0009 percent of the total energy demand of users of the SCE distribution system. Since this small additional demand is negligible relative to the existing demand, the additional electricity to be purchased from SCE will not have a significant impact on the electrical supply for the project areas. It should also be noted that several new power plants are currently being permitted by the California Energy Commission, the addition of the new plants will also support the regional power demand.

4.7.3 Mitigation Measures

No significant impacts to energy sources are expected to result during construction or operation of the proposed project. Therefore, no mitigation is necessary or proposed.

4.8 Solid/Hazardous Waste

Impacts to waste disposal will be considered significant if the generation and disposal of either nonhazardous or hazardous waste exceeds the capacity of designated landfills.

4.8.1 Nonhazardous Waste

It is estimated that during the construction of the proposed project at LAR, approximately 150 tons of municipal (non-hazardous) solid waste would be generated over a 30-month period. It is estimated that about 10 percent of the waste would be recycled and the remaining 90 percent would be land filled off-site. Solid waste generated at LAR would be disposed of at one of the landfill sites maintained by the LACSD. As stated in Section 3.8.1, these sites have the capacity to accept the waste produced by the proposed project.

The terminals would generate a minimal amount of non-hazardous waste during construction over a one-year period. Non-hazardous waste generation would include paper products and metals from piping replacement. It is estimated that approximately 10 percent of these wastes would be recycled and the remaining wastes would be disposed of at an approved landfill. Solid waste generated at the Carson, Marine Terminal 2, East Hines, Hathaway and Vinvale terminals would be disposed of at one of the landfill sites maintained by the LACSD, and the Colton terminal would be serviced by the San Bernardino County Midvalley landfill. As stated in Section 3.8.1, these sites have the capacity to accept the waste produced by the proposed project.

During the operation phase of the project, an additional 75 tons per year of municipal solid waste, such as paper, product packaging, disposable cups and other such non-process wastes would be generated from operator personnel activities. This represents a relatively small portion of the approximately 18,000 tons per year of municipal solid waste generated at the LAR and is not considered significant. About 10 percent of this would be recycled and the rest sent to an LACSD landfill site capable of accepting this additional 75 tons per year of municipal solid waste.

LAR has an ongoing program to recycle aluminum cans, paper, cardboard, glass and plastic bottles. The municipal solid waste to be recycled as part of these projects would be in addition to the items that will be recycled as part of the ongoing recycling program.

Operation of the proposed project would not be expected to generate additional non-hazardous waste at the terminals (with the exception of Marine Terminal 2) as there would be no new operations or expansion of existing operations that would generate waste. Once the pentane storage tank was constructed at the Marine Terminal 2, no additional generation of non-hazardous waste would be anticipated. No significant impacts on solid waste facilities are expected.

4.8.2 Soil Excavation

Soil excavation would occur primarily in one area at LAR, at the new butane loading racks. The new butane loading racks would require excavation in the area adjacent to the existing loading racks. A bermed containment area would be constructed to hold a potential release from butane/pentane equivalent to six rail cars and 90 minutes of firewater supply. The total volume of this containment area would be approximately 56,435 cubic feet. Minor grading and filling activities for other areas at LAR would be required for the construction of building foundations for new equipment such as pump, vessel or a heat exchanger. It is estimated that 2,000 cubic yards of miscellaneous grading and excavation for foundation preparation would be required for the remaining project areas. For the areas requiring excavating and grading, these areas would be backfilled to the surrounding grade elevation.

Excavation in the Northeast Property would be minimized to avoid potentially buried asbestos as this was the location of a former Jons Manville facility. ARCO has developed a Soil Handling Plan for work in this area. Any excavation occurring in this area would strictly adhere to the Soil Handling Plan.

In the Northeast Property, where soil disturbance would take place, a barricade system would be put into place to prohibit access to all personnel not involved in excavation activities. Watering of soils would be applied to all excavation areas to eliminate airborne fibers. If asbestos containing materials are uncovered, they will be separated, wetted, bagged, and taken to the ARCO waste facility. Soil samples will be collected and analyzed from the areas where asbestos was found. If soils are found to be asbestos containing, they will be excavated and taken to a regulated hazardous waste facility.

Construction activities could uncover hydrocarbon-contaminated soils, given the heavily industrialized nature of the LAR facilities and the fact that refining activities, petroleum storage, and distribution have been conducted at the sites for a number of years. Analytical profiles (laboratory analyses) conducted on soils previously excavated from other portions of the refinery have indicated that approximately 90 percent of the soil was classified as nonhazardous and 10 percent was classified as a California hazardous waste (ENSR, 1993). The proposed project would require only the construction of the pentane loading rack area and minor grading for pipeline modifications in that area, so the potential for contaminated materials is expected to be minor. ARCO would sample and analyze soils within the vicinity of the proposed units prior to construction. Contaminated soil would be handled in accordance with the appropriate federal, state, and local regulations, including SCAQMD Rule 1166 - Volatile Organic Compounds Emissions from Decontamination of Soil. Therefore, significant impacts due to contaminated soil excavation are not expected.

Affected nonhazardous soil from LAR is currently recycled offsite at the American Remedial Technologies facility in Lynnwood, California. Therefore, no significant impacts are anticipated due to excavation of nonhazardous soil.

4.8.3 Hazardous Waste

Affected hazardous soil from the refinery is currently transported and disposed of by Chemical Waste Management at their Kettleman Hills, California Class I facility or Safety Kleen Environmental Services at their Buttonwillow, California Class I facility (ARCO, 2000).

During the construction of the LAR portion of the project, approximately 0.5 ton of hazardous waste (paint and solvent waste) would be generated and would either be landfilled or treated offsite. Additionally, approximately 100 gallons of used motor oil would be generated. The used motor oil would most likely be recycled offsite.

The terminals would require minor alterations for the conversion of a few tanks to ethanol storage which would create small quantities of regulated waste. It is estimated that approximately one to two truck loads of hydrocarbon storage tank residue would be generated from each tank that would be converted to ethanol storage. This waste would be transported to an approved disposal location.

Operation of the proposed project would generate additional hazardous waste, including chemical catalysts and process wastes. Additional catalysts would be used to promote chemical interactions in various areas of the refining processes. Table 4.8-1 identifies new units associated with the project that would use catalysts. The amounts of catalysts used and expected change-out frequency are also provided in this table. The change-out frequency varies with the catalyst and is therefore presented as a range. These new catalysts would be evaluated for offsite regeneration if possible. The refinery currently handles catalysts in this manner.

Table 4.8-1
Hazardous Waste Sources

Unit	Tons	Change Out Frequency	Hazardous
ISOSIV	27	2 years	Yes
Selective Hydrogenation	18	5 years	Yes

Waste minimization options would be implemented where appropriate. In addition, current waste minimization practices could also contribute to a reduction in these projected volumes.

As indicated in Table 4.8-1, approximately 45 tons of waste that is either federally or state designated as hazardous would be generated per year with these projects. It is estimated that three truck loads per year would be transported to the various potential disposal sites. It is currently proposed that this waste either be reclaimed or be transported to either Chemical Waste Management, Inc.'s Kettleman Hills facility or Safety Kleen Buttonwillow facility for disposal.

Approximately 499 acres of the Chemical Waste Management facility's 1,600 acres have been approved for hazardous waste activity by the federal Environmental Protection Agency, the California EPA - Department of Toxic Substances Control, and the Kings County Planning Commission. The volume of hazardous waste that is accepted by the facility on a yearly basis has ranged from 250,000 to 500,000 pounds for the years 1997 to 1999; and the landfill currently has an expected 20 to 25 years of capacity (Vasquez, 2000).

Approximately 270 acres of Safety Kleen's 320 acres is approved for hazardous waste activity by the federal Environmental Protection Agency, the California EPA - Department of Toxic Substances Control, and the Kern County Planning Commission. The volume of hazardous waste that is accepted by the facility on a yearly basis is not available. According to the landfill operator, the landfill currently has an expected 35 year capacity (Davis, 2000).

Based on the expected landfill capacities of 25 years and 35 years, the hazardous waste generated by the proposed project is not expected to significantly impact the disposal capacities of the Chemical Waste Management and Safety Kleen facilities. LAR will continue its ongoing waste minimization activities to reduce the volumes of hazardous waste generated.

4.8.4 Mitigation Measures

While no significant impacts to the waste disposal facilities are expected, ARCO would continue to evaluate and implement waste minimization techniques to ensure that waste impacts from the project would be minimized. Specifically, with respect to hazardous wastes, LAR has prepared and implemented a Source Reduction Evaluation Review and Plan and Hazardous Waste Performance Report under the requirements of Senate Bill 14 (SB14). Under the requirements of this regulation, the refinery must

- reduce the generation of hazardous waste at its source;
- reduce the release into the environment of chemicals that have adverse and serious health or environmental effects; and
- document hazardous waste management information and make that information available.

Any personnel working directly with soils that are hazardous wastes will be trained in accordance with 29CFR1910.120 - Hazardous Waste Operations and Emergency Response.

The refinery will update its current SB14 Plan to reflect the additional hazardous wastes that will be generated with the project. As required under SB14, the reduction of waste will be made where deemed technically and economically feasible. The potential for recycling of all wastes, including nonhazardous and municipal wastes will also be evaluated.

In an event where asbestos-containing materials (ACM) are uncovered, ARCO has a Soils Handling Plan (Plan) already in place and follows AQMD Rule 1150 permit requirements. Measures outlined in the Plan state that ARCO will take numerous steps to prevent exposure of asbestos to workers and to the environment. Such steps include:

W1 – Any personnel working directly with soils that are hazardous wastes will be trained in accordance with 29CFR 1910.120 – Hazardous Waste Operations and Emergency Response.
W2 – The refinery will update its current SB14 Plan to reflect the additional hazardous wastes that will be generated with these projects. As required under SB14, the reduction of waste will be made where deemed technically and economically feasible. Recycling of all wastes, including nonhazardous and municipal wastes, will also be evaluated where appropriate.
W3 – Schedule asbestos awareness training for appropriate employees.
W4 – Perform personnel air sampling and area air monitoring daily at each station.
W5 – Restrict non-project personnel from areas which contain asbestos.
W6 – Implement soil watering program to minimize asbestos fiber release to atmosphere (as determined by area air monitoring).
W7 – Cease work if fiber counts exceed regulatory limits.
W8 – Collect soil samples from the excavation area for analysis for disposal characterization and reuse as appropriate.

4.9 Public Service

Impacts to public services will be considered significant if:

- Additional service needed from the fire departments require an increased workforce.

4.9.1 Construction and Operation

As the proposed project will result in only minor modifications to these existing industrial facilities, no significant impacts to fire services provided by the Los Angeles County Fire Department, Long Beach Fire Department or Rialto Fire Department are expected to occur as a result of either construction or operation of the proposed project. ARCO LAR maintains its own onsite fire department, as discussed in Section 3.9.2. Additionally, fire stations in the areas near LAR and the terminals are equipped to handle emergency response incidents at industrial facilities. Close coordination with local fire departments and emergency services also will be continued, including the fire departments within the County of Los Angeles and the cities of South Gate, Long Beach and Rialto.

The proposed project alone will not create the need for additional personnel or equipment. Therefore, no significant impacts to fire services will occur as a result of the project.

4.9.2 Mitigation Measures

Because no significant impacts to public services are expected as a result of the proposed project, no mitigation is necessary or proposed.

4.10 Cultural Resources

4.10.1 Methodology and Significance Thresholds

Impacts to cultural resources will be considered significant if:

- The project results in the disturbance of a significant prehistoric or historic archaeological site or a property of historic or cultural significance to a community or ethnic or social group.
- Unique paleontological resources are present that could be disturbed by construction of the proposed project.

4.10.1.1 Project Impacts

Project implementation will result in no ground disturbing activity or impacts to equipment and structures over 50 years of age at the Carson, East Hynes, Hathaway, Colton, or Vinvale Terminals. Therefore, no impact to prehistoric or historic cultural resources is anticipated or addressed in this section for these five terminals.

Minor ground disturbance will occur at the Marine Terminal 2 site, but it will be limited to a fill area in the Long Beach Harbor (Garrett, personal communication). There will be no impacts to equipment or structures over 50 years old at the Marine Terminal 2 site. Therefore, no impact to prehistoric or historic cultural resources is anticipated or addressed in this section for the Marine Terminal 2 site.

The potential for significant cultural resource impacts to occur within the LAR is addressed in this section.

<u>Archaeological Resources</u>

The LAR is located in an area of high archaeological sensitivity. The Tongva/Gabrielino village site known as *Suangna* is located at and near a portion of the refinery, and CA-LAN-2682, a large cemetery, was recently exposed at the property. Earth disturbance associated with the construction of the project will not impact the known limits of either of these sites. However, there is a potential that additional buried archaeological deposits may exist, which could be adversely affected by ground disturbance associated with the construction of the a portion of the project. Any such impact would be considered significant, but mitigatable.

Historic Resources

No buildings, structures, or equipment 50 years or older will be modified as part of the proposed project. Therefore, no significant impacts to historic cultural resources are expected to occur as a result of project implementation.

4.10.2 Mitigation Measures

The following measures are proposed to alleviate potential impacts to cultural resources to a less than significant level:

CR-1: A cultural resources orientation will be provided to construction workers associated with excavation activities. The orientation will include a description of what kind of cultural resources might be encountered during construction and what steps are to be taken if such a find is unearthed.

CR-2: In the event that cultural deposits are exposed during project construction, subsurface earth disturbances within LAR shall be monitored by a professional archaeologist and a representative of the Gabrielino/Tongva Tribal Council.

CR-3: In the event that cultural deposits are exposed during project construction, the archaeological monitor shall have the authority to temporally halt or redirect all earth disturbing work within the vicinity of the find. The find shall be evaluated and mitigated as warranted. After the find has been appropriately mitigated work in the area may resume.

CR-4: If human remains are unearthed, State Health and Safety Code Section 7050.5 requires that no further disturbance shall occur until the County Coroner has made the necessary findings as to origin and disposition pursuant to Public Resources Code Section 5097.98. If the remains are determined to be of Native American descent, the coroner has 24 hours to notify the Native American Heritage Commission (NAHC). The NAHC will than contact the most likely descendent of the deceased Native American, who will then serve as consultant on how to proceed with the remains.

With the implementation of these mitigation measures, the potential for impacts to cultural resources will be reduced to an insignificant level.

4.11 Geology and Soils

Geologic and seismic conditions will be considered significant if any of the following conditions are met:

- Earthquake induced ground motion capable of inducing catastrophic structural failure of the major components of the proposed project.
- Secondary seismic effects occur, i.e., earthquake-induced ground failure or liquefaction-related failure.
- Topographic alterations result in significant changes such as visual degradation, soil erosion, and drainage alteration.
- Disturbance of large volumes of soil containing petroleum hydrocarbons or other hazardous constituents.

4.11.1 Construction

Construction will require grading and excavation at LAR and the Marine Terminal 2. Activities at the other terminals (Carson, Colton, East Hynes, Hathaway, and Vinvale) are limited to minor pipe refitting and adjustments and will require neither grading nor excavation.

4.11.1.1 Expansive Soil

The uppermost four to 10 feet of soil materials at the LAR and Marine Terminal 2 comprise granular alluvial materials and sandy, silty artificial fills, none of which tend to show significant soil expansion. Soil expansion is not expected to present a problem during this project, and therefore is not considered to be significant.

4.11.1.2 Erosion

Erosion from wind or water could occur during construction as soils are exposed. Standard construction grading practices and retention features will contain runoff. Further, routine dust abatement measures including watering of the excavations for dust control will minimize wind erosion. The combination of these factors will combine to keep impacts to an insignificant level.

4.11.1.3 Soil Contamination

Petroleum hydrocarbon contaminated soils exist onsite, and it is possible that some contaminated soils will be disturbed during the excavations to be conducted at the LAR and Marine Terminal 2. Contaminated soils, when encountered, are disposed of or recycled offsite at California certified disposal or recycling facilities. ARCO will characterize the areas to be disturbed prior to excavation (see also subsection 4.8.2). No significant impacts are anticipated as a result of the potential for hydrocarbon contaminated soils to be excavated during construction of the project.

4.11.2 Operation

4.11.2.1 Seismicity - Ground Rupture

The subject area is located nearby but not included within the earthquake fault zones delineated as part of the Alquist-Priolo Special study for the Newport-Inglewood fault zone. Therefore, the risk to either the LAR or Marine Terminal 2 due to earthquake-induced ground rupture is considered insignificant.

4.11.2.2 Seismicity - Ground Shaking

The use of standard engineering practices for building within a seismically active area such as the Long Beach area, which encompasses the LAR and Marine Terminal 2 components of the project, requires that project design and construction practices adhere to appropriate earthquake safety codes. ARCO will adhere to the current Uniform Building Code. With proper design and construction, no significant impacts are expected from this project.

4.11.2.3 Seismicity - Liquefaction

Liquefaction is a mechanism of ground failure whereby earthquake-induced ground motion transforms loose, water-saturated granular material to a liquid state. The northeast corner of LAR and the entire Marine Terminal 2 have been identified by the CDMG as areas that have the potential for permanent ground displacements due to liquefaction. Therefore, appropriate measures will necessarily be employed to mitigate the potential liquefaction hazard.

4.11.2.4 Seismicity - Slope Stability

As the topography at the LAR and the Marine Terminal 2 is generally level, the potential for slope instability at either site is negligible; therefore, no mitigation measures are necessary.

4.11.2.5 Subsidence

While subsidence had historically been a problem in the Long Beach area, which encompasses the area of Marine Terminal 2, it has not been a significant problem since 1958 when the practice of pumping saltwater into the oil reservoirs to replace the withdrawn oil and gas was initiated. Since no additional groundwater from on-site wells will be used for this project and subsidence is being mitigated by the ongoing regional replacement injection of saltwater into depleted oil reservoirs; no impact from subsidence is expected from this project.

4.11.3 Mitigation Measures

Since liquefaction has been identified by the CDMG as a potential hazard in the northeastern corner of the LAR and at the Marine Terminal 2 site, appropriate mitigation measures will be employed to reduce or eliminate the risk of lateral spreading or loss of subsurface soil strength.

The following measures are proposed to reduce or eliminate the risk of liquefaction:

GS-1: All of the project components, and especially the LAR and Marine Terminal 2 components, will employ project design and construction practices that adhere to appropriate earthquake safety codes such as API, ASME B31.4, the Uniform Building Code and the UFC.

GS-2: ARCO will adhere to the current Uniform Building Code Zone 4 requirements.

With proper design and construction, it is expected that the potential hazard due to liquefaction will be mitigated to insignificance.

4.12 Growth-Inducing Impacts of the Proposed Project

CEQA defines growth-inducing impacts as those impacts of a proposed project that "could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects which would remove obstacles to population growth (CEQA Guidelines §15126.2 [d]).

The proposed project is not expected to foster population growth in the area, nor will additional housing or infrastructure be required. The project involves the modification of existing industrial facilities. The proposed project does not include increasing refinery crude throughput capacity, so additional refinery workers are not expected to be needed. No new services will be required; therefore, no infrastructure development or improvement will be required, and no population growth will be encouraged as a result of the project.