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## APPENDIX B

## AIR EMISSION ESTIMATION METHODOLOGIES

This appendix provides the methodologies that were used to estimate potential air pollutant emissions associated with the ARCO CARB Phase 3 - MTBE Phase Out Project. This appendix begins with a discussion of the methodologies used to estimate construction and operational emissions. Then the health risk assessment prepared for the refinery is presented. The appendix continues with discussions of mitigation measures and emissions remaining after mitigation. It concludes with a discussion of emissions from the project alternatives. Spreadsheets that provide details of the emissions calculations are attached as well as detailed inputs and outputs from the health risk assessment described in Section 4.1.

## B.1 CONSTRUCTION EMISSIONS

Construction emissions can be distinguished as either on-site or off-site. On-site emissions generated during construction principally consist of exhaust emissions ($NO_X$, $SO_X$, CO, VOC, and $PM_{10}$) from construction equipment, fugitive dust ($PM_{10}$) from grading and excavation, and VOC from asphaltic paving and painting. 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.

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 pentane 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 pentane 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

To estimate the peak daily emissions associated with the construction activities, the anticipated construction schedule, the types of construction equipment, the number of construction equipment, and the peak daily operating time for each piece of equipment were estimated. Additionally, estimates were made of the number and length of daily on-site and off-site motor vehicle trips. Table B.1-1 lists the anticipated schedule, peak daily construction equipment requirements, and peak daily motor vehicle trips for construction associated with each of the process units at LAR and with each of the terminals. This information was developed from previous experience with similar refinery and terminal construction projects. Construction is anticipated to occur four days per week at LAR and five days per week at the terminals, from 6:00 am to 5:00 pm.

**Table B.1-1**
**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 |
| | | |
| 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 |

**Table B.1-1 (Cont.)**
**Construction Schedule, Equipment Requirements and Motor Vehicle Trips**

| Equipment/Vehicle Type | Number | Hours per Day Operation/Miles per Day per Vehicle |
|---|---|---|
| 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 |
| | | |
| 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 |

**Table B.1-1 (Cont.)**

**Construction Schedule, Equipment Requirements and Motor Vehicle Trips**

| Equipment/Vehicle Type | Number | Hours per Day Operation/Miles per Day per Vehicle |
|---|---|---|
| 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 |
| North Hydrogen Plant Modifications (1/2/02 - 5/6/02) | | |
| Tractor | 1 | 2 |
| Crane | 1 | 4 |
| Cherry Picker | 1 | 7 |
| Welding Machine | 4 | 8 |
| Backhoe | 1 | 4 |
| Forklift | 1 | 6 |
| Air Compressor | 3 | 6 |
| Generator | 2 | 10 |
| Light Plant | 2 | 4 |
| Concrete Pump | 1 | 1 |

**Table B.1-1 (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) (Cont.) | | |
| 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 | | |

| | | |
|---|---|---|
| On-site pickup truck | 1 | 50 |
| On-site flat bed truck | 1 | 40 |
| | 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 |
| | | |
| 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 |

**Table B.1-1 (Cont.)**
**Construction Schedule, Equipment Requirements and Motor Vehicle Trips**

| Equipment/Vehicle Type | Number | Hours per Day Operation/Miles per Day per Vehicle |
|---|---|---|
| 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 |
| 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 |

**Table B.1-1 (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) - (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 |
| 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 |
| 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 |

**Table B.1-1 (Cont.)**

**Construction Schedule, Equipment Requirements and Motor Vehicle Trips**

| Equipment/Vehicle Type | Number | Hours per Day Operation/Miles per Day per Vehicle |
|---|---|---|
| Pentane Railcar Loading Facility Modifications for Off-Loading (7/2/01 - 1/31/02) - (Cont.) | | |
| 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 |
| | | |
| 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 |

**Table B.1-1 (Cont.)**
**Construction Schedule, Equipment Requirements and Motor Vehicle Trips**

| Equipment/Vehicle Type | Number | Hours per Day Operation/Miles per Day per Vehicle |
|---|---|---|
| Polypropylene Loading Facility Modifications for Butane Loading and Off-Loading (8/6/01 - 2/6/02) - (Cont.) | | |
| 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 |
| 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 |

**Table B.1-1 (Cont.)**

**Construction Schedule, Equipment Requirements and Motor Vehicle Trips**

| Equipment/Vehicle Type | Number | Hours per Day Operation/Miles per Day per Vehicle |
|---|---|---|
| Refrigerated Pentane Storage Tank Construction at Marine Terminal 2 (8/6/01 - 8/6/02) - (Cont.) | | |
| 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 |
| 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 | | |
| Crane | 1 | 2 |
| Cherry Picker | 1 | 4 |
| Welding Machine | 3 | 7 |
| Backhoe | 1 | 4 |
| Forklift | 1 | 2 |
| Air Compressor | 2 | 1 |

**Table B.1-1 (Cont.)**

**Construction Schedule, Equipment Requirements and Motor Vehicle Trips**

| Equipment/Vehicle Type | Number | Hours per Day Operation/Miles per Day per Vehicle |
|---|---|---|
| Vinvale Terminal Modifications for Ethanol Storage, Off-Loading and Blending (8/1/01 - 9/28/01) - (Cont.) | | |
| Generator | 1 | 6 |
| Light Plant | 1 | 8 |
| Concrete Pump | 1 | 8 |
| | 1 | 2 |
| Off-site construction commuter | | |
| On-site construction commuter | 10 | 50 |
| Off-site delivery vehicle | 1 | 10 |
| On-site delivery vehicle | 2 | 10 |

| | | |
|---|---|---|
| Off-site pickup truck | 1 | 20 |
| On-site pickup truck | 1 | 50 |
| On-site flat bed truck | 1 | 10 |
| | 1 | 15 |
| 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 |

**Table B.1-1 (Concluded)**
**Construction Schedule, Equipment Requirements and Motor Vehicle Trips**

| Equipment/Vehicle Type | Number | Hours per Day Operation/Miles per Day per Vehicle |
|---|---|---|
| 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 |
| 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 |

### B.1.1 Exhaust Emissions from Construction Equipment.

The combustion of fuel to provide power for the operation of various construction activities and equipment results in the generation of $NO_X$, $SO_X$, CO, VOC, and $PM_{10}$ emissions. The following predictive emission equation was used to estimate exhaust emissions from each construction activity:

Exhaust Emissions (lb/day) = EF x BHP x LF x $T_H$ x N (EQ. B.1-1)

where:

EF = Emission factor for specific air contaminant (lb/bhp-hr)

BHP = Equipment bhp

LF = Equipment load factor

$T_H$ = Equipment operating hours/day

N = Number of pieces of equipment

Table B.1-2 provides the emission factors, horsepower and load factors used to estimate peak daily exhaust emissions from construction equipment. Equipment horsepower ratings and load factors are default values from the South Coast Air Quality Management District (SCAQMD) CEQA Air Quality Handbook (SCAQMD, 1993). The emission factors were also taken from the SCAQMD CEQA Handbook. These emission factors were applied to the construction equipment operating data in Table B.1-1 to calculate peak daily construction equipment exhaust emissions during construction for each process unit at LAR and at each terminal.

**Table B.1-2**
**Construction Equipment Horsepower, Load Factors and Emission Factors**

| Equipment Type | Fuel | Horse-power | Load Factor percent | CO lb/bhp-hr | VOC lb/bhp-hr | $NO_X$ lb/bhp-hr | $SO_X$ lb/bhp-hr | $PM_{10}$ lb/bhp-hr |
|---|---|---|---|---|---|---|---|---|
| Tractor | Diesel | 157 | 57.5 | 0.011 | 0.002 | 0.023 | 0.002 | 0.001 |
| Crane | Diesel | 194 | 43 | 0.009 | 0.003 | 0.023 | 0.002 | 0.002 |
| Cherry Picker | Diesel | 43 | 50.5 | 0.013 | 0.003 | 0.031 | 0.002 | 0.002 |
| Welding Machine | Diesel | 35 | 45 | 0.011 | 0.002 | 0.018 | 0.002 | 0.001 |
| Backhoe | Diesel | 79 | 46.5 | 0.015 | 0.003 | 0.031 | 0.002 | 0.002 |
| Forklift | Diesel | 83 | 30 | 0.013 | 0.003 | 0.031 | 0.002 | 0.002 |
| Air Compressor | Diesel | 37 | 48 | 0.011 | 0.002 | 0.018 | 0.002 | 0.001 |
| Generator | Diesel | 22 | 74 | 0.011 | 0.002 | 0.018 | 0.002 | 0.002 |
| Light Plant | Diesel | 10.5 | 74 | 0.011 | 0.002 | 0.018 | 0.002 | 0.002 |
| Concrete Pump | Diesel | 84 | 74 | 0.020 | 0.003 | 0.024 | 0.002 | 0.002 |
| Front End Loader | Diesel | 39 | 51.5 | 0.020 | 0.004 | 0.021 | 0.002 | 0.002 |
| Vibratory Roller | Diesel | 58 | 57.5 | 0.007 | 0.002 | 0.020 | 0.002 | 0.001 |

### B.1.2 Fugitive Dust (PM10) Emissions

Fugitive dust emissions are generated during the construction phase from the following operations:

- Material handling (i.e., dropping soil onto the ground or into trucks during excavation)
- Soil compaction
- Storage pile wind erosion
- Vehicle travel on paved roads

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

Although fugitive dust emissions from construction activities are temporary, they may have an impact on local air quality. Fugitive dust emissions often vary substantially from day to day, depending on the level of activity, the specific operations, and the prevailing meteorological conditions. The following methodologies provide the predictive emission equations, emission factors, and default values used to calculate fugitive dust emissions for the project.

The following equations were used to calculate uncontrolled fugitive dust $PM_{10}$ emissions. Construction contractors will comply with SCAQMD Rule 403 – Fugitive Dust, by watering the site two times per day, reducing the uncontrolled fugitive dust emissions by 50 percent.

<u>Emissions from Material Handling</u>

Fugitive $PM_{10}$ emissions are generated during excavation when excavated material is dropped onto the ground at the side of the excavation location or dropped into trucks for removal from the site. The following equation was used to estimate these emissions:

$$\text{Emissions (lb/day)} = 0.0011 \times (U/5)^{1.3} / (M/2)^{1.4} \times V \times D \times N_D \qquad \text{(EQ. B.1-2)}$$

where:

- U = Mean wind speed (miles/hour)
- M = Soil moisture content (percent)
- V = Volume of soil handled (cu. yd./day)
- D = Soil density (tons/cu. yd.)
- $N_D$ = Number of times soil is dropped

Source: Equation 1, Section 13.2.4, US EPA Compilation of Air Pollutant Emission Factors (AP-42), January 1995.

The values that were used for the variables in this equation are listed in Table B.1-3.

**Table B.1-3**
**Parameters Used to Calculate Fugitive Dust $PM_{10}$ Emissions from Material Handling**

| Parameter | Value | Basis |
|---|---|---|
| Mean wind speed | 12 miles/hr | SCAQMD 1993 CEQA Air Quality Handbook, Default |
| Soil moisture content | 5.9 percent | "Open Fugitive Dust PM10 Control Strategies Study," Midwest Research Institute, October 12, 1990. |
| Volume of soil handled:<br>Polypropylene Railcar Facility Modifications | 1,000 $yd^3$ | From typical excavation rate of 125 $yd^3$/hr and anticipated 8 hr/day excavation duration |
| Combined Total for Remainder of LAR Construction | 250 $yd^3$ | From typical excavation rate of 125 $yd^3$/hr and anticipated 8 hr/day excavation duration |
| Soil density | 1.215 ton/$yd^3$ | Table 2.46, Handbook of Solid Waste Management |
| Number of soil drops | 2 | Once onto ground and once into haul truck |

Emissions from Soil Compaction:

Following excavation for equipment foundations, surfaces will be compacted prior to pouring concrete. The following equation, which was developed for fugitive $PM_{10}$ emissions from bulldozing, was used to estimate emissions from soil compaction:

Emissions (lb/day) = $0.75 \times s^{1.5} / M^{1.4} \times T_H \times N$ (EQ. B.1-3)

where:

s = Soil silt content (percent)

M = Soil moisture content (percent)

$T_H$ = Equipment operating hours/day

N = Number of pieces of equipment

Source: Table 11.9-1, US EPA Compilation of Air Pollutant Emission Factors (AP-42), July 1998.

Values of the variables used in this equation to calculate fugitive dust $PM_{10}$ emissions are listed in Table B.1-4.

**Table B.1-4**
**Parameters Used to Calculate Fugitive Dust $PM_{10}$ Emissions from Soil Compaction**

| Parameter | Value | Basis |
|---|---|---|
| Soil silt content | 7.5 percent | SCAQMD 1993 CEQA Air Quality Handbook, Overburden |
| Soil moisture content | 5.9 percent | "Open Fugitive Dust PM10 Control Strategies Study," Midwest Research Institute, October 12, 1990. |
| Hours of Operation: | | |
| Polypropylene Railcar Facility Modifications | 8 | Anticipated Construction Schedule |
| Combined Total for Remainder of LAR Construction | 2 | Anticipated Construction Schedule |
| Number of Pieces of Equipment: | | |
| Polypropylene Railcar Facility Modifications | 3 | Anticipated Construction Schedule |
| Combined Total for Remainder of LAR Construction | 1 | Anticipated Construction Schedule |

Emissions from Storage Pile Wind Erosion:

Wind erosion of temporary soil storage piles during excavation generates fugitive $PM_{10}$ emissions. The following equation was used to estimate these emissions:

Emissions (lb/day) = 0.85 x (s/1.5) x (365-p/235) x ($U_{12}$/15) x A (EQ. B.1-4)

where:

s = Soil silt content (percent)

p = Number of days per year with precipitation of 0.01 inches or more

$U_{12}$ = Percentage of time unobstructed wind speed exceeds 12 miles/hour

A = Storage pile area (acres)

Source: US EPA Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures, 1992

Table B.1-5 lists the values used in this equation to estimate emissions.

**Table B.1-5**
**Parameters Used to Calculate Fugitive Dust $PM_{10}$ Emissions from Storage Pile Wind Erosion**

| Parameter | Value | Basis |
|---|---|---|
| Soil silt content | 7.5 percent | SCAQMD 1993 CEQA Air Quality Handbook, Overburden |
| Number of days per year with precipitation of 0.01 inches or more | 0 | Conservative assumption based on construction not occurring during rain |
| Percentage of time unobstructed wind speed exceeds 12 miles per hour | 100 percent | Conservative estimate |
| Storage Pile Area:<br>Polypropylene Railcar Facility Modifications<br>Combined Total for Remainder of LAR Construction | <br>0.07 acres<br><br>0.03 acres | <br>Conservatively set equal to retention pond surface area (110 ft. x 26 ft.)<br>Conservatively set equal to anticipated area to be excavated at any one time (one-seventh of total of 9,000 $ft^2$) |

<u>Emissions from Paved Road Dust Entrainment:</u>

Vehicles travelling on paved roads entrain dust that has deposited on the roads, which produces $PM_{10}$ emissions. These emissions were estimated using the following equation:

Emissions (lb/day) = 7.26 $(sL/2)^{0.65}$ / $(WF/3)^{1.5}$ x VMT (EQ. B.1-5)

where:

sL = Road surface silt loading ($g/m^2$)

WF = mileage-weighted average of vehicles on the roadway (tons)

VMT = vehicle-miles-traveled

Source: California Air Resources Board Emission Inventory Methodology 7.9, Entrained Paved Road Dust (1997)

Table B.1-6 lists the values used in this equation to estimate entrained paved road dust $PM_{10}$ emissions. Although the vehicle weight used in the calculation should be the mileage-weighted average of all vehicles on the road, weights for the various types of vehicles, estimated from the weight-ranges for the vehicle classes in which they belong, have been conservatively used. The silt loading values are the default values assigned to the various road types in the California Air Resources Board Emission Inventory Methodology 7.9, Entrained Paved Road Dust (1997). The number of vehicles of each type and the mileage for each vehicle per day are listed in Table B.1-1.

**Table B.1-6**
**Parameters Used to Calculate Entrained Paved Road Dust $PM_{10}$ Emissions**

| Vehicle Type | Vehicle Weight (tons) | Road Type | Silt Loading ($g/m^2$) |
|---|---|---|---|
| Off-site construction commuter | 2.4 | Collector | 0.037 |
| On-site construction commuter | 2.4 | Local | 0.240 |
| Off-site delivery vehicle | 20 | Collector | 0.037 |
| On-site delivery vehicle | 15 | Local | 0.240 |
| Off-site bus, worker transportation | 20 | Major | 0.037 |
| On-site bus, worker transportation | 15 | Local | 0.240 |
| Off-site pickup truck | 5 | Collector | 0.037 |
| On-site pickup truck | 5 | Local | 0.240 |
| On-site flat bed truck | 15 | Local | 0.240 |

### B.1.3 Asphaltic Paving Emissions

In addition to the combustion emissions associated with the operation of paving equipment used to apply asphaltic materials, VOC emissions are generated from the evaporation of hydrocarbons contained in the asphaltic materials. The following equation was used to estimate daily VOC emissions from asphaltic paving:

$$\text{Emissions (lb/day)} = 2.62 \times A \qquad \text{(EQ. B.1-6)}$$

where:

A = Area paved (acres/day)

Source: URBEMIS7G User's Guide, 1998

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/pentane 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.

### B.1.4 Architectural Coating (Painting) Emissions

Architectural coating generates VOC emissions from the evaporation of solvents contained in the surface coatings applied to buildings. The following equation was used to estimate VOC emissions from architectural coatings:

Emissions (lb/day) = C x V (EQ. B.1-7)

where:

C = VOC content of coating (lb/gal)

V = Amount of coating applied (gal/day)

A VOC content of 2.40 lb/gal 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 at LAR, because all 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, 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.

### B.1.5 Motor Vehicle Emissions During Construction

The following equations were used to calculate emissions from motor vehicles:

<u>CO and $NO_X$</u>

Emissions (lb/vehicle-day) = [($EF_{Run}$ x VMT) + ($EF_{Start}$ x Start)] / 453.6 (EQ. B.1-8)

where:

$EF_{Run}$ = Running exhaust emission factor (g/mi)

$EF_{Start}$ = Start-up emission factor (g/start)

VMT = Distance traveled (mi/vehicle-day)

Start = Number of starts/vehicle-day

VOC

$$\text{Emissions (lb/vehicle-day)} = [(EF_{Run} \times VMT) + (EF_{Start} \times Start) + (EF_{Soak} \times Trip) + (EF_{Rest} \times Rest) + EF_{Runevap} \times VMT) + (EF_{Diurnal} \times Diurnal)] / 453.6 \quad \text{(EQ. B.1-9)}$$

where:

$EF_{Soak}$ = Hot-soak emission factor (g/trip)

Trip = One-way trips/vehicle-day

$EF_{Rest}$ = Resting loss evaporative emission factor (g/hr)

Rest = Resting time with constant or decreasing ambient temperature (hours/vehicle-day)

$EF_{Runevap}$ = Running evaporative emission factor (g/mi)

$EF_{Diurnal}$ = Diurnal evaporative emission factor (g/hr)

Diurnal = Time with increasing ambient temperature (hours/vehicle-day)

$PM_{10}$

$$\text{Emissions (lb/vehicle-day)} = (EF_{Run} + EF_{Tire} + EF_{Brake}) \times VMT / 453.6 \quad \text{(EQ. B.1-10)}$$

where:

$EF_{Tire}$ = Tire wear emission factor (g/mi)

$EF_{Brake}$ = Break wear emission factor (g/mi)

The motor vehicle emission factors generally depend on the vehicle class, and the running exhaust emission factors depend on vehicle speed. Table B.1-7 lists the vehicle class for each type of vehicle and the assumed vehicle speed.

**Table B.1-7**
**Motor Vehicle Classes, Speeds and Daily VMT 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 |

Tables B.1-8 through B.1-10 list the emission factors.

**Table B.1-8**

**Motor Vehicle CO and $NO_X$ Emission Factors During Construction**

| Vehicle Type | CO | | $NO_X$ | |
|---|---|---|---|---|
| | Running Exhaust (g/mi) | Start-Up (g/start)[a] | Running Exhaust (g/mi) | Start-Up (g/start)[a] |
| Off-site construction commuter | 3.46 | 40.56 | 0.68 | 2.27 |
| On-site construction commuter | 6.74 | 40.56 | 0.96 | 2.27 |
| Off-site delivery vehicle | 9.98 | N/A | 9.25 | N/A |
| On-site delivery vehicle | 16.72 | N/A | 11.25 | N/A |
| Off-site bus, worker transportation | 3.31 | N/A | 19.65 | N/A |
| On-site bus, worker transportation | 14.04 | N/A | 8.17 | N/A |
| Off-site pickup truck | 2.79 | 40.34 | 0.93 | 2.96 |
| On-site pickup truck | 5.44 | 40.34 | 1.33 | 2.96 |
| On-site flat bed truck | 14.04 | N/A | 8.17 | N/A |

[a] Assumed to be after 720 minutes with engine off.

Source: ARB EMFAC7G motor vehicle emission factor model, 2/10/2000 version, for calendar year 2001, summertime.

**Table B.1-9**

**Motor Vehicle VOC Emission Factors During Construction**

| Vehicle Type | Running Exhaust (g/mi) | Start-Up (g/start)[a] | Hot-Soak (g/trip) | Resting Loss (g/hr) | Running Evaporative (g/mi) | Diurnal Evaporative (g/hr) |
|---|---|---|---|---|---|---|
| Off-site construction commuter | 0.24 | 3.85 | 0.56 | 0.11 | 0.038 | 0.62 |
| On-site construction commuter | 0.37 | 3.85 | 0.56 | 0.11 | 0.282 | 0.62 |
| Off-site delivery vehicle | 1.51 | N/A | N/A | N/A | N/A | N/A |
| On-site delivery vehicle | 2.20 | N/A | N/A | N/A | N/A | N/A |
| Off-site bus, worker transportation | 3.06 | N/A | N/A | N/A | N/A | N/A |
| On-site bus, worker transportation | 1.76 | N/A | N/A | N/A | N/A | N/A |
| Off-site pickup truck | 0.38 | 4.90 | 0.34 | 0.08 | 0.029 | 0.42 |
| On-site pickup truck | 0.58 | 4.90 | 0.34 | 0.08 | 0.229 | 0.42 |
| On-site flat bed truck | 1.76 | N/A | N/A | N/A | N/A | N/A |

[a] Assumed to be after 720 minutes with engine off.

Source: ARB EMFAC7G motor vehicle emission factor model, 2/10/2000 version, for calendar year 2001, summertime.

**Table B.1-10**
**Motor Vehicle $PM_{10}$ Emission Factors During Construction**

| Vehicle Type | Running Exhaust (g/mi) | Tire Wear (g/mi) | Brake Wear (g/mi) |
|---|---|---|---|
| Off-site construction commuter | 0.00 | 0.01 | 0.01 |
| On-site construction commuter | 0.00 | 0.01 | 0.01 |
| Off-site delivery vehicle | 0.59 | 0.04 | 0.01 |
| On-site delivery vehicle | 0.59 | 0.04 | 0.01 |
| Off-site bus, worker transportation | 0.21 | 0.03 | 0.01 |
| On-site bus, worker transportation | 0.41 | 0.01 | 0.01 |
| Off-site pickup truck | 0.00 | 0.01 | 0.01 |
| On-site pickup truck | 0.00 | 0.01 | 0.01 |
| On-site flat bed truck | 0.41 | 0.01 | 0.01 |

Source: ARB EMFAC7G motor vehicle emission factor model, 2/10/2000 version, for calendar year 2001, summertime.

To calculate start-up emissions it was assumed that each gasoline-fueled vehicle (i.e., on-site pickup truck, off-site pickup truck and worker commuter vehicle) would be started twice each day, once at the beginning of the day and once at the end of the day. Start-up emissions are not applicable to diesel-fueled vehicles. Additionally, to calculate VOC resting loss and diurnal evaporative emissions, it was assumed that each vehicle would experience 12 hours of constant or decreasing ambient temperature (for resting losses) and 12 hours of increasing ambient temperature (for diurnal emissions).

## B.2 OPERATIONAL EMISSIONS

After construction is completed, direct operational emissions will be generated at LAR and the terminals by the new and modified processes, by changes in storage tank service, and by railcar, marine tanker, and tanker truck loading. Additionally, indirect operational emissions will be generated by new LAR employee commuting trips, tanker truck trips to deliver ethanol to terminals, and by marine tanker and tug boat operations at Marine Terminal 2.

### B.2.1 Direct Operational Emissions

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.

The following methodologies were used to estimate emissions from these sources.

<u>Emissions from Process Components</u>

The following equation was used to calculate fugitive VOC emissions from process components:

$$\text{Emissions (lb/day)} = (EF / 365) \times N \qquad \text{(EQ. B.2-1)}$$

where:

EF = VOC emission factor for type of component and type of service (lb/year/component)
N = Number of components

The emission factors that were used are listed in Table B.2-1.

**Table B.2-1**
**Fugitive VOC Emission Factors for Process Components**

| Type of Component - Service | VOC Emission Factor (lb/year) |
|---|---|
| Refinery | |
| Bellows valves - All | 0 |
| Non-Bellows valves - HC gas/vapor | 72 |
| Valves - Fuel & natural gas | 12 |
| Non-Bellows valves - Light liquid | 57 |
| Non-Bellows valves - Heavy liquid | 4.4 |
| Inaccessible valves - HC gas/vapor | 120 |
| Inaccessible valves - Light liquid | 74 |
| Pumps, sealless - All | 0 |
| Pumps, non-sealless - Light liquid | 520 |
| Pumps, non-sealless - Heavy liquid | 402 |
| Compressors – All | 2570 |
| Flanges - All | 4.9 |
| Pressure relief valves (no rupture disc) - All | 1135 |
| Process drains – All | 398 |
| Terminals | |
| Valves - Light liquid | 47 |
| Pumps - Non-Rule 466 service | 86 |
| Flanges – All | 4.9 |
| Light liquid streams are liquid streams with a vapor pressure greater than that of kerosene (>0.1 psia @ 100 $^{o}$F or 689 Pa @ 38 $^{o}$C), based on the most volatile class of liquid at >20% by volume.<br>Source: Guidelines for Fugitive Emissions Calculations, Petroleum Industry, SCAQMD, June 1999, Attachment 6 | |

Emissions of toxic air contaminants (TACs) from process components were also estimated using the following equation:

Emissions (lb/day) = VOC x Wt / 100 (EQ. B.2-2)

where:

VOC = VOC emissions from the process component (lb/day)
Wt = Weight percent of toxic compound in stream passing through the component

The emission factors in Table B.2-1 were used to calculate increases in emissions from new process components as well as reductions in emissions from process components that are anticipated to be removed during process modifications. ARCO estimated the numbers and types of service for components to be added and removed for each LAR process unit and at the terminals. With the exception of four process units, these estimates included a 40 percent contingency factor for new valves and flanges to account for potential increases during detailed design. Additionally, with the exception of four units, it was assumed that 75 percent of the new valves would be bellows valves and that none of the removed vales are bellows valves. The exceptions were the modifications to the LHU, conversion of the ISO-SIV unit to a hydrotreater, modification of No. 3 reformer fractionator, and conversion of the SFIA No. 1 Naphtha Splitter and depentanizer, for which more detailed design has been completed. The estimated total number of new and removed components at LAR and the terminals are listed in Table B.2-2. The compositions of the streams for the new and removed process components are listed in the attached spreadsheets.

**Table B.2-2**
**Components Added and Removed**

| | | Number | | | |
|---|---|---|---|---|---|
| **Component Type** | **Service** | **LAR** | **Marine Terminal 2, Ethanol** | **Marine Terminal 2, Pentane** | **Hathaway Terminal** |
| Valves, sealed bellows (added) | Vapor | 3 | 0 | 0 | 0 |
| Valves, sealed bellows (removed) | Vapor | 1 | 0 | 0 | 0 |
| Valves, sealed bellows (added) | Light Liquid | 869 | 0 | 0 | 0 |
| Valves, sealed bellows (removed) | Light Liquid | 28 | 0 | 0 | 0 |
| Valves, non-sealed bellows (added) | Vapor | 1 | 0 | 0 | 0 |
| Valves, non-sealed bellows (removed) | Vapor | 112 | 0 | 0 | 0 |
| Valves, non-sealed bellows (added) | Light Liquid | 280 | 6 | 20 | 6 |
| Valves, non-sealed bellows (removed) | Light Liquid | 500 | 0 | 0 | 0 |
| Pumps, sealless (added) | Light Liquid | 0 | 0 | 0 | 0 |
| Pumps, sealless (removed) | Light Liquid | 0 | 0 | 0 | 0 |
| Pumps, non-sealless (added) | Light Liquid | 25 | 0 | 0 | 0 |
| Pumps, non-sealless (removed) | Light Liquid | 22 | 0 | 0 | 0 |
| Compressors (added) | Vapor | 0 | 0 | 0 | 0 |
| Compressors (removed) | Vapor | 0 | 0 | 0 | 0 |
| Flanges (added) | All | 2,249 | 4 | 40 | 4 |
| Flanges (removed) | All | 998 | 0 | 0 | 0 |

| | | | | | |
|---|---|---|---|---|---|
| Pressure relief valves (added) | All | 10 | 0 | 0 | 0 |
| Pressure relief valves (removed) | All | 10 | 0 | 0 | 0 |
| Process drains (added) | All | 5 | 0 | 0 | 0 |
| Process drains (removed) | All | 4 | 0 | 0 | 0 |
| | | **Number** | | | |
| **Component Type** | **Service** | **East Hynes** | **Vinvale** | **Carson** | **Colton** |
| Valves, sealed bellows (added) | Vapor | 0 | 0 | 0 | 0 |
| Valves, sealed bellows (removed) | Vapor | 0 | 0 | 0 | 0 |
| Valves, sealed bellows (added) | Light Liquid | 0 | 0 | 0 | 0 |
| Valves, sealed bellows (removed) | Light Liquid | 0 | 0 | 0 | 0 |
| Valves, non-sealed bellows (added) | Vapor | 0 | 0 | 0 | 0 |
| Valves, non-sealed bellows (removed) | Vapor | 0 | 0 | 0 | 0 |
| Valves, non-sealed bellows (added) | Light Liquid | 32 | 10 | 6 | 6 |
| Valves, non-sealed bellows (removed) | Light Liquid | 0 | 0 | 0 | 0 |
| Pumps, sealless (added) | Light Liquid | 0 | 0 | 0 | 0 |
| Pumps, sealless (removed) | Light Liquid | 0 | 0 | 0 | 0 |
| Pumps, non-sealless (added) | Light Liquid | 0 | 2 | 0 | 0 |
| Pumps, non-sealless (removed) | Light Liquid | 0 | 0 | 0 | 0 |
| Compressors (added) | Vapor | 0 | 0 | 0 | 0 |
| Compressors (removed) | Vapor | 0 | 0 | 0 | 0 |
| Flanges (added) | All | 64 | 30 | 6 | 6 |
| Flanges (removed) | All | 0 | 0 | 0 | 0 |
| Pressure relief valves (added) | All | 0 | 0 | 0 | 0 |
| Pressure relief valves (removed) | All | 0 | 0 | 0 | 0 |
| Process drains (added) | All | 0 | 0 | 0 | 0 |
| Process drains (removed) | All | 0 | 0 | 0 | 0 |

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 emission factors in Table B.2-1. 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.

<u>Emissions from Loading Operations</u>

VOC emissions will be generated by increased pentane loading of railcars at LAR, pentane loading of marine tankers at Marine Terminal 2, and ethanol loading of tanker trucks at the Hathaway terminal. These emissions were estimated using the following equation:

Emissions (lb/day) = EF x V x (1 - CE / 100) (EQ. B.2-3)

where:

EF = VOC emission factor (lb/1000 gal)

V = Volume of material loaded (1000 gal/day)

CE = Vapor recovery unit (VRU) control efficiency (percent)

The emission factors that were used are listed in Table B.2-3.

**Table B.2-3**
**VOC Emission Factors for Loading Operations**

| **Material** | **VOC Emissions Factor (lb/1000 gal)** |
|---|---|
| Pentane, railcar loading [a] | 11.8 |
| Pentane, marine tanker loading [a] | 2.4 |
| Ethanol [b] | 0.08 |

[a] From AP-42, Equation (1), Section 4.2-4, January 1995.
[b] From SCAQMD Rule 462 limit for controlled emissions.

Control efficiencies for the thermal oxidizer VRUs at LAR and at Marine Terminal 2 were estimated to be 99.5 percent. The VRU control efficiency at the Hathway terminal was not accounted for explicitly. It was assumed, instead, that the emissions would be at the 0.08 lb/1000 gal specified in SCAQMD Rule 462.

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. Emissions of TACs during tanker truck loading were estimated by applying Equation B.2-2 to the estimated total VOC emissions.

<u>Emissions from Sulfur Recovery</u>

Additional sulfur will be removed by the two light hydro units in order to meet the CARB Pase 3 specifications for gasoline sulfur content. Most of this sulfur will be recovered by the LAR sulfur plant, but a small fraction will be emitted as sulfur oxides. These emissions were estimated using the following equation:

Emissions (lb/day) = S x 2 x (1 - CE / 100) (EQ. B.2-4)

where:

S = Weight of additional sulfur removed by LHUs (lb/day)

CE = Sulfur plant recovery efficiency (percent)

The additional sulfur to be removed is estimated to 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.

Emissions from Storage Tanks

New emissions from the new pentane storage tank at Marine Terminal 2 and the emissions that will be eliminated when the existing tanks at the terminal are demolished were estimated using version 3.1 of the US EPA TANKS program. The changes in VOC emissions that are anticipated to occur from changes in service of existing tanks at LAR and the terminals were also estimated using version 3.1 of the TANKS program. Additionally, changes in emissions of TACs from changes in service of the storage tanks at the terminals were estimated by applying Equation B.2-2 to the VOC emissions from each storage tank.

### B.2.2 Indirect Operational Emissions

In addition to the process related changes in emissions that will result from the modifications at LAR and the terminals, emissions from indirect sources will increase. The indirect sources that were evaluated include:

- New LAR employee commuting trips
- Tanker truck trips to deliver ethanol to terminals
- Additional locomotive activity moving the additional rail cars transporting butane and pentane
- Additional marine tanker calls for importing ethanol and exporting pentane

Emissions from On-Road Motor Vehicles

Equations B.1-8 through B.1-10 were used to calculate exhaust and evaporative emissions from new LAR employee commuting trips and from tanker truck ethanol delivery trips. Equation B.1-5 was used to calculate entrained road dust $PM_{10}$ emissions from these vehicles. Table B.2-4 lists the assignment of these vehicles to vehicle classes and speeds, and Tables B.2-5 through B.2-7 list the emission factors. Table B.2-8 lists the parameters used to calculate entrained paved road dust $PM_{10}$ emissions.

To calculate start-up emissions it was assumed that each gasoline-fueled vehicle (i.e., worker commuter vehicle) would be started twice each day, once at the beginning of the day and once at the end of the day. Start-up emissions are not applicable to diesel-fueled vehicles. Additionally, to calculate VOC resting loss and diurnal evaporative emissions, it was assumed that each vehicle would experience 12 hours of constant or decreasing ambient temperature (for resting losses) and 12 hours of increasing ambient temperature (for diurnal emissions).

**Table B.2-4**
**Motor Vehicle Classes, Speeds and Daily VMT During Operations**

| Vehicle Type | Vehicle Class | Speed (mph) |
|---|---|---|
| Off-site commuter | Light duty truck, cat | 35 |
| Ethanol tanker, full, freeway | Heavy heavy-duty truck, diesel | 40 |
| Ethanol tanker, full, surface street | Heavy heavy-duty truck, diesel | 25 |
| Ethanol tanker, empty, freeway | Heavy heavy-duty truck, diesel | 40 |
| Ethanol tanker, empty, surface street | Heavy heavy-duty truck, diesel | 25 |

**Table B.2-5**
**Motor Vehicle CO and $NO_X$ Emission Factors During Operation**

| Vehicle Type | CO | | $NO_X$ | |
|---|---|---|---|---|
| | Running Exhaust (g/mi) | Start-Up (g/start)[a] | Running Exhaust (g/mi) | Start-Up (g/start)[a] |
| Off-site commuter | 3.46 | 40.56 | 0.68 | 2.27 |
| Ethanol tanker, full, freeway | 6.47 | N/A | 9.57 | N/A |
| Ethanol tanker, full, surface street | 9.98 | N/A | 9.25 | N/A |
| Ethanol tanker, empty, freeway | 6.47 | N/A | 9.57 | N/A |
| Ethanol tanker, empty, surface street | 9.98 | N/A | 9.25 | N/A |

[a] Assumed to be after 720 minutes with engine off.

Source: ARB EMFAC7G motor vehicle emission factor model, 2/10/2000 version, for calendar year 2001, summertime.

**Table B.2-6**
**Motor Vehicle VOC Emission Factors During Operation**

| Vehicle Type | Running Exhaust (g/mi) | Start-Up (g/start)[a] | Hot-Soak (g/trip) | Resting Loss (g/hr) | Running Evaporative (g/mi) | Diurnal Evaporative (g/hr) |
|---|---|---|---|---|---|---|
| Off-site commuter | 0.24 | 3.85 | 0.56 | 0.11 | 0.038 | 0.62 |
| Ethanol tanker, full, freeway | 1.02 | N/A | N/A | N/A | N/A | N/A |

| | | | | | | |
|---|---|---|---|---|---|---|
| Ethanol tanker, full, surface street | 1.51 | N/A | N/A | N/A | N/A | N/A |
| Ethanol tanker, empty, freeway | 1.02 | N/A | N/A | N/A | N/A | N/A |
| Ethanol tanker, empty, surface street | 1.51 | N/A | N/A | N/A | N/A | N/A |
| [a] Assumed to be after 720 minutes with engine off. | | | | | | |

Source: ARB EMFAC7G motor vehicle emission factor model, 2/10/2000 version, for calendar year 2001, summertime.

**Table B.2-7**

**Motor Vehicle $PM_{10}$ Emission Factors During Operation**

| Vehicle Type | Running Exhaust (g/mi) | Tire Wear (g/mi) | Brake Wear (g/mi) |
|---|---|---|---|
| Off-site commuter | 0.00 | 0.01 | 0.01 |
| Ethanol tanker, full, freeway | 0.59 | 0.04 | 0.01 |
| Ethanol tanker, full, surface street | 0.59 | 0.04 | 0.01 |
| Ethanol tanker, empty, freeway | 0.59 | 0.04 | 0.01 |
| Ethanol tanker, empty, surface street | 0.59 | 0.04 | 0.01 |

Source: ARB EMFAC7G motor vehicle emission factor model, 2/10/2000 version, for calendar year 2001, summertime.

**Table B.2-8**

**Parameters Used to Calculate Entrained Paved Road Dust $PM_{10}$ Emissions**

| Vehicle Type | Vehicle Weight (tons) | Road Type | Silt Loading ($g/m^2$) |
|---|---|---|---|
| Off-site commuter | 2.4 | Collector | 0.037 |
| Ethanol tanker, full, freeway | 40 | Freeway | 0.020 |
| Ethanol tanker, full, surface street | 40 | Collector | 0.037 |
| Ethanol tanker, empty, freeway | 11 | Freeway | 0.020 |
| Ethanol tanker, empty, surface street | 11 | Collector | 0.037 |

The 10 additional LAR employees are anticipated to travel a round-trip distance of 50 miles per day. Although ethanol may be delivered to the terminals by pipeline, it was conservatively assumed that all ethanol received at the East Hynes, Vinvale, Carson and Colton terminals would come from the Hathaway Terminal by tanker truck. The estimated daily travel distance for ethanol delivery tanker trucks are listed in Table 3.2-9. These distances are based on anticipated routing patterns.

**Table B.2-9**

**Daily Mileage for Ethanol Tanker Trucks from Hathaway Terminal**

| Destination | Number/Day | Surface Street (One-Way Miles/Truck per Day) | Freeway (One-Way Miles/Truck per Day) |
|---|---|---|---|
| Vinvale | 18 | 2 | 12 |
| Carson | 6 | 5 | 5 |
| Colton | 8 | 3 | 57 |
| East Hynes | 5 | 6 | 0 |
| Outside SCAB | 7 | 2 | 48 |

Emissions from Locomotives

Pentane will be transported from LAR either by pipeline to Marine Terminal 2 or by rail car. If all pentane were transported by rail car, the maximum daily number of rail car shipments would increase by four. This minor increase will not require additional locomotive use, so pentane shipping from LAR by rail car will not increase emissions.

Emissions from Marine Tankers

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.

# B.3 EMISSIONS SUMMARIES (PRE-MITIGATION)

## B.3.1 Construction Emissions Summary

Tables 3.3-1 through 3.3-23 list estimated peak daily emissions during construction at each process unit and terminal.

**Table B.3-1**
**Light Hydro Unit #1 Modifications 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 | 21.3 | 4.5 | 42.5 | 3.7 | 2.4 | | 2.4 |
| On-Site Motor Vehicles | 7.3 | 1.0 | 3.4 | 0.0 | 0.2 | 9.4 | 9.6 |
| On-Site Fugitive PM10 | | | | | | 0.0 | 0.0 |
| Asphaltic Paving | | 0.0 | | | | | 0.0 |
| Architectural Coating | | 0.0 | | | | | 0.0 |
| **Total On-Site** | **28.6** | **5.6** | **45.9** | **3.7** | **2.6** | **9.4** | **12.0** |
| **Off-Site Motor Vehicles** | **29.4** | **4.0** | **8.2** | **0.0** | **0.2** | **5.1** | **5.3** |
| **TOTAL** | **58.0** | **9.5** | **54.1** | **3.7** | **2.7** | **14.5** | **17.3** |

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

**Table B.3-2**
**ISO-SIV Conversion to Light Hydro Unit #2 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 | 43.3 | 8.8 | 81.3 | 7.2 | 4.5 | | 4.5 |
| On-Site Motor Vehicles | 16.1 | 2.2 | 8.0 | 0.0 | 0.4 | 21.9 | 22.3 |
| On-Site Fugitive PM10 | | | | | | 0.0 | 0.0 |
| Asphaltic Paving | | 0.0 | | | | | 0.0 |
| Architectural Coating | | 0.0 | | | | | 0.0 |
| **Total On-Site** | **59.4** | **11.0** | **89.3** | **7.2** | **4.9** | **21.9** | **26.8** |
| **Off-Site Motor Vehicles** | **73.1** | **9.7** | **18.1** | **0.0** | **0.3** | **11.0** | **11.3** |
| **TOTAL** | **132.4** | **20.7** | **107.4** | **7.2** | **5.2** | **32.9** | **38.1** |

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

**Table B.3-3**
**#3 Reformer Fractionator Modifications 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 | 25.2 | 5.4 | 49.8 | 4.6 | 2.9 | | 2.9 |
| On-Site Motor Vehicles | 3.6 | 0.5 | 2.1 | 0.0 | 0.1 | 5.6 | 5.7 |
| On-Site Fugitive PM10 | | | | | | 0.0 | 0.0 |
| Asphaltic Paving | | 0.0 | | | | | 0.0 |
| Architectural Coating | | 0.0 | | | | | 0.0 |
| **Total On-Site** | **28.8** | **5.9** | **51.8** | **4.6** | **3.0** | **5.6** | **8.5** |
| **Off-Site Motor Vehicles** | **8.5** | **1.1** | **2.0** | **0.0** | **0.1** | **1.5** | **1.6** |
| **TOTAL** | **37.3** | **7.0** | **53.8** | **4.6** | **3.0** | **7.0** | **10.1** |

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

**Table B.3-4**
**Debutanizer Modifications in Gasoline Fractionation Area 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 | 17.7 | 4.0 | 34.2 | 3.0 | 2.1 | | 2.1 |
| On-Site Motor Vehicles | 4.7 | 0.6 | 2.3 | 0.0 | 0.1 | 6.2 | 6.3 |
| On-Site Fugitive PM10 | | | | | | 0.0 | 0.0 |
| Asphaltic Paving | | 0.0 | | | | | 0.0 |
| Architectural Coating | | 0.0 | | | | | 0.0 |
| **Total On-Site** | **22.4** | **4.7** | **36.5** | **3.0** | **2.2** | **6.2** | **8.4** |
| **Off-Site Motor Vehicles** | **23.7** | **2.9** | **4.0** | **0.0** | **0.1** | **2.5** | **2.6** |
| **TOTAL** | **46.1** | **7.6** | **40.4** | **3.0** | **2.3** | **8.7** | **11.0** |

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

**Table B.3-5**
**New FCCU Rerun Bottoms Splitter 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 | 56.5 | 11.5 | 104.6 | 9.1 | 5.9 | | 5.9 |
| On-Site Motor Vehicles | 17.4 | 2.3 | 8.8 | 0.0 | 0.4 | 23.8 | 24.2 |
| On-Site Fugitive PM10 | | | | | | 0.0 | 0.0 |
| Asphaltic Paving | | 0.2 | | | | | 0.0 |
| Architectural Coating | | 0.0 | | | | | 0.0 |
| **Total On-Site** | **73.9** | **14.0** | **113.4** | **9.1** | **6.4** | **23.8** | **30.2** |
| **Off-Site Motor Vehicles** | **49.8** | **6.9** | **14.2** | **0.0** | **0.3** | **8.6** | **8.9** |
| **TOTAL** | **123.7** | **20.8** | **127.7** | **9.1** | **6.6** | **32.4** | **39.0** |

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

**Table B.3-6**
**North Hydrogen Plant Modifications 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 | 26.5 | 5.1 | 46.8 | 4.2 | 2.7 | | 2.7 |
| On-Site Motor Vehicles | 3.7 | 0.5 | 1.7 | 0.0 | 0.1 | 4.9 | 5.0 |
| On-Site Fugitive PM10 | | | | | | 0.0 | 0.0 |
| Asphaltic Paving | | 0.0 | | | | | 0.0 |
| Architectural Coating | | 0.0 | | | | | 0.0 |
| **Total On-Site** | **30.3** | **5.6** | **48.5** | **4.2** | **2.8** | **4.9** | **7.7** |
| **Off-Site Motor Vehicles** | **16.5** | **2.3** | **5.0** | **0.0** | **0.1** | **2.9** | **3.0** |
| **TOTAL** | **46.8** | **7.9** | **53.5** | **4.2** | **2.9** | **7.8** | **10.6** |

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

**Table B.3-7**
**MTBE Unit Conversion to Iso-Octene 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 | 33.3 | 7.2 | 63.5 | 5.5 | 3.7 | | 3.7 |
| On-Site Motor Vehicles | 8.7 | 1.2 | 4.2 | 0.0 | 0.2 | 11.5 | 11.7 |
| On-Site Fugitive PM10 | | | | | | 0.0 | 0.0 |
| Asphaltic Paving | | 0.0 | | | | | 0.0 |
| Architectural Coating | | 0.0 | | | | | 0.0 |
| **Total On-Site** | **42.0** | **8.4** | **67.7** | **5.5** | **3.9** | **11.5** | **15.4** |
| **Off-Site Motor Vehicles** | **25.7** | **3.5** | **7.3** | **0.0** | **0.2** | **4.7** | **4.9** |
| **TOTAL** | **67.7** | **11.9** | **75.0** | **5.5** | **4.1** | **16.2** | **20.3** |

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

**Table B.3-8**
**Cat-Poly Unit Conversion to Dimerization Unit 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 | 53.3 | 12.0 | 105.9 | 9.1 | 6.1 | | 6.1 |
| On-Site Motor Vehicles | 17.7 | 2.4 | 8.9 | 0.0 | 0.4 | 23.7 | 24.2 |
| On-Site Fugitive PM10 | | | | | | 0.0 | 0.0 |
| Asphaltic Paving | | 0.0 | | | | | 0.0 |
| Architectural Coating | | 0.0 | | | | | 0.0 |
| **Total On-Site** | **71.0** | **14.4** | **114.8** | **9.1** | **6.5** | **23.7** | **30.2** |
| **Off-Site Motor Vehicles** | **34.4** | **4.9** | **10.9** | **0.0** | **0.2** | **6.7** | **6.9** |
| **TOTAL** | **105.4** | **19.3** | **125.8** | **9.1** | **6.7** | **30.5** | **37.2** |

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

**Table B.3-9**
**Mid-Barrel Unit Conversion to Gasoline Hydrotreater 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 | 31.1 | 6.4 | 57.8 | 5.0 | 3.4 | | 3.4 |
| On-Site Motor Vehicles | 8.7 | 1.2 | 4.2 | 0.0 | 0.2 | 11.5 | 11.7 |
| On-Site Fugitive PM10 | | | | | | 0.0 | 0.0 |
| Asphaltic Paving | | 0.0 | | | | | 0.0 |
| Architectural Coating | | 0.0 | | | | | 0.0 |
| **Total On-Site** | **39.7** | **7.6** | **62.0** | **5.0** | **3.6** | **11.5** | **15.0** |
| **Off-Site Motor Vehicles** | **25.7** | **3.5** | **7.3** | **0.0** | **0.2** | **4.7** | **4.9** |
| **TOTAL** | **65.5** | **11.1** | **69.2** | **5.0** | **3.7** | **16.2** | **19.9** |

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

**Table B.3-10**
**Tank Farm Piping Modifications 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 | 11.1 | 2.3 | 21.5 | 2.0 | 1.2 | | 1.2 |
| On-Site Motor Vehicles | 3.7 | 0.5 | 1.7 | 0.0 | 0.1 | 4.9 | 5.0 |
| On-Site Fugitive PM10 | | | | | | 0.0 | 0.0 |
| Asphaltic Paving | | 0.0 | | | | | 0.0 |
| Architectural Coating | | 0.0 | | | | | 0.0 |
| **Total On-Site** | **14.8** | **2.8** | **23.3** | **2.0** | **1.2** | **4.9** | **6.1** |
| **Off-Site Motor Vehicles** | **13.3** | **2.0** | **5.3** | **0.0** | **0.1** | **3.3** | **3.4** |
| **TOTAL** | **28.1** | **4.9** | **28.6** | **2.0** | **1.4** | **8.1** | **9.5** |

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

**Table B.3-11**
**New Pentane Off-Loading Racks at Pentane Rail Car Loading Facility 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 | 20.1 | 3.9 | 35.4 | 3.4 | 2.1 | | 2.1 |
| On-Site Motor Vehicles | 11.3 | 1.6 | 5.3 | 0.0 | 0.2 | 15.0 | 15.3 |
| On-Site Fugitive PM10 | | | | | | 0.0 | 0.0 |
| Asphaltic Paving | | 0.0 | | | | | 0.0 |
| Architectural Coating | | 0.0 | | | | | 0.0 |
| **Total On-Site** | **31.4** | **5.5** | **40.7** | **3.4** | **2.4** | **15.0** | **17.4** |
| **Off-Site Motor Vehicles** | **42.4** | **5.9** | **12.5** | **0.0** | **0.2** | **7.8** | **8.1** |
| **TOTAL** | **73.8** | **11.3** | **53.2** | **3.4** | **2.6** | **22.8** | **25.5** |

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

**Table B.3-12**
**New Pentane Transfer Pumps at Pentane Spheres 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 | 15.7 | 3.2 | 30.1 | 2.7 | 1.6 | | 1.6 |
| On-Site Motor Vehicles | 6.7 | 0.9 | 3.3 | 0.0 | 0.2 | 9.0 | 9.2 |
| On-Site Fugitive PM10 | | | | | | 0.0 | 0.0 |
| Asphaltic Paving | | 0.0 | | | | | 0.0 |
| Architectural Coating | | 0.0 | | | | | 0.0 |
| **Total On-Site** | **22.4** | **4.1** | **33.4** | **2.7** | **1.8** | **9.0** | **10.8** |
| **Off-Site Motor Vehicles** | **17.4** | **2.5** | **6.2** | **0.0** | **0.1** | **3.9** | **4.0** |
| **TOTAL** | **39.8** | **6.6** | **39.6** | **2.7** | **1.9** | **12.9** | **14.8** |

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

**Table B.3-13**
**Butane Loading Facilities at Polypropylene Loading Facility 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 | 45.2 | 9.2 | 87.5 | 7.3 | 4.5 | | 4.5 |
| On-Site Motor Vehicles | 16.4 | 2.2 | 8.7 | 0.0 | 0.4 | 23.4 | 23.8 |
| On-Site Fugitive PM10 | | | | | | 17.9 | 17.9 |
| Asphaltic Paving | | 0.2 | | | | | 0.0 |
| Architectural Coating | | 0.0 | | | | | 0.0 |
| **Total On-Site** | **61.6** | **11.5** | **96.2** | **7.3** | **4.9** | **41.2** | **46.2** |
| **Off-Site Motor Vehicles** | **41.3** | **5.8** | **12.6** | **0.0** | **0.2** | **7.4** | **7.6** |
| **TOTAL** | **102.9** | **17.3** | **108.8** | **7.3** | **5.1** | **48.7** | **53.8** |

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

**Table B.3-14**
**Marine Terminal 2 Modifications for Ethanol Off-Loading 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 | 14.0 | 2.8 | 25.9 | 2.2 | 1.5 | | 1.5 |
| On-Site Motor Vehicles | 2.2 | 0.3 | 0.9 | 0.0 | 0.0 | 2.2 | 2.2 |
| On-Site Fugitive PM10 | | | | | | 0.0 | 0.0 |
| Asphaltic Paving | | 0.0 | | | | | 0.0 |
| Architectural Coating | | 0.0 | | | | | 0.0 |
| **Total On-Site** | **16.2** | **3.1** | **26.8** | **2.2** | **1.5** | **2.2** | **3.7** |
| **Off-Site Motor Vehicles** | **4.6** | **0.6** | **1.0** | **0.0** | **0.0** | **0.8** | **0.8** |
| **TOTAL** | **20.8** | **3.7** | **27.8** | **2.2** | **1.5** | **3.0** | **4.5** |

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

**Table B.3-15**
**Marine Terminal 2 Modifications for Pentane Shipping 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 | 31.9 | 6.9 | 60.3 | 5.3 | 3.6 | | 3.6 |
| On-Site Motor Vehicles | 8.2 | 1.1 | 4.3 | 0.0 | 0.2 | 11.3 | 11.5 |
| On-Site Fugitive PM10 | | | | | | 0.0 | 0.0 |
| Asphaltic Paving | | 0.0 | | | | | 0.0 |
| Architectural Coating | | 0.0 | | | | | 0.0 |
| **Total On-Site** | **40.1** | **8.0** | **64.6** | **5.3** | **3.8** | **11.3** | **15.1** |
| **Off-Site Motor Vehicles** | **32.7** | **4.3** | **7.8** | **0.0** | **0.1** | **4.8** | **4.9** |
| **TOTAL** | **72.8** | **12.3** | **72.4** | **5.3** | **3.9** | **16.0** | **19.9** |

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

**Table B.3-16**
**East Hynes Terminal Modifications 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 | 14.0 | 2.8 | 25.9 | 2.2 | 1.5 | | 1.5 |
| On-Site Motor Vehicles | 2.2 | 0.3 | 0.9 | 0.0 | 0.0 | 2.2 | 2.2 |
| On-Site Fugitive PM10 | | | | | | 0.0 | 0.0 |
| Asphaltic Paving | | 0.0 | | | | | 0.0 |
| Architectural Coating | | 0.0 | | | | | 0.0 |
| **Total On-Site** | **16.2** | **3.1** | **26.8** | **2.2** | **1.5** | **2.2** | **3.7** |
| **Off-Site Motor Vehicles** | **4.6** | **0.6** | **1.0** | **0.0** | **0.0** | **0.8** | **0.8** |
| **TOTAL** | **20.8** | **3.7** | **27.8** | **2.2** | **1.5** | **3.0** | **4.5** |

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

**Table B.3-17**
**Vinvale Terminal Modifications 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 | 17.1 | 3.4 | 30.9 | 2.8 | 1.8 | | 1.8 |
| On-Site Motor Vehicles | 2.2 | 0.3 | 0.9 | 0.0 | 0.0 | 2.2 | 2.2 |
| On-Site Fugitive PM10 | | | | | | 0.0 | 0.0 |
| Asphaltic Paving | | 0.0 | | | | | 0.0 |
| Architectural Coating | | 0.0 | | | | | 0.0 |
| **Total On-Site** | **19.2** | **3.7** | **31.8** | **2.8** | **1.8** | **2.2** | **4.0** |
| **Off-Site Motor Vehicles** | **8.3** | **1.0** | **1.5** | **0.0** | **0.0** | **1.0** | **1.0** |
| **TOTAL** | **27.6** | **4.7** | **33.3** | **2.8** | **1.9** | **3.2** | **5.0** |

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

**Table B.3-18**
**Hathaway Terminal Modifications 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 | 17.1 | 3.4 | 30.9 | 2.8 | 1.8 | | 1.8 |
| On-Site Motor Vehicles | 2.2 | 0.3 | 0.9 | 0.0 | 0.0 | 2.2 | 2.2 |
| On-Site Fugitive PM10 | | | | | | 0.0 | 0.0 |
| Asphaltic Paving | | 0.0 | | | | | 0.0 |
| Architectural Coating | | 0.0 | | | | | 0.0 |
| **Total On-Site** | **19.2** | **3.7** | **31.8** | **2.8** | **1.8** | **2.2** | **4.0** |
| **Off-Site Motor Vehicles** | **8.3** | **1.0** | **1.5** | **0.0** | **0.0** | **1.0** | **1.0** |
| **TOTAL** | **27.6** | **4.7** | **33.3** | **2.8** | **1.9** | **3.2** | **5.0** |

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

**Table B.3-19**
**Carson Terminal Modifications 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 | 14.0 | 2.8 | 25.9 | 2.2 | 1.5 | | 1.5 |
| On-Site Motor Vehicles | 2.2 | 0.3 | 0.9 | 0.0 | 0.0 | 2.2 | 2.2 |
| On-Site Fugitive PM10 | | | | | | 0.0 | 0.0 |
| Asphaltic Paving | | 0.0 | | | | | 0.0 |
| Architectural Coating | | 0.0 | | | | | 0.0 |
| **Total On-Site** | **16.2** | **3.1** | **26.8** | **2.2** | **1.5** | **2.2** | **3.7** |
| **Off-Site Motor Vehicles** | **4.6** | **0.6** | **1.0** | **0.0** | **0.0** | **0.8** | **0.8** |
| **TOTAL** | **20.8** | **3.7** | **27.8** | **2.2** | **1.5** | **3.0** | **4.5** |

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

**Table B.3-20**
**Colton Terminal Modifications 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 | 14.0 | 2.8 | 25.9 | 2.2 | 1.5 | | 1.5 |
| On-Site Motor Vehicles | 2.2 | 0.3 | 0.9 | 0.0 | 0.0 | 2.2 | 2.2 |
| On-Site Fugitive PM10 | | | | | | 0.0 | 0.0 |
| Asphaltic Paving | | 0.0 | | | | | 0.0 |
| Architectural Coating | | 0.0 | | | | | 0.0 |
| **Total On-Site** | **16.2** | **3.1** | **26.8** | **2.2** | **1.5** | **2.2** | **3.7** |
| **Off-Site Motor Vehicles** | **4.6** | **0.6** | **1.0** | **0.0** | **0.0** | **0.8** | **0.8** |
| **TOTAL** | **20.8** | **3.7** | **27.8** | **2.2** | **1.5** | **3.0** | **4.5** |

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

**Table B.3-21**
**Peak Daily Construction General Grading 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 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 |
| On-Site Motor Vehicles | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| On-Site Fugitive PM10 | | | | | | 2.2 | 2.2 |
| Asphaltic Paving | | 0.0 | | | | | 0.0 |
| Architectural Coating | | 0.0 | | | | | 0.0 |
| **Total On-Site** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **2.2** | **2.2** |
| **Off-Site Motor Vehicles** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** |
| **TOTAL** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **2.2** | **2.2** |

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

**Table B.3-22**
**Peak Daily Construction General Surface Coating 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 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 |
| On-Site Motor Vehicles | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| On-Site Fugitive PM10 | | | | | | 0.0 | 0.0 |
| Asphaltic Paving | | 0.0 | | | | | 0.0 |
| Architectural Coating | | 24.0 | | | | | 0.0 |
| **Total On-Site** | **0.0** | **24.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** |
| **Off-Site Motor Vehicles** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** |
| **TOTAL** | **0.0** | **24.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** |

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

**Table B.3-23**
**Peak Daily Construction General Asphaltic Paving 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 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 |
| On-Site Motor Vehicles | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| On-Site Fugitive PM10 | | | | | | 0.0 | 0.0 |
| Asphaltic Paving | | 0.1 | | | | | 0.0 |
| Architectural Coating | | 0.0 | | | | | 0.0 |
| **Total On-Site** | **0.0** | **0.1** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** |
| **Off-Site Motor Vehicles** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** |
| **TOTAL** | **0.0** | **0.1** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** |

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

Because construction is not anticipated to occur at every process unit and terminal simultaneously, the overall peak daily construction emissions will not be equal to the sum of the peak daily emissions listed in the preceding tables. Therefore, the anticipated overlap of construction at the various locations was evaluated to determine overall peak daily emissions. First, it was conservatively assumed that the peak daily emissions during construction at each overlapping location would occur at the same time. Next, the locations where construction is anticipated be taking place were identified for each week of the entire construction period. 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) Dependentanizer 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 pentane 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 pentane storage and marine tanker loading
- General grading
- General surface coating
- General asphaltic paving

The estimated emissions during this period are summarized in Table B.3-24 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 B.3-24**
**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 | | | | | | 20.0 | 20.0 |
| Asphaltic Paving | | 0.5 | | | | | |
| Architectural Coating | | 24.0 | | | | | |
| **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** |
| *CEQA Significance Level* | *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.

### B.3.2 Operational Emissions Summary

Table B.3-25 lists the estimated peak daily direct operational emissions at LAR and each of the terminals as well as the indirect emissions from new employee commuting trips and from tanker trucks transporting ethanol. Tables B.3-26 and B.3-27 compare the operational emissions with the CEQA significance levels for sources subject to RECLAIM and for non-RECLAIM sources, respectively. As seen in Table B.3-27, the significance level is exceeded for VOC emissions.

**Table B.3-25**
**Peak Daily Operational Emissions Summary (Pre-mitigation)**

| Source | CO (lb/day) | VOC (lb/day) | $NO_X$ (lb/day) | $SO_X$ (lb/day) | $PM_{10}$ (lb/day) |
|---|---|---|---|---|---|
| **Direct Emissions** | | | | | |
| 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 |
| **Total** | **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 |
| **Total** | **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 |
| **Total** | **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** | **0.0** | **0.0** |
| **Indirect Emissions** | | | | | |
| New employee commuting trips | 7.4 | 0.9 | 0.9 | 0.0 | 0.4 |
| Tanker trucks transporting ethanol | 34.5 | 5.4 | 48.3 | 0.0 | 56.9 |
| **Total Indirect Emissions** | **41.8** | **6.3** | **49.2** | **0.0** | **57.4** |

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

**Table B.3-26**
**Project Operational Criteria Pollutant Emissions Summary for RECLAIM Sources**

| Pollutant | Direct 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 B.3-27**
**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.

Table B.3-28 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 B.3-28**
**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** |

Anticipated changes in direct operational emissions of TACs at LAR and the terminals are listed in Table B.3-29.

**Table B.3-29**
**Changes in Direct Operational Toxic Air Contaminant Emissions**

| Species | Emissions (lbs/year) | | | | | | |
|---|---|---|---|---|---|---|---|
| | LAR, Excluding Storage Tanks | 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] | -1,345.2 | -3.4 | -29.6 | -20.7 | -12.6 | -3.8 | -2.4 |
| 1,3-Butadiene[a] | -5.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cresol (Mixed)[a] | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Hydrogen Cyanide | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Hydrogen Sulfide[a] | 0.6 | 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 | 0.0 |
| Naphthalene | 275.6 | -25.4 | -0.1 | -5.4 | -0.1 | 0.0 | 0.0 |
| Phenol[a] | -0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Propylene | -749.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Toluene[a] | 233.7 | -17.8 | -80.5 | -62.7 | -44.1 | -10.3 | -6.3 |
| Xylenes (Mixed)[a] | 705.3 | -30.1 | -25.2 | -20.5 | -14.6 | -3.4 | -2.1 |

**Table B.3-29 (Cont.)**
**Changes in Direct Operational Toxic Air Contaminant Emissions**

| Species | Emissions (lbs/year) | | | | | | |
|---|---|---|---|---|---|---|---|
| | **LAR, Excluding Storage Tanks** | **Marine Terminal 2** | **Hathaway Terminal** | **East Hynes Terminal** | **Vinvale Terminal** | **Carson Terminal** | **Colton Terminal** |
| Other Toxic Air Contaminants | | | | | | | |
| 2,2,4-Trimethyl Pentane | 917.0 | -13.5 | -313.4 | -19.6 | -76.7 | -1.4 | -0.4 |
| Cumene | 1.9 | 0.0 | -0.1 | -0.1 | -0.1 | 0.0 | 0.0 |
| Ethyl Benzene | -18.5 | -6.8 | -5.8 | -4.6 | -3.2 | -0.8 | -0.5 |
| Hexane | -4,209.7 | -5.8 | -121.0 | -63.0 | -27.4 | -13.5 | -8.5 |
| [a] SCAQMD Rule 1401 Carcinogenic Air Contaminant | | | | | | | |

## B.4 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 B.3-29. 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 attachments to this appendix.

<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 B.4-1. 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.

Receptors

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; b) extending north, south and east from the property line to approximately 500 hundred meters with a spacing of 100 meters; and c) extending approximately 2,500 meters west from the property line with a spacing of 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.

**Table B.4-1**
**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 |

Source Parameters

Table B.4-2 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 B.4-2 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 B.4-2**
**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-$m^2$] |
|---|---|---|---|---|---|---|---|
| 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 (Assessment of Chemical Exposure for AB2588) 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 B.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. However, the HRA indicates that the proposed project will not increase cancer risks.

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 not only below the SCAQMD significance criteria, but they indicate that there are no adverse impacts as a result of the project.

## B.5 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 0.02

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 St. 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.

## B.6 EMISSIONS SUMMARIES (MITIGATED)

### B.6.1 Construction Emissions

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 B.6-1 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 B.6-2 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.

### B.6.2 Operational Emissions

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 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.

**Table B.6-1**
**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 all vehicles leaving unimproved areas | 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 if they are commercially available and can feasibly be retrofitted onto construction equipment. | Construction Equipment Exhaust | CO<br>VOC<br>$NO_X$<br>$SO_X$<br>$PM_{10}$ | Unknown<br>Unknown<br>Unknown<br>Unknown<br>Unknown |
| AQ-5 | Proper equipment maintenance | Construction Equipment Exhaust | CO<br>VOC<br>$NO_X$<br>$SO_X$<br>$PM_{10}$ | 5<br>5<br>5<br>5<br>0 |
| | No feasible measures identified[b] | On-Road Motor Vehicles | CO<br>VOC<br>$NO_X$<br>$PM_{10}$ | N/A<br>N/A<br>N/A<br>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 B.6-2**
**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* |
| Signigifant? (Yes/No) | **Yes** | **Yes** | **Yes** | No | | | **Yes** |

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

ARCO will reduce VOC emissions by at least 42 pounds per day, 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 offset. This will reduce operational VOC emissions to 55 pounds per day or less.

## B.7 PROJECT ALTERNATIVES

Two project alternatives have been identified for the proposed project, including storage of pentane at LAR instead of Marine Terminal 2 and the conversion of the MTBE Unit into a Selective Hydrogenation Unit. Project alternatives were developed by modifying one or more components of the proposed project. Unless otherwise stated, all other components of each project alternative are identical to the proposed project.

### B.7.1 Alternative 1 – Storage of Pentane at LAR

As an alternative to storage of pentane at Marine Terminal 2, one new 87-foot storage sphere at LAR would be constructed to store chilled pentane at 60º F. The pentane would be refrigerated by utilizing the existing surplus refrigeration capacity at the Liquids Recovery Unit (LRU) or by installing a new dedicated propane-powered refrigeration system near the two existing pentane spheres in this area of LAR.

Four existing tetramer tanks would be demolished to allow room for the new 60,000 BBL capacity pentane sphere. Demolition of the tetramer tanks and the construction of the new sphere would result in the removal of approximately 500 tons of concrete from existing tank foundations, as well as 3,000 cubic yards of potentially contaminated soil during excavation of new foundations.

A new booster pump would be installed to feed the pentane from the sphere to an existing shipping pump, which would utilize an existing pipeline dedicated for loading ships at Marine Terminal 2 directly from LAR.

Approximately the same amount of construction would be associated with this alternative, although two additional tanks would have to be removed. Additionally, the anticipated construction schedule is the same as for construction at Marine Terminal 2 for pentane storage and shipping. Therefore, peak daily pre-mitigated and mitigated construction emissions for this alternative would be the same as for the project.

Since four existing tanks would be taken out of service and a sphere would be constructed rather than a fixed roof tank, the alternative will result in lower direct VOC emissions. This alternative would result in similar indirect emissions. Alternative 1 operational criteria pollutant emissions for Non-RECLAIM sources are summarized in Table B.7-1. Emissions from RECLAIM sources are the same as for the proposed project.

**Table B.7-1**
**Alternative 1 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] | -7.2 | 6.3 | -1.0 | 55 | No |
| $NO_X$ | 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.

### B.7.2 Alternative 2 – MTBE Unit Conversion into a Selective Hydrogenation Unit (SHU)

With this option, the existing MTBE unit would be converted into a SHU for alkylation feed treating to improve the octane of refinery gasoline components. As with the proposed conversion of the MTBE Unit into an ISO Octene Unit, this alternative would enable compliance with octane requirements absent MTBE and with less benzene as required by the CARB Phase 3 gasoline specification. Conversion to a SHU would require a new heat exchanger, re-servicing of an existing Methanol Stripper column to a Product Stripper column and modification of associated instrumentation/control systems.

Approximately the same amount of construction would be associated with this alternative as with the proposed conversion of the MTBE Unit into an ISO-Octene Unit. Additionally, the anticipated construction schedule is the same as for the proposed project. Therefore, peak daily pre-mitigated and mitigated construction emissions for this alternative would be the same as for the project.

However, direct operational VOC emissions would be lower. This alternative would result in similar indirect emissions. Alternative 2 operational criteria pollutant emissions for Non-RECLAIM sources are summarized in Table B.7-2. Emissions from RECLAIM sources are the same as for the proposed project. In addition, this alternative would result in a comparable reduction in toxic air contaminants from LAR.

**Table B.7-2**
**Alternative 2 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] | 60.3 | 6.3 | 66.5 | 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.