Appendix C

Construction-and Operational-Related Air Quality Impacts (e.g., emissions) Estimation Methodologies

Emissions that can adversely affect air quality originate from various activities. A project generates emissions both during the period of its construction and through ongoing daily operations. During construction of the new CTs and SCR units, emissions will be generated by onsite construction equipment and by offsite vehicles used to deliver supplies, remove soil, and for worker commuting. After construction activities are completed, emissions will be generated by operation of the CTs and SCRs, along with offsite vehicles used for aqueous ammonia delivery.

The following discussion provides the methodologies used to estimate the construction and operational air quality impacts from the project. The discussion first presents the methodologies for estimating unmitigated construction emissions and unmitigated operational emissions. The unmitigated emissions are compared with the SCAQMD's CEQA air quality significance thresholds to determine if significant air quality impacts are created during the various phases of the proposed project. Feasible mitigation measures are then identified for emissions that exceed the SCAQMD's CEQA air quality significance thresholds, and the remaining mitigated emissions are presented. Details (e.g., formulae, input variables, assumptions, and references) of the methodologies used to estimate air quality impacts are presented in the attached spreadsheets.

C.1 Construction Emissions (Unmitigated)

Construction-related emissions can be distinguished as either onsite or offsite. Onsite emissions generated during construction principally consist of exhaust emissions (NO_X, SO_X, CO, VOC, and PM_{10}) from heavy-duty construction equipment operation, fugitive dust (PM_{10}) from disturbed soil, and VOC emissions from storage tank degassing prior to demolition and from asphaltic paving and painting. Offsite emissions during the construction phase normally consist of exhaust emissions and entrained paved road dust (PM_{10}) from worker commute trips, material delivery trips, and haul truck material removal trips to and from the construction site.

Construction-related activities at the project sites are anticipated to include the following major components:

- Demolition of four storage tanks at HGS
- Demolition of four cooling towers and a storage tank at VGS
- Demolition of a concrete pad at SGS

- Backfilling at HGS to bring the site to road grade
- Grading at all three sites
- Trenching along road sides at HGS
- Jacking (e.g, boring) of utilities under roads at HGS
- Construction of CT pads and equipment foundations at HGS and VGS
- Construction of tank pads at SGS
- Equipment installation of CTs, SCRs, auxiliary equipment, and tanks at all three project sites
- Paving of access roads and equipment maintenance areas at all three project sites

C.1.1 Numbers, Sizes, Schedules, and Assumptions Associated with Construction Equipment, Vehicles, and Workers

To estimate the "worst-case" peak daily emissions associated with the construction activities, the anticipated schedule, and the types and number of construction equipment were estimated. Additionally, estimates were made of the number of peak daily worker commuting trips and material delivery and removal trips for each of the construction activities. The specific assumptions for each phase of construction are discussed below.

C.1.1.1 Demolition of four (4) storage tanks at HGS:

Two 80,000 barrel, one 100,000 barrel, and one 5,000-barrel tanks will be demolished at HGS. Equipment and manpower requirements for tank demolition were estimated by Mr. Robert Lartz of Recon Corporation, based on previous experience. A tractor with a shear attachment and a crew of 3 workers are required to demolish tanks of this size. A crane is also required to handle the cut tank sections, along with a haul truck to remove material from the site. Due to the accelerated time frame required for this project, it has been assumed that two crews will be required to accomplish the demolition according to the established schedule.

C.1.1.2 Demolition of four (4) cooling towers and a storage tank at VGS:

The demolition of the 80,000-barrel storage tank at VGS is based on the same information described above for HGS, however, only one crew is anticipated. Cooling tower demolition is based on data taken from *Building Construction Cost Data*, RS Means, 12th Annual Edition, 1999 Western Addition (Means). It is assumed that cooling tower demolition is equivalent to demolition of a building of mixed construction. According to Means, a crew of 8 workers using one crane, one front end loader and two dump trucks can demolish approximately 20,100 cubic feet of building per day (Means, 020-604-0100). Each cooling tower has a rod reinforced concrete pad that must also be demolished. A crew of five workers using a backhoe, jackhammer, and front end loader are capable of removing 200 square yards of rod reinforced concrete per day (Means, 020-554-2000).

C.1.1.3 Demolition of a concrete pad at SGS:

The existing 2,250-square-foot rod reinforced concrete pad will be demolished. A crew of five workers using a backhoe, jackhammer, and front end loader are capable of removing 200 square yards of rod reinforced concrete per day (Means, 020-554-2000).

C.1.1.4 Backfilling at HGS to bring the site to road grade:

The existing tank farm, an area of approximately 137,500 square feet, will be backfilled to an average depth of two feet. Backfilling and compaction require a bulldozer with a towed vibrating sheepsfoot roller along with an operator and a part-time laborer/assistant. This crew is capable of 750 cubic yards of backfill per day (Means, 022-204-1700). To meet the projected schedule, two crews will be required.

C.1.1.5 Grading at all three sites:

Grading of approximately 10 acres at VGS, 12 acres at HGS, and 2,000 square feet at SGS will be required. Fine grading for site preparation for a slab on grade requires a crew of two and a grader. This crew should be capable of 1,040 square yards per day (Means, 025-122-1100)

C.1.1.6 Trenching for piping on property at HGS:

Trenching is required from the ammonia tanks to the CT installation, a distance of approximately 775 linear feet on site, and crossing a city street. In addition, a trench will be required for the natural gas connector pipeline from the main pipeline to the CT installation, a distance of less than 200 feet. Trenching, installing bedding, and backfill of the trenches will require a crew of five workers using a trencher, backhoe, and a plate compactor. This crew can trench 800 linear feet per day (Means, 022-258-2550, 026-012-0100, 026-012-0500).

C.1.1.7 Jacking (boring) of utilities under roads at HGS:

The aqueous ammonia supply pipe from the existing aqueous ammonia storage tanks to the new CTs with SCRs will be installed under Fries Avenue. The preferred installation method is jacking (boring) under the street. This requires the construction of a pit on both sides of the road to allow access for the boring equipment. The pit construction will require a crew of two workers and one backhoe (Means, 022-250-2035). Construction time is one day.

C.1.1.8 Construction of CT pads and equipment foundations at HGS and VGS:

Construction of a slab on grade for the CT pads and foundations will require a crew of 25 workers with a gasoline-fueled concrete vibrator and a small concrete pump. This crew is capable of 10.25 cubic yards per day (Means, 033-130-0840). The foundation for each CT is approximately 8,600 square feet, and is expected to be 12 inches thick. To meet the project schedule, one crew will be required at VGS and five crews will be required at HGS.

C.1.1.9 Construction of tank pads at SGS:

The aqueous ammonia tanks at SGS will require a foundation of approximately 2,250 square feet. Construction of a slab on grade for the ammonia tank foundations will require a crew of nine workers with a gasoline-fueled concrete vibrator, with four additional rod men for reinforcing the concrete. This crew is capable of 3,184 square feet per day (Means, 033-130-4840).

C.1.1.10 Equipment installation of CTs, SCRs, auxiliary equipment, and tanks at all three project sites:

Based on project estimates for similar installations (Harbor Generating Station Repowering Project EIR, February 1990), extrapolated for the larger number of CTs to be installed at HGS, it is estimated that 400 workers will be required, along with six forklifts and four cranes. For VGS, 100 workers, two forklifts and one crane are anticipated to install the CT at that site. For SGS, 100 workers, two forklifts and one crane are anticipated for the installation of the SCR systems on the existing three power generating Units (e.g., #1, #2, and #3). Delivery truck requirements to each facility were provided by the equipment suppliers.

C.1.1.11 Paving of access roads and equipment maintenance areas at all three project sites:

Asphalt paving of an area equivalent to the equipment pad is required to provide an equipment maintenance area for each CT at HGS and VGS. Paving of an access road of approximately 2,000 square feet is assumed for an access road. Paving requires a crew of six workers with an asphalt paver and a roller. This crew can pave 15,000 square feet per day (Means, 025-124-0500).

Tables C-1 through C-3 list the anticipated schedule, peak daily construction equipment requirements, peak daily construction worker trips, peak daily material delivery truck trips, and peak daily haul truck trips for construction at each project site. Due to the accelerated construction schedule, construction-related activities are anticipated to occur seven days per week for up to 24 hours per day. Allowing time for shift changes and work breaks, construction equipment is assumed to operate for 16 hours per day.

Table C-1
Construction Schedule, Equipment Requirements and Motor Vehicle Trips
Harbor Generating Station

Start and End Construction Days	Type of Equipment (Onsite)	Number of Equipment	Number of Construction Workers (Offsite)	Daily Material Delivery Trips (Offsite)	Daily Haul Truck Trips (Offsite)
Demolition					
1-10	D6 Bulldozer	1	16	0	26
	Front End Loader	1			
	Excavator	2			
	Light Plant	20			
	Crane	2			
Backfill					
11-20	D8 Bulldozer	2	10	50	0
	Grader	2			
	Compactor	2			
	Light Plant	20			
Grading					
18-20	Grader	1	3	0	0
	Light Plant	20			

Table C-1 (cont'd)
Construction Schedule, Equipment Requirements and Motor Vehicle Trips
Harbor Generating Station

Start and End Construction Days	Type of Equipment (Onsite)	Number of Equipment	Number of Construction Workers (Offsite)	Daily Material Delivery Trips (Offsite)	Daily Haul Truck Trips (Offsite)
Construction of Foundations					
21-28	Concrete Vibrator Concrete Pump Light Plant	10 10 20	250	33	0
Asphalt Paving					
21-28	Paver Light Plant	1 20	6	14	0
Equipment Installation					
29-150	Forklift Backhoe Compressor Light Plant Trencher Plate Compactor Crane	6 2 2 20 1 1 4	400	10	1

Table C-2
Construction Schedule, Equipment Requirements and Motor Vehicle Trips
Scattergood Generating Station

Start and End Construction Days	Type of Equipment (Onsite)	Number of Equipment	Number of Construction Workers (Offsite)	Daily Material Delivery Trips (Offsite)	Daily Haul Truck Trips (Offsite)
Demolition					
1-10	Front End Loader Backhoe Light Plant Jackhammer	1 1 5 1	10	0	16

Table C-2 (cont'd)
Construction Schedule, Equipment Requirements and Motor Vehicle Trips
Scattergood Generating Station

Start and End Construction Days	Type of Equipment (Onsite)	Number of Equipment	Number of Construction Workers (Offsite)	Daily Material Delivery Trips (Offsite)	Daily Haul Truck Trips (Offsite)
Grading					
18-20	Grader Light Plant	1 5	3	0	0
Construction of Foundations					
21-28	Concrete Vibrator Concrete Pump Light Plant	1 1 5	13	8	0
Asphalt Paving					
21-28	Paver Light Plant	1 5	3	6	0
Equipment Installation					
29-150	Forklift Compressor Light Plant Welder Crane	2 2 5 6 1	100	10	1

Table C-3
Construction Schedule, Equipment Requirements and Motor Vehicle Trips
Valley Generating Station

Start and End Construction Days	Type of Equipment (Onsite)	Number of Equipment	Number of Construction Workers (Offsite)	Daily Material Delivery Trips (Offsite)	Daily Haul Truck Trips (Offsite)
Demolition					
1-10	Front End Loader Excavator Backhoe Light Plant Jackhammer Crane	2 1 1 5 1 1	12	0	10

Table C-3 (cont'd)
Construction Schedule, Equipment Requirements and Motor Vehicle Trips
Valley Generating Station

Start and End Construction Days	Type of Equipment (Onsite)	Number of Equipment	Number of Construction Workers (Offsite)	Daily Material Delivery Trips (Offsite)	Daily Haul Truck Trips (Offsite)
Grading					
11-15	Grader	1	3	0	0
	Light Plant	5			
Construction of Foundations					
16-22	Concrete Vibrator	2	50	25	0
	Concrete Pump	2			
	Light Plant	5			
Asphalt Paving					
21-25	Paver	1	3	8	0
	Light Plant	5			
Equipment Installation					
29-150	Forklift	2	105	10	1
	Backhoe	1			
	Compressor	2			
	Light Plant	5			
	Welder	2			
	Trencher	1			
	Plate Compactor	1			
	Crane	1			

C.1.2 Exhaust Emissions from Construction Equipment

The combustion of fuel to provide power for the operation of construction 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 type of construction equipment:

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

where:

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

BHP = Equipment brake horse power (bhp)

LF = Equipment load factor

T_H = Equipment operating hours/day (anticipated to be 10 for all equipment)

N = Number of pieces of equipment

Table C-4 provides the emission factors, horsepower, and load factors used to estimate peak daily exhaust emissions from construction equipment. With the exception of the two bulldozers, the concrete vibrators, the concrete pumps, and the light plants, equipment horsepower ratings, load factors, and emission factors were taken from the SCAQMD's CEQA Air Quality Handbook (SCAQMD, 1993)[1]. Horsepower ratings for the two bulldozers (e.g., D8 and D6), the concrete vibrators, the concrete pumps, and the light plants were obtained from the Caterpillar Web site (http://www.cat.com), the Allen Engineering Web site (www.alleneng.com, concrete vibrator backpack power unit), the Schwing Web site (www.schwing.com, Model P-88), and the Ingersoll-Rand Web site (www.irco.com, Model L8), respectively. The emission factors and load factors for these equipment were taken from the SCAQMD's CEQA Handbook[2].

Table C-4
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
D8 Bulldozer	Diesel	305	59	0.011	0.002	0.023	0.002	0.001
D6 Bulldozer	Diesel	165	59	0.011	0.002	0.023	0.002	0.001
Grader	Diesel	156.6	57.5	0.008	0.003	0.021	0.002	0.001
Front End Loader	Diesel	147	46.5	0.015	0.003	0.022	0.002	0.001
Skip Loader	Diesel	55	46.5	0.020	0.004	0.021	0.002	0.002
Compactor, Vibrating Sheepsfoot	Diesel	161	57.5	0.007	0.002	0.020	0.002	0.001
Excavator	Diesel	151.7	58	0.011	0.001	0.024	0.002	0.002
Barber-Green Paver	Diesel	91	59	0.007	0.001	0.023	0.002	0.001
Forklift	Diesel	83	47.5	0.013	0.003	0.031	0.002	0.002
Backhoe	Diesel	79	46.5	0.015	0.003	0.022	0.002	0.001
Concrete Vibrator	Gasoline	2.5	62	0.570	0.025	0.011	0.001	0.000

[1] These variables were obtained from an EPA report entitled Nonroad Engine and Vehicle Study Report, (EPA 460/3-91-02, November 1991).
[2] Id.

Table C-4 (cont'd)
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
Concrete Pump	Diesel	33	62	0.020	0.003	0.024	0.002	0.002
Light Plant	Diesel	13.6	62	0.020	0.003	0.024	0.002	0.002
Jackhammer/ Compressor	Diesel	37	48	0.011	0.002	0.018	0.002	0.001
Welder	Diesel	35	45	0.011	0.002	0.018	0.002	0.001
Trencher	Diesel	60	69.5	0.020	0.003	0.022	0.002	0.002
Plate Compactor	Diesel	8	55	0.007	0.002	0.020	0.002	0.001
Crane	Diesel	194	43	0.009	0.003	0.023	0.002	0.002

C.1.3 Fugitive Dust (PM_{10}) Emissions

Fugitive dust emissions generated during the construction phase can generally be classified into three major categories: demolition; site preparation (e.g., backfill and grading); and general construction. Demolition and site preparation include the use of heavy-duty construction equipment (e.g., backhoe) for excavation, concrete removal, backfill and grading, and slab pouring/paving. General construction activities entail the handling and transport of construction materials in conjunction with the actual physical installation of the equipment.

Fugitive dust emissions during the construction phase for the proposed project are anticipated to be generated by the following operations:

- Bulldozing;
- Grading;
- Construction equipment and motor vehicle travel on unpaved surfaces;
- Storage pile wind erosion;
- Material handling (i.e., dropping soil onto the ground or into trucks);
- Vehicle travel on paved roads; and
- Loss of soil from haul trucks during transport.

Although fugitive dust emissions from construction activities are temporary, they may have a significant impact on local air quality. Fugitive dust emissions often vary substantially from day to day, depending on the level of activity at the construction site, the specific operations, and the prevailing meteorological conditions. The following methodologies provide the predictive emission equations used to estimate fugitive dust emissions associated with the proposed project. The emission factors and default values used to calculate fugitive dust emissions for the proposed project can be found in Table C-5.

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. This control efficiency was factored into the unmitigated fugitive dust emission estimates for the proposed project.

C.1.3.1 Emissions from Bulldozing

Emissions (lb/day) = $0.75 \times (s^{1.5} / M^{1.4}) \times T_H \times N$ (EQ. C-2)

where:

s = Soil silt content (percent)

M = Soil moisture content (percent)

T_H = Bulldozer operating time (hours/day)

N = Number of bulldozers

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

C.1.3.2 Emissions from Grading

Emissions (lb/day) = $0.0306 \times S^{2.0} \times VMT \times N$ (EQ. C-3)

where:

S = Grader speed (miles/hr)

VMT = Vehicle distance traveled (miles/vehicle-day)

N = Number of graders

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

C.1.3.3 Emissions from Construction Equipment and Motor Vehicle Travel on Unpaved Surfaces

Emissions (lb/day) = $2.6 \times (S/15) \times (s/12)^{0.8} \times (W/3)^{0.4} / (M/0.2)^{0.3} \times VMT \times N$ (EQ. C-4)

where:

S = Equipment/motor vehicle speed (miles/hour) (set to 15 mph for speeds above 15 mph)

s = Soil silt content (percent)

W = Equipment/motor vehicle weight (tons)

M = Soil moisture (percent)

VMT = Vehicle distance traveled (miles/vehicle-day)

N = Number of vehicles

Source: Equation 1, Section 13.2.3, U.S. EPA Compilation of Air Pollutant Emission Factors (AP-42), September 1998.

Note that emissions from bulldozer and grader travel on unpaved surfaces are included in the bulldozing and grading emissions equations above.

C.1.3.4 Emissions from Storage Pile Wind Erosion

Emissions (lb/day) = $0.85 \times (s/1.5) \times (365\text{-}p/235) \times (U_{12}/15) \times A$ (EQ. C-5)

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

C.1.3.5 Emissions from Material Handling

Emissions (lb/day) = $0.0011 \times (U/5)^{1.3} / (M/2)^{1.4} \times V \times D \times N_D$ (EQ. C-6)

where:

U = Mean wind speed (miles/hour)

M = Soil moisture (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, U.S. EPA Compilation of Air Pollutant Emission Factors (AP-42), January 1995.

C.1.3.6 Emissions from Paved Road Dust Entrainment

Emissions (lb/day) = $7.26\ (sL/2)^{0.65} / (W/3)^{1.5} \times VMT$ (EQ. C-7)

where:

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

W = Vehicles weight (tons)

VMT = Vehicle distance traveled (miles/vehicle-day)

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

C.1.3.7 Emissions from Loss of Soil from Haul Trucks

Emissions (lb/day) = $[0.029\ (U^* - U_t)^2 + 0.0125\ (U^* - U_t)]\ (M / 2)^{-1.4} \times PM \times A_T \times N_T$ (EQ. C-8)

where:

U^* = Friction velocity (mi/hr)

= $0.4 \times U_T / \ln(H_T / H_R)$

U_T = Truck speed (mi/hr)

H_T = Height above exposed surface (cm)

H_R = Roughness height (cm)

U_t = Threshold friction velocity (mi/hr)

M = Soil moisture content (%)

PM = PM_{10} factor (dimensionless)

A_T = Exposed surface area (sq. ft.)

N_T = Number of haul truck trips per day

Source: Adapted from AP-42 industrial wind erosion equations

Table C-5 lists the values for the various parameters and variables in these equations that were used to estimate onsite and offsite fugitive PM_{10} emissions.

Table C-5
Parameters Used to Calculate Onsite and Offsite Fugitive Dust PM_{10} Emissions

Parameter	Value	Basis
Soil silt content (s)	7.5 percent	SCAQMD 1993 CEQA Air Quality Handbook, Overburden
Soil moisture content (M)	5.9 percent	"Open Fugitive Dust PM10 Control Strategies Study," Midwest Research Institute, October 12, 1990.
Grader speed (S)	5 mph	Assumption
Grader distance traveled (VMT)	1 mile/day	Assumption
Construction equipment speed on unpaved surfaces (S)	5 mph	Assumption
Material haul and delivery truck speeds on unpaved surfaces (S)	5 mph	Assumption
Onsite pickup truck speed on unpaved surfaces (S)	15 mph	Assumption
Construction equipment weight (W)	40 tons	Estimated weight for heavy equipment
Material haul and delivery truck weight (W)	40 tons	Estimated weight for loaded haul truck

Table C-5 (cont'd)
Parameters Used to Calculate Onsite and Offsite Fugitive Dust PM_{10} Emissions

Parameter	Value	Basis
Onsite pickup truck weight (W)	5 tons	Estimated weight for 1 ton truck
Construction equipment distance traveled on unpaved surfaces (VMT)	1 mile/day	Assumption
Haul and delivery truck distance traveled on unpaved surfaces (VMT)	1 mile/day	Estimated from site configurations
Onsite pickup truck distance traveled on unpaved surfaces (VMT)	Varies by site and activity	Typical values for types of activities
Number of days per year with precipitation of 0.01 inches or more (p)	0	Conservative assumption based on construction not occurring during wet season
Percentage of time unobstructed wind speed exceeds 12 miles per hour (U_{12})	100 percent	Conservative estimate
Storage pile surface area (A): HGS grading and backfill SGS grading VGS grading	 0.023 acres 0.052 acres 0.023 acres	Estimated from grading and excavation requirements
Mean wind speed (U)	12 miles/hr	SCAQMD 1993 CEQA Air Quality Handbook, Default
Volume of soil handled (V): HGS tank demolition HGS backfilling	 468 cu. yd. 900 cu. yd.	Estimated from grading and excavation requirements
Soil density (D)	1.215 ton/cu. yd.	Table 2.46, Handbook of Solid Waste Management
Number of soil drops N_D	4 drops/ton	Assumption
Construction worker commuting vehicle weight (W)	3 tons	Typical for light-duty truck
Offsite roadway silt loading (sL)	0.037 g/m^2	Default for collector road, ARB Emission Inventory Methodology 7.9, Entrained Paved Road Dust (1997)
Haul truck speed (U_t)	60	Conservative upper limit
Height above exposed soil surface in haul truck (H_T)	30.48	Assumption

Table C-5 (cont'd)
Parameters Used to Calculate Onsite and Offsite Fugitive Dust PM_{10} Emissions

Parameter	Value	Basis
Roughness height (H_R)	0.3	Default value
Threshold friction velocity for haul trucks (U_t)	1.61	Environ study
PM_{10} factor for haul truck soil losses (PM)	0.5	Assumption
Exposed haul truck soil surface area (A_T)	258	Typical value for open top sets

C.1.4 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:

Emissions (lb/day) = 2.62 x A (EQ. C-9)

where:

A = Area paved (acres/day)

Source: URBEMIS7G User's Guide, 1998

The maximum areas anticipated to be paved during one day are estimated to be 0.99 acres (43,200 ft^2) at HGS, 0.03 acres (1,125 ft^2) at SGS, and 0.2 acres (8,640 ft^2) at VGS.

C.1.5 Architectural Coating Emissions

Architectural coatings generate VOC emissions from the evaporation of solvents contained in the coating to form a durable film that acts as the protective barrier for the substrate coated. The following equation was used to estimate VOC emissions from architectural coatings associated with the proposed project:

Emissions (lb/day) = C x V (EQ. C-10)

where:

C = VOC content of coating (lb/gal)

V = Amount of coating applied (gal/day)

A VOC content of 3.5 lb/gal (420 g/l) was assumed, based on the VOC limit specified in SCAQMD Rule 1113 for an industrial maintenance coating. The maximum daily volume of coating anticipated to be applied for all three project sites is estimated to be 10 gallons for touch-up purposes. The equipment to be installed at each site will be pre-painted to manufacturer specifications.

C.1.6 Storage Tank Degassing Emissions

As mentioned in Chapter 4 of the Air Quality section, four tanks at HGS and one tank at VGS will be removed to make room for the new CTs, SCRs, and auxiliary equipment. Prior to the tanks removal and demolition, the tanks will be emptied of their liquid contents. However, the volume inside the tanks (e.g., vapor space) will be saturated with the organic vapors evolved from the materials that the tanks once contained. The following equation was used to calculate the VOC emissions associated with the removal of organic vapors prior to tank demolition:

Emissions (lb/day) = $(p_v / 14.7) (M_V) / [0.1301 \times (453.6 + T_V)] \times V_T$ (EQ. C-11)

where:

p_v = Tank liquid contents vapor pressure (psia)

M_V = Tank contents vapor molecular weight (lb/lb-mole)

0.1301 = Ideal gas law constant (bbl-atm/mole-deg. R)

T_V = Tank internal temperature (^oF)

V_T = Tank vapor space volume (bbl)

Table C-6 lists the parameters used to calculate storage tank degassing emissions for each of the tanks. Two of the tanks at HGS and the tank at VGS to be demolished are floating roof tanks. Because the floating roofs will be sitting on supports that are assumed to be six feet high after the tanks are emptied, the vapor space volumes for these tanks were calculated as the volumes of cylinders six feet high. The other two tanks to be demolished at HGS are fixed roof tanks. The temperature was assumed to be 80 ^oF for all tanks.

Table C-6
Values Used to Estimate Storage Tank Degassing VOC Emissions

Parameter	Value	Basis
HGS, Tank 1		
Vapor Pressure	0.0124 psia	Light cycle oil; Ultramar
Vapor Molecular Weight	130	Light cycle oil; Ultramar
Vapor Space Volume	15,525 bbl	Floating roof, 136 ft. dia., 6 ft. high when empty
HGS, Tank 2		
Vapor Pressure	0.0124 psia	Light cycle oil; Ultramar
Vapor Molecular Weight	130	Light cycle oil; Ultramar
Vapor Space Volume	80,000 bbl	Fixed roof
HGS, Tank 3		
Vapor Pressure	0.0124 psia	Light cycle oil; Ultramar
Vapor Molecular Weight	130	Light cycle oil; Ultramar
Vapor Space Volume	80,000 bbl	Fixed roof
HGS, Tank 4		
Vapor Pressure	0.0132 psia	Cutter stock, Ultramar
Vapor Molecular Weight	130	Cutter stock, Ultramar
Vapor Space Volume	1,028 bbl	Floating roof, 35 ft. diameter, 6 ft. high when wmpty
VGS, Tank 1		
Vapor Pressure	0.00009	No. 6 fuel oil, AP-42, Table 7.1-2
Vapor Molecular Weight	190	No. 6 fuel oil, AP-42, Table 7.1-2
Vapor Space Volume	21,488 bbl	Floating roof, 160 ft. dia., 6 ft. high when empty

Although SCAQMD Rule 1149 requires emission control during storage tank degassing, control is not required for organic liquids with vapor pressures less than 3.9 psia. As seen in Table C-6, all of the liquids stored in these tanks have vapor pressures below this limit, so control of emissions during degassing was not assumed to estimate unmitigated emissions.

C.1.7 Motor Vehicle Emissions During Construction

Onsite daily motor vehicle construction emissions include emissions from material delivery and haul trucks, watering trucks, and pickup trucks while onsite. Offsite daily construction motor vehicle emissions entail all emissions generated outside the project sites' boundaries from worker and material transport trips. The methods of estimating emissions from these sources are discussed in the following sections.

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

CO and NO_X

Emissions (lb/vehicle-day) = [(EF_{Run} x VMT) + (EF_{Start} x Start)] / 453.6 (EQ. C-12)

VOC

Emissions (lb/vehicle-day) = [(EF_{Run} x VMT) + (EF_{Start} x Start) + (EF_{Soak} x Trip)
+ (EF_{Rest} x Rest) + $EF_{Runevap}$ x VMT)
+ ($EF_{Diurnal}$ x Diurnal)] / 453.6 (EQ. C-13)

PM_{10}

Emissions (lb/vehicle-day) = (EF_{Run} + EF_{Tire} + EF_{Brake}) x VMT / 453.6 (EQ. C-14)

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

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

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

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 C-7 lists the vehicle class for each type of vehicle, the assumed vehicle speed, and the daily VMT for each vehicle type. Tables C-8 through C-10 list the emission factors.

Table C-7
Motor Vehicle Classes, Speeds and Daily VMT During Construction

Vehicle Type	Vehicle Class	Speed (mph)	VMT (mi/vehicle-day)
Onsite pickup truck	Medium duty truck, catalyst	15	1
Watering truck	Medium heavy-duty truck, diesel	15	1
Dump truck, 3-axle	Heavy heavy-duty truck, diesel	15	1
Material removal haul truck, onsite	Heavy heavy-duty truck, diesel	5	0.5
Delivery vehicle, onsite	Heavy heavy-duty truck, diesel	5	1
Street sweeper	Medium heavy-duty truck, diesel	15	30
Construction commuter	Light-duty truck, catalyst	35	20
Material removal haul truck, offsite	Heavy heavy-duty truck, diesel	25	60
Delivery vehicle, offsite	Heavy heavy-duty truck, diesel	25	60

Table C-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]
Onsite pickup truck	5.44	40.34	1.33	2.96
Watering truck	14.04	N/A	8.17	N/A
Dump truck, 3-axle	16.72	N/A	11.25	N/A
Material removal haul truck, onsite	33.60	N/A	15.78	N/A
Delivery vehicle, onsite	33.60	N/A	15.78	N/A
Street sweeper	14.04	N/A	8.17	N/A
Construction commuter	3.46	40.56	0.68	2.27
Material removal haul truck, offsite	9.98	N/A	9.25	N/A
Delivery vehicle, offsite	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 C-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)
Onsite pickup truck	0.58	4.90	0.34	0.08	0.229	0.42
Watering truck	1.76	N/A	N/A	N/A	N/A	N/A
Dump truck, 3-axle	2.20	N/A	N/A	N/A	N/A	N/A
Material removal haul truck, onsite	3.49	N/A	N/A	N/A	N/A	N/A
Delivery vehicle, onsite	3.49	N/A	N/A	N/A	N/A	N/A
Street sweeper	1.76	N/A	N/A	N/A	N/A	N/A
Construction commuter	0.24	3.85	0.56	0.11	0.038	0.62
Material removal haul truck, offsite	1.51	N/A	N/A	N/A	N/A	N/A
Delivery vehicle, offsite	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 C-10
Motor Vehicle PM_{10} Emission Factors During Construction

Vehicle Type	Running Exhaust (g/mi)	Tire Wear (g/mi)	Brake Wear (g/mi)
Onsite pickup truck	0.00	N/A	0.01
Watering truck	0.41	N/A	0.01
Dump truck, 3-axle	0.59	N/A	0.01
Material removal haul truck, onsite	0.59	N/A	0.01
Delivery vehicle, onsite	0.59	N/A	0.01
Street sweeper	0.41	0.01	0.01
Construction commuter	0.00	0.01	0.01

Table C-10 (cont'd)
Motor Vehicle PM_{10} Emission Factors During Construction

Vehicle Type	Running Exhaust (g/mi)	Tire Wear (g/mi)	Brake Wear (g/mi)
Material removal haul truck, offsite	0.59	0.04	0.01
Delivery vehicle, offsite	0.59	0.04	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., onsite 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).

C.2 Operational Emissions (Unmitigated)

C.2.1 Direct Operational Emissions (Onsite)

Operational emissions consist primarily of emissions generated from the operation of the new combustion turbines at the Valley and Harbor generating stations. There will be a NO_X emissions reduction at the Scattergood generating station resulting from the installation of SCRs on Unit 1, Unit 2 and Unit 3. At the SGS site, there will be an increase in PM_{10} resulting from the conversion of SO_2 in the exhaust stream to SO_3 in the SCR reaction chambers in the presence of the SCR catalyst. Specific emission sources at the Harbor generating station are the five new combustion turbines (GE LM6000 Sprint), five new cooling towers, and one black start diesel powered generator set. Specific emission sources at the Valley generating station will be one new combustion turbine (GE LM6000 Sprint), one new cooling tower, and one black start diesel powered generator set. Air emissions will consist of criteria pollutants (NO_X, SO_X, CO, VOC and PM_{10}) and toxic air contaminants (TACs).

C.2.1.1 Combustion Turbine Emissions

As indicated above, the new combustion turbines are GE LM6000 Sprints. These turbines will have the capability to fire both natural gas and diesel fuel. The primary fuel will be natural gas. Each combustion turbine will have water injection and SCR for NO_X control and a CO catalyst system for CO reduction. Each combustion turbine will have a capacity of 47.3 MW. The maximum-fired duty of each combustion turbine can be calculated using the following equation:

Maximum Firing Rate (MMBtu/hr) = P x F (EQ. C-15)

where:

P = Combustion Turbine Power Output (kW)

F = Conversion Factor = 8250 Btu/kW-hr[3]

The maximum quantity of gaseous fuel fired in an hour is then determined as follows:

Maximum Fuel (MMSCFH) = MFR/(LHV x 1,000,000) (EQ. C-16)

where:

MFR = Maximum Firing Rate Calculated from Equation C-15

LHV = Lower heating value (Btu/scf)

Emissions from the normal operation of the combustion turbines were determined using the SCAQMD's BACT permitting limits, which are five ppmv for NO_X, six ppmv for CO, five ppmv for NH_3 slippage and two ppmv for VOC. These values are based on 15% stack gas O_2 and are on a dry basis. These emission limits were then converted to emission rates per unit of heat and fuel input as follows:

Emission Rate (lbs/MMBtu) = EV x Concentration x MW/(1,000,000 x 379) (EQ. C-17)

EV = F (dry SCF/MMBtu) x 20.9/(20.9-%O_2) (EQ. C-18)

where:

F = Exhaust Gas Volume (dry SCF/MMBtu)

[3] The conversion factor is in terms of the Lower Heating Value and was supplied by GE Power.

$\%O_2$ = Percent Oxygen in the Exhaust Gas

EV = Corrected Stack Gas Exhaust Volume (dry SCF/MMBtu)

Concentration = Concentration of Pollutant (ppmv)

MW = Molecular Weight of Pollutant (lbs/lb-mole)

Source: SCAQMD Title V Technical Guidance Manual, page A-20, 1998. EPA Method 19, 40 CFR Part 60, provides the F factor for various fuels.

PM_{10} emission factors for the normal operation of the combustion turbine were obtained from the latest edition of USEPA's AP-42, Table 3.1-2a. In addition, PM_{10} emissions associated with the ammonia slippage and the conversion of SO_2 to SO_3 and then to ammonium sulfate were also estimated. The AP-42 SO_X emission factor in Table 3.1-2a of AP-42, was used to estimate the SO_X emissions. The SO_X emission factor requires the sulfur content of the fuel. For natural gas the highest value report by the supplier, eight ppmv, was used. For diesel fuel, a sulfur value of 0.05 percent by weight was selected.

To convert the emission rate in lbs/MMBtu to lbs/unit of fuel the following equation was used:

For natural gas:

Emission Factor (lbs/MASCO) = ER (lbs/MMBtu) x HHV (EQ. C-19)

where:

ER = Emission Rate (lbs/MMBtu)

HHV = Higher Heating Value (Btu/scf)

For diesel fuel:

Emission Factor (lbs/Mgal) = ER (lbs/MMBtu) x HHV/1,000 (EQ C-20)

where:

ER = Emissions Rate (lbs/MMBtu)

HHV = Higher Heating Value (Btu/gal)

To calculate the conversion of SO_2 to SO_3, and then to PM_{10}, the following equations were used:

$SO_3 = 0.05 \times SO_2$ (EQ. C-21)

where:

SO_3 = lb-mole of SO_3

SO_2 = lb-mole of SO_2

Source: SCAQMD Energy Team Application and Processing Calculations, 10-14-93.

$PM_{10} = SO_3 \times$ MW of ammonium sulfate (EQ. C-22)

where:

PM_{10} = lbs of PM_{10}

SO_3 = lb-moles of SO_3

MW of ammonium sulfate = 132.2 lbs/lb-mole

During start-up and commissioning, the combustion turbines will operate for a period of time without any NO_X or CO control. Once stable operating conditions are reached, water injection will begin. Finally, when the SCR reaches the appropriate temperature for the catalyst to be effective, ammonia injection will commence and the SCR will become fully operational. Several different emission factors were used to properly represent the different levels of control and load during this startup period. During the entire natural gas start-up phase, emissions of PM_{10}, SO_X and VOC were estimated using the emission factors described above. For diesel fuel use, AP-42 PM_{10} and SO_X emission factors were used for all levels of operation. For VOC emissions estimates when burning diesel fuel, the AP-42 emission factors were used for the uncontrolled and water injection phases of the start-up and commissioning. During full control (SCR and CO catalyst) when using diesel fuel, the SCAQMD BACT emission limit for VOC described above was used. For NO_X, an uncontrolled, all load emission factor from AP-42 Combustion Turbine Emission Factor Documentation, Table 3.4-1, was used during startup operation prior to water injection. Similarly, an all-load, uncontrolled emission factor from Table 3.4-1 was used for CO prior to water injection. With the start of water injection, the manufacturer-guaranteed emission rates of 25 ppmv for natural gas and 42 ppmv for No.2 diesel fuel were used for estimating NO_X emissions. For CO emissions estimation, the all load, water injection emission factor from the AP-42 Combustion Turbine Emission Factor Documentation, Table 3.4-1, was used. Table C-11 presents all of the criteria pollutant emission factors used for the combustion turbine emissions.

Table C-11
Combustion Turbine Criteria Pollutant Emission Factors

Pollutant	Natural Gas Combustion Emission Factor			Diesel Fuel Combustion Emission Factor		
	No Control (lbs/MMscf)	Water Injection (lbs/MMscf)	Full Control (lbs/MMscf)	No Control (lbs/Mgal)	Water Injection (lbs/Mgal)	Full Control (lbs/Mgal)
NO_X as NO_2	309.75	98.28	19.64	88.54	23.07	2.75
CO	185.85	35.07	14.39	1.72	14.32	2.00
VOC as CH_4	2.73	2.73	2.73	1.12	1.12	0.38
PM_{10}	6.93	6.93	6.93	1.67	1.67	1.67
PM_{10} (SO_3)	NA	NA	0.15	NA	NA	NA
SO_X as SO_2	1.48	1.48	1.48	7.09	7.09	7.09

The combustion turbines will emit Toxic Air Contaminants (TACs). For TACs, excluding ammonia, the most recent emission factors from the California Air Resources Board (CARB) were used to estimate emissions. These emission factors are the same for uncontrolled operation, operation with water injection only, and with SCR/CO catalyst operation. Emissions of ammonia will occur only when the SCR is operational. Therefore, the five-ppmv emission limit was used to develop the emission factor. The TAC emission factors for natural gas firing are presented in Table C-12 and TAC emission factors for No. 2 diesel fuel firing are presented in Table C-13. Only those TACs that are listed in SCAQMD Rule 1401 are listed in the following tables.

Under normal operation, the combustion turbines at HGS and VGS would operate at maximum capacity for 23 hours, 365 days per year. Each combustion turbine would be started every day. The start-up requires one hour. During the first five minutes of startup, there would be no NO_X control, followed by 55 minutes of operation with water injection only. Each combustion turbine will consume 0.409 MMscf/hr during normal operation. The predicted emissions during normal operation were determined as follows:

Emissions (lbs/hr) = EF (lbs/MMscf) x Fuel (MMscf/hr) (EQ. C-23)

The same equation was used to estimate emissions during the combustion turbine start-up. Fuel consumption during turbine start-up will be 0.277 MMscf/hr with 0.010 MMscf of the start-up fuel consumed in the first five minutes without any NO_X control.

Table C-12
Natural Gas Fired Combustion Turbine TAC Emission Factors

HAP	CAS Number	Emission Factor (lbs/MMscf)
1,3-Butadiene	106990	1.27E-04
Acetaldehyde	75070	1.37E-01
Acrolein	107028	1.89E-02
Ammonia	7664417	7.25E+00
Benz(a)anthracene (PAH)	56553	2.26E-05
Benzene	71432	1.33E-02
Benzo(a)pyrene (PAH)	50328	1.39E-05
Benzo(b)fluoranthene (PAH)	205992	1.13E-05
Benzo(k)fluoranthene (PAH)	207089	1.10E-05
Chrysene (PAH)	218019	2.52E-05
Dibenz(a,h)anthracene (PAH)	53703	2.35E-05
Ethylbenzene	100414	1.79E-02
Formaldehyde	50000	9.17E-01
Hexane	110543	2.59E-01
Indeno(1,2,3-cd)pyrene (PAH)	193395	2.35E-05
Naphthalene (PAH)	91203	1.66E-03
Propylene	115071	7.71E-01
Propylene Oxide	75569	4.78E-02
Toluene	108883	7.10E-02
Xylene(Total)	1330207	2.61E-02

Table C-13
Diesel Fuel-Fired Combustion Turbine TAC Emission Factors

TAC	CAS Number	Emission Factor (lbs/Mgal)
Ammonia	7664417	1.01E 00
Arsenic	7440382	2.02E-04
Benz(a)anthracene (PAH)	56553	8.53E-05
Benzene	71432	1.13E-02
Benzo(a)pyrene (PAH)	50328	8.33E-05
Benzo(b)fluoranthene (PAH)	205992	1.32E-04
Benzo(k)fluoranthene (PAH)	207089	1.30E-04
Beryllium	7440417	5.43E-05
Cadmium	7440439	3.25E-04
Chrysene (PAH)	218019	1.03E-04
Chromium (Hex)	18540299	1.08E-05
Chromium (total)	7440473	4.24E-04
Copper	7440508	9.98E-04
Dibenz(a,h)anthracene (PAH)	53703	8.25E-05
Dioxin: 4D Total	41903575	3.74E-09
Dioxin: 5D Total	36088229	7.15E-09
Dioxin: 6D Total	34465468	9.00E-09
Dioxin: 7D Total	37871004	1.68E-08
Dioxin: 8D	3268879	1.07E-07
Formaldehyde	50000	7.05E-02
Furan: 4F Total	55722275	3.34E-08
Furan: 5F Total	30402154	4.67E-08
Furan: 6F Total	55684941	2.41E-08
Furan: 7F Total	38998753	1.67E-08
Furan: 8F	39001020	8.61E-09
HCL	7647010	8.09E-02
Indeno(1,2,3-cd)pyrene (PAH)	193395	8.26E-05
Lead	7439921	6.08E-04
Manganese	7439965	1.03E-02
Mercury	7439976	2.71E-06
Naphthalene (PAH)	91203	1.08E-02
Nickel	7440020	4.88E-02
Selenium	7782492	8.39E-06
Zinc	7440666	5.38E-02

C.2.1.2 Black Start Generator Set

A black start generator set will be installed at both the HGS and VGS project sites. The black start generator set is a diesel-fuel fired internal combustion (IC) engine coupled to a 565 kW generator. The black start generator set is a Caterpillar unit with a maximum fuel consumption rate of 44.5 gallons per hour. This equates to a maximum firing rate of 6,185,500 Btu/hr. The Black Start Generator Set is used to provide the electricity to start a combustion turbine when line electrical power is unavailable.

Emission factors for CO, PM_{10}, and VOC were obtained from AP-42, Table 3.3-1. The emission factor for SO_X was taken from AP-42, Table 3.1-2a, since Table 3.3-1 does not account for the sulfur content of the fuel. NO_X emissions were estimated using a guaranteed emission rate from the manufacturer of 6.9 grams/bhp-hr. This value was converted to an emission factor in lbs/Mgal as follows:

EF (lbs/Mgal) = ER x bhp x 1000/(454 x Fuel) (EQ. C-24)

where:

ER = Emission Rate (grams/bhp) = 6.9

bhp = brake horsepower = 896

Fuel = fuel used to achieve 896 bhp (gal)

Table C-14 presents the criteria pollutant emission factors for the black start generator set.

Table C-14
Black Start Generator Set Criteria Pollutant Emission Factors

Pollutant	Emission Factor (lbs/Mgal)
NO_X as NO_2	306.01
CO	132,05
VOC as CH_4	48.65
PM_{10}	43.09
SO_X as SO_2	7.09

TAC emission factors, which were obtained from CARB, are presented in Table C-15.

Table C-15
Black Start Generator Set TAC Emission Factors

TAC	CAS Number	Emission Factor (lbs/Mgal)
1,3-Butadiene	106990	5.41E-03
Acrolein	107028	1.30E-02
Benz(a)anthracene (PAH)	56553	2.34E-04
Benzene	71432	1.22E-01
Benzo(a)pyrene (PAH)	50328	1.81E-05
Benzo(b)fluoranthene (PAH)	205992	8.66E-05
Benzo(k)fluoranthene (PAH)	207089	3.28E-05
Chrysene (PAH)	218019	5.30E-05
Dibenz(a,h)anthracene (PAH)	53703	5.50E-05
Formaldehyde	50000	1.16E-01
Indeno(1,2,3-cd)pyrene (PAH)	193395	4.63E-05
Naphthalene (PAH)	91203	5.44E-02
Propylene	115071	3.58E-01
Toluene	10883	5.50E-02
Xylene, Total	1330207	3.59E-02

C.2.1.3 Cooling Tower Emissions

Each combustion turbine will have a cooling tower to provide the necessary cooling for the lubricating oil system and the chillers. The cooling towers will have a two cells with a maximum water circulation rate of 4,100 gpm. Cooling towers may result in the emissions of PM_{10}. The PM_{10} would occur from the cooling tower drift (water droplets) that contain dissolved solids. When the drift evaporates, it would leave behind the dissolved, which may be considered as PM_{10}.

The PM_{10} emissions from the cooling towers were estimated as follows:

Drift (lbs/day) = Circulation Rate (gpm) x (drift factor (%)/100) x 1440 (min/day) x 8.334 (lbs/gal) (EQ. C-25)

Emissions (lbs/day) = Drift (lbs/day) x Total Dissolved Solids (ppm) /1,000,000 (EQ. C-26)

Source: AP-42, Chapter 13.4, Wet Cooling Towers

C.2.1.4 Boilers

The Scattergood Generating Station has three utility boilers. Unit #1 and Unit #2 currently have urea injection for NO_X control, while Unit #3 does not have any add-on NO_X control. The current ammonia emissions from Unit #1 and Unit #2 are 20 ppmv. All three units will be retrofit with SCR for NO_X control. The emission limits after control will be seven ppmv for NO_X and 10 ppmv for NH_3. These values are for three percent stack gas O_2. The emissions of NO_X and NH_3 were converted to lbs/MMscf as described in Equations C-17 and C-18. There will be emissions of PM_{10} associated with the conversion of SO_2 to SO_3 and then to ammonium sulfate resulting from SCR technology. These PM_{10} emissions were estimated by calculating the total SO_2 emissions at maximum capacity and using Equations C-21 and C-22. The maximum-fired duty for the SGS boilers are 1,769 MMBtu/hr for Unit 1; 1,769 MMBtu/hr for Unit 2; and 4,347 MMBtu/hr for Unit 3.

C.2.2 Indirect Operational Emissions (Offsite)

Indirect offsite operational emissions will be generated by additional trips by tanker trucks delivering aqueous ammonia to the project sites. However, operation of the various equipment associated with the three project sites will not require any additional employees, so there will not be any indirect operational emissions from additional employee commuting trips.

Equations C-12 through C-14 above were used to calculate emissions generated by the additional aqueous ammonia delivery trips to each project site. The emission factors for heavy heavy-duty diesel vehicles in Tables C-8 through C-10 above were used in these equations. Additionally, Equation C-7 above was used to estimate fugitive PM_{10} emissions from entrained road dust during these trips. The vehicle weight (W) was estimated to be 40 tons, and the silt loading (sL) was conservatively estimated to be the default value of 0.037 g/m^2 for collector roads.

Based on operational requirements for aqueous ammonia, it was estimated that one additional aqueous ammonia delivery trip will be made to HGS[4] each week, two additional delivery trips will be made to SGS each week, and one additional delivery trip will be made to VGS each month. Since the incremental two weekly deliveries to SGS are unlikely to occur on the same day, the peak daily emissions from these trips would occur when one trip is made to each project site on the same day. In other words, three aqueous ammonia delivery trips occurring at the same time and on the same day.

[4] Currently, the HGS has 240-MW of combined cycle gas turbine electrical power that uses aqueous ammonia in the associated SCRs as NOx control. These two weekly trips for the five new CTs would be in addition to the trips associated with the existing cycle gas turbines.

The round-trip travel distance for the aqueous ammonia delivery trips was estimated by measuring the distance from a potential supplier of the aqueous ammonia (La Roche Industries, Inc. at 15116 Canary Street, La Mirada, CA) to each of the project sites. Probable truck routings for each project site were obtained from http://www.mapquest.com. The Mapquest roundtrip distance measurements are as follows:

- HGS: 42 miles roundtrip
- SGS: 52 miles roundtrip
- VGS: 72 miles roundtrip

C.3 EMISSIONS SUMMARY (UNMITIGATED)

C.3.1 Construction Emissions Summary (Pre-Mitigation)

Table C-16 lists estimated peak daily unmitigated onsite and offsite construction emissions associated with each phase of construction for each project site. The emissions associated with a particular source (e.g., construction equipment exhaust, bulldozing, grading, worker commuting, material delivery trips, tank degassing, etc.) for a specific construction activity are shown in the attached spreadsheets.

Table C-16
Peak Daily Construction Emissions by Project Site for Each Construction Phase (Pre-Mitigation)

Activity	Location	CO (lb/day)	VOC (lb/day)	NO_X (lb/day)	SO_X (lb/day)	Exhaust PM_{10} (lb/day)	Fugitive PM_{10}[a] (lb/day)	Total PM_{10} (lb/day)
HGS Tank Demolition	Onsite	131.8	292.9	238.0	20.3	13.9	16.0	29.9
	Offsite	30.6	4.5	22.3	0.0	1.4	103.1	104.5
HGS Backfill	Onsite	151.9	32.6	302.9	27.3	14.7	93.2	107.9
	Offsite	48.8	7.3	41.5	0.0	2.6	197.3	199.9
HGS Grading	Onsite	52.0	10.4	78.8	6.9	4.5	2.7	7.2
	Offsite	1.5	0.2	0.2	0.0	0.0	0.1	0.1
HGS Foundations	Onsite	254.5	23.1	131.6	10.7	8.0	40.0	48.0
	Offsite	150.0	20.2	44.4	0.0	1.7	89.4	91.1
HGS Paving	Onsite	47.7	9.7	68.8	5.8	3.9	5.2	9.1
	Offsite	21.4	3.2	17.5	0.0	1.1	49.3	50.4
HGS Equipment Installation	Onsite	180.0	76.0	341.5	27.3	19.5	18.8	38.3
	Offsite	202.4	26.6	36.1	0.0	0.5	43.2	43.7
SGS Slab Demolition	Onsite	40.6	7.4	54.9	4.9	2.7	5.8	8.5
	Offsite	16.5	2.4	13.4	0.0	0.8	63.2	64.1
SGS Grading	Onsite	22.0	5.9	42.4	3.9	2.2	3.7	5.9
	Offsite	1.5	0.2	0.2	0.0	0.0	0.1	0.1
SGS Foundations	Onsite	31.6	3.2	20.6	1.7	1.3	5.4	6.7
	Offsite	13.3	1.9	7.4	0.0	0.4	19.3	19.7
SGS Paving	Onsite	16.8	2.5	32.1	2.7	1.6	2.7	4.4
	Offsite	6.7	1.0	5.1	0.0	0.3	14.2	14.5
SGS Equipment Installation	Onsite	64.1	48.9	119.9	10.4	6.7	7.3	14.0
	Offsite	58.1	7.8	16.0	0.0	0.6	31.1	31.7
VGS Demolition	Onsite	84.0	16.4	143.2	12.6	7.9	4.9	12.8
	Offsite	17.0	2.4	9.3	0.0	0.5	40.2	40.7

Table C-16 (cont'd)
Peak Daily Construction Emissions by Project Site for Each Construction Phase (Pre-Mitigation)

Activity	Location	CO (lb/day)	VOC (lb/day)	NO_X (lb/day)	SO_X (lb/day)	Exhaust PM_{10} (lb/day)	Fugitive PM_{10}[a] (lb/day)	Total PM_{10} (lb/day)
VGS Grading	Onsite	21.7	5.8	42.4	3.9	2.2	2.7	4.9
	Offsite	1.5	0.2	0.2	0.0	0.0	0.1	0.1
VGS Foundations	Onsite	54.1	5.0	29.3	2.3	1.8	9.4	11.2
	Offsite	46.2	6.5	23.9	0.0	1.3	60.8	62.1
VGS Paving	Onsite	17.1	3.0	32.2	2.7	1.6	3.3	5.0
	Offsite	8.5	1.3	6.7	0.0	0.4	18.8	19.2
VGS Equipment Installation	Onsite	74.5	22.6	130.7	11.0	7.4	7.9	15.3
	Offsite	59.6	8.0	15.5	0.0	0.5	28.5	29.1

[a] It is assumed that construction activities will comply with SCAQMD Rule 403 - Fugitive Dust, by watering active sites two times per day, reducing fugitive dust by 50 percent.

Because these activities are not anticipated to all take place at the same time, the overall peak daily construction emissions will not be equal to the sum of the peak daily emissions from all of the construction activities. Therefore, the anticipated overlap of activities was evaluated to determine overall peak daily emissions. First, it was conservatively assumed that the peak daily emissions from each overlapping activity would occur at the same time. Next, the activities that are anticipated to occur simultaneously were identified for each day of the entire construction period. The peak daily emissions from the construction activities taking place each day were then added together to estimate the total peak daily emissions during each week. Finally, the day with the highest overall peak daily emissions was identified.

Because different activities tend to lead to higher emissions of one pollutant than another, the activities that lead to the highest overall peak daily emissions are not the same for every pollutant. The overall peak daily construction-related CO emissions are anticipated to occur during foundation construction and paving at all three project sites. The overall peak daily construction-related VOC emissions are anticipated to occur during simultaneous demolition activities at all three project sites. Overall peak daily construction-related NO_X, and SO_X emissions are anticipated to occur during simultaneous equipment installation at all three project sites. The overall peak daily construction-related PM_{10} emissions are anticipated to occur during simultaneous backfilling and grading at HGS, grading at SGS, and foundation construction at VGS.

Table C-17 lists the overall "worst-case" peak daily emissions by type of source and compares the emissions with the SCAQMD's CEQA significance thresholds to determine whether construction-related air quality impacts are significant. As seen, the significance thresholds are anticipated to be exceeded for CO, VOC, NO_X, and PM_{10} construction-related emissions.

Table C-17
Overall Peak Daily Emissions During Construction (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}[a] (lb/day)	Total PM_{10} (lb/day)
Onsite Construction Equipment Exhaust	408.3	46.2	590.5	48.6	23.1	--	23.1
Onsite Motor Vehicles	13.5	0.8	1.6	0.0	0.1	--	0.1
Onsite Fugitive PM10	--	--	--	--	--	108.9	108.9
Onsite Tank Degassing	--	269.6	--	--	--	--	--
Total Onsite	**421.8**	**316.7**	**592.1**	**48.6**	**23.2**	**108.9**	**132.1**
Offsite Haul Truck Soil Loss	--	--	--	--	--	80.1	80.1
Offsite Motor Vehicles	246.2	9.3	67.6	0.0	3.9	178.3	182.2
Total Offsite	**246.2**	**9.3**	**67.6**	**0.0**	**3.9**	**258.4**	**262.3**
TOTAL	**668.0**	**326.0**	**659.8**	**48.6**	**27.1**	**367.4**	**394.4**
CEQA Significance Level	*550*	*75*	*100*	*150*	--	--	*150*
Significant? (Yes/No)	**Yes**	**Yes**	**Yes**	No	--	--	**Yes**
Note: Totals may not match sum of individual values because of rounding							

C.3.2 Operational-Related Emissions Summary (Pre-Mitigation)

Operational-related emissions were calculated for comparison with the various significance thresholds and criteria that are listed in Table 4.2-1 of Subsection 4.2 of this Final EIR. Peak daily emissions from both direct operations and indirect emissions were calculated for comparison with the peak daily mass emissions thresholds. Additionally, peak hourly, daily and annual emissions of various pollutants were estimated for use in air quality dispersion modeling to evaluate potential localized air quality impacts, as described in Subsection 4.2.3.2 for criteria pollutants and in Subsection 4.2.3.3 for toxic air contaminants. The reader is referred to those Subsections of this Final EIR for a presentation of the results of those potential impact evaluations. The following subsections summarize the emissions that were estimated for these various analyses.

C.3.2.1 Peak Daily Operational Emissions

Because all of the new equipment operating modes are not anticipated to take place at the same time, the overall maximum daily operational emissions will not be equal to the sum of the maximum daily emissions from all of the operating modes. For the HGS project site, it was assumed that five CTs would be under normal operation for 23 hours. For the 24th hour, each CT would be under either normal startup or a diesel fuel readiness testing, whichever resulted in the highest emissions. The black start generator was also assumed to be tested on the same day. For the VGS project site, it was assumed that the CT was in normal operation for 23 hours. For the 24th hour the CT would be under startup or diesel fuel readiness testing, whichever resulted in the highest emissions. The black start generator was also assumed to be tested on the same day. For the SGS project site, it was assumed that the SCRs on all three existing units were operative, which results in maximum reductions in NO_X emissions and maximum incremental increases in ammonia slippage and PM_{10} emissions.

A summary of the resulting "worst-case" operational-related non-RECLAIM daily mass emissions associated with each project site is shown in Table C-18. The table also compares the daily mass operational emissions to the SCAQMD criteria pollutant significance thresholds listed in Table 4.2-1. Based on this comparison, the proposed projects may result in significant CO, PM_{10}, and VOC operational emissions.

A summary of operational RECLAIM pollutant (NO_X) emissions is shown in Table C-19. As discussed previously at the beginning of Subsection 4.2, the significance determination is based on whether direct NO_X emissions, when added to each project site's Annual Allocation (2001) including purchased RTCs are greater than the project site's Initial 1994 RECLAIM Allocation plus NTCs plus the maximum daily operation NO_X significance thresholds of 55 pounds per day. Based on this comparison, the direct NO_X emissions from the installation of CTs at the HGS site may create significant NO_X emissions, while operation of the new CT at the VGS site is not anticipated to lead to significant NO_X emissions.

Although the installation of the three SCR systems at the VGS site will significantly reduce NO_X emissions from the facility, these NO_X emission reductions are not used to offset the NO_X emission increases at the HGS and VGS project sites. The SCR systems installation at the SGS site are being undertaken to comply with an existing SCAQMD rule and therefore cannot be used to offset emission increases from new emission sources.

Table C-18
Overall Peak Daily Operational Non-RECLAIM Daily Mass Emissions

Source	CO (lb/day)	VOC (lb/day)	NO_X (lb/day)	SO_X (lb/day)	PM_{10} (lb/day)
HGS CTs	748.43	136.40	0.00	101.93	340.90
HGS Cooling Towers	0.00	0.00	0.00	0.00	36.90
HGS Black Start Diesel-Fueled Generator	2.91	1.07	0.00	0.16	0.95
Total HGS	**751.34**	**137.47**	**0.00**	**102.09**	**378.75**
VGS CT	149.69	27.28	0.00	20.39	68.14
VGS Cooling Tower	0.00	0.00	0.00	0.00	7.38
VGS Black Start Diesel-Fueled Generator	2.91	1.07	0.00	0.16	0.95
Total VGS	**152.60**	**28.35**	**0.00**	**20.55**	**76.47**
SGS SCRs	**0.00**	**0.00**	**0.00**	**0.00**	**27.60**
Total Direct	**903.94**	**165.82**	**0.00**	**122.64**	**482.82**
Indirect Emissions (Aqueous Ammonia Delivery Trucks)	**3.70**	**0.60**	**0.40**	**0.00**	**9.90**
Total Project	**907.64**	**166.42**	**0.40**	**122.64**	**492.72**
Significance Threshold	*550*	*55*	*55*	*150*	*150*
Significant? (Yes/No)	**Yes**	**Yes**	No	No	**Yes**

Notes: 1) HGS site – for CO, VOC, and SO_x, 5 CTs firing natural gas for 23-1/2 hrs, plus 5 CTs one-half hour diesel fuel readiness test, one black start generator test, and five cooling towers; for PM_{10}, 5 CTs firing natural gas for 23 hrs and one hour normal start up. (2) VGS site – for CO, VOC and SO_x, 1 CT firing natural gas for 23-1/2 hours plus one-half hour diesel fuel readiness testing; for PM_{10}, 1 CT firing natural gas 23 hrs plus one hours nromal start up, , one black start generator test, and one cooling tower; (3) SGS Site – All three SCRs under operation.

Table C-19
Project RECLAIM NO_X Peak Daily Emissions

Emissions	Project Site	
	HGS	**VGS**
RECLAIM NO_X Emissions (lb/day)[a]	1,057	217
2001 RECLAIM NO_X Allocation (lb/day)[b]	179	285
Total (lb/day)	**1,236**	**502**
Significance Threshold	299	1,542
Significant? (Yes/No)	**YES**	No

[a] The emissions were determined as follows: (1) HGS site – five CTs firing natural gas for 23 hrs, 5 CTs one-hour highest emission rate from either start-up or diesel fuel readiness test, one black start generator test, and five cooling towers; (2) VGS site – one CT firing natural gas for 23 hours, one- hour highest emissions from either normal start-up or diesel fuel readiness test, one black start generator test, and one cooling tower.

[b] The 2001 facility Allocation for NO_X includes purchased RTCs and is converted to pounds per day by dividing by 365 days per year. This value was taken from the Facility Permit to Operate for each site. The value from the column headed NO_X RTC Holding was selected.

C.3.2.2 Emissions for Analysis of SO_2 Ambient Air Quality Impacts

For the one-hour and three-hour SO_2 ambient air quality analyses at the HGS site, the evaluation assumed the following:

- Four CTs would be operating at maximum capacity on natural gas
- One CT would be tested for readiness (30-minute test)
- The Black Start Generator Set would be tested for readiness (30-minute test)

Table C-20 provides the resulting estimated SO_2 emission rates for the HGS site.

Table C-20
HGS Emissions for One-Hour and Three-Hour Ambient SO_2 Impacts Analysis

Pollutant	Four CTs Normal Operation (lbs/hr)	One CT Readiness Test (lbs/hr)	Black Start Generator Readiness Test (lbs/hr)	Total Emissions (lbs/hr)
SO_2	2.44	6.05	0.16	8.65

The Valley Generating Station will have one combustion turbine and one Black Start Generator Set. The short-term analysis will include the readiness testing of one CT and the black start generator set. The VGS site emissions are presented in Table C-21.

Table C-21
VGS Emissions for One-Hour and Three-Hour Ambient SO_2 Impacts Analysis

Pollutant	One CT Readiness Test (lbs/hr)	Black Start Readiness Test (lbs/hr)	Total Emissions (lbs/hr)
SO_2	6.05	0.16	6.21

For analyzing the 24-hour SO_2 impacts at the HGS site, the following scenario was evaluated:

- 5 CTs normal operation at maximum capacity
- One CT diesel fuel readiness test (30-minute test)
- Black start generator set readiness test (30-minute duration)

Table C-22 provides the SO_2 emissions for this scenario.

Table C-22
HGS Emissions for 24-Hour Ambient SO_2 Impacts Analysis

Pollutant	5 CTs Normal Operation (lbs/hr)	1 CT Readiness Test (lbs/hr)	Black Start Generator Readiness Test (lbs/hr)	Total Emissions (lbs/hr)	Total Emissions (lbs/day)
SO_2	3.05	6.05	0.16	9.26	79.41

The same scenario applies to the VGS site the worst-case, except that only one combustion turbine will be present. Table C-23 provides the SO_2 emissions for this scenario.

Table C-22
VGS Emissions for 24-Hour Ambient SO_2 Impacts Analysis

Pollutant	CT Normal Operation (lbs/hr)	CT Readiness Test (lbs/hr)	Black Start Generator Readiness Test (lbs/hr)	Total Emissions (lbs/hr)	Total Emissions (lbs/day)
SO_2	0.61	6.05	0.16	6.82	20.84

The following operating scenario was selected for the annual SO_2 ambient air quality analysis for the HGS site:

- 5 Combustion Turbines at maximum operation
- Five combustion turbines undergoing a diesel fuel readiness test, 12 tests each per year
- One black start generator set readiness test, 12 tests per year.

The analysis for the VGS site is similar except that there will only be one on CT present at the VGS site. Table C-23 provides the SO_2 emission rates for the HGS site and VGS site.

Table C-23
Emissions for Annual Ambient SO_2 Impacts Analysis

Site	CT Normal Operations (lbs/hr)	CT Diesel Fuel Readiness Test (lbs/test)	Black Start Generator Readiness Test (lbs/test)	Total Emissions (lbs/yr)
Harbor	3.05	6.05	0.16	27,083
Valley	0.61	6.05	0.16	5,418

C.3.2.3 Emissions for Analysis of One-Hour NO_2 and One-Hour and Eight-Hour CO Ambient Air Quality Impacts

For the one-hour NO_2 and the one-hour and eight-hour CO ambient air quality impacts analyses, the worst case for the HGS site is the start-up of the combustion turbines. As indicated above, the first five minutes of operation during the CT start-up will be completely uncontrolled. This will be followed by 55 minutes of water injection control. At the VGS site, there will be one CT. Therefore, the analysis for the VGS site incorporates one black start generator test. Table C-24 lists the NO_2 and CO emissions modeled for the Harbor and Valley sites.

Table C-24
Emissions for One-Hour NO_2 and One-Hour and Eight-Hour CO Ambient Impacts Analysis

Site	NO_2 (lbs/hr)	CO (lbs/hr)
HGS (5 CTs)	127.05	49.10
VGS CT	25.41	9.82
VGS Black Start Readiness Test	6.73	2.91
VGS Total	32.14	12.73

C.3.2.4 Emissions for Analysis of Annual NO_2 Ambient Air Quality Impacts

The annual NO_2 impact analysis was conducted using the following scenario at the HGS site:

- Five CTs starting daily and 23 hours of normal full-load operation
- Diesel fuel readiness test of each CT, twelve times per year
- Twelve readiness tests of the Black Start Generator Set

The VGS site was analyzed using the same scenario, however, at the VGS site there will be one CT. Table C-25 provides the NO_2 emissions modeled for the annual NO_2 analysis.

Table C-25
Emissions for Annual NO_2 Ambient Impacts Analysis

Site	Normal Operations (lbs/hr)	Start-up (lbs/hr)	CT Readiness Test (lbs/test)	Black Start Generator Readiness Test (lbs/test)	Total (lbs/yr)
HGS	40.15	127.05	15.55	6.73	383,700
VGS	8.03	25.41	3.11	6.73	76,805

C.3.2.5 Emissions for Analysis of PM_{10} Ambient Air Quality Impacts

Two averaging times were modeled for PM_{10}: 24-hours and annual. For the 24-hour and annual-average PM_{10} cases, the following conditions were assessed for the HGS site:

- 5 CTs under normal operation
- One CT conducting a readiness test for the 24-hour analysis and 60 readiness tests for the annual analysis
- One black start generator set readiness test for the 24-hour analysis and 12 readiness tests for the annual analysis
- 5 Cooling Towers in operation

For the VGS site, the conditions would be the same except that there will be one CT and one cooling tower.

For the SGS site, the PM_{10} was estimated from conversion of SO_2 to SO_3 and then to ammonium sulfate as a result of SCR Technology.

The PM_{10} emissions for all three sites results are provided in Table C-26.

Table C-26
Emissions for 24-Hour and Annual PM_{10} Ambient Impacts Analysis

Site	Boilers Normal Operation (lbs/hr)	CT Normal Operation (lbs/hr)	1 CT Readiness Test (lbs/test)	Black Start Generator Readiness Test (lbs/test)	Cooling Tower (lbs/hr)	Total (lbs/day)	Total (lbs/yr)
HGS	NA	14.45	1.43	0.95	1.54	386.1	140,147
VGS	NA	2.89	1.43	0.95	0.31	79.2	28,061
SGS	1.15	NA	NA	NA	NA	27.6	10,074

C.3.2.6 Toxic Air Contaminants

Both acute and chronic risks were evaluated for TACs. For acute risks, the worst-case evaluation resulted from the full-load normal operation of the combustion turbines and one black start generator readiness test. For chronic risks (long term), the following operating scenario was considered for the HGS site:

- Five CTs normal full-load operation
- Five CTs undergoing readiness tests, 60 tests total per year
- Black start generator set readiness test, 12 tests per year

For the VGS site the worst case acute TAC emissions occur for one CT readiness test and one black start generator readiness test. For the chronic assessment, the same conditions used for the HGS site apply except the VGS site will have only one CT instead of five. Table C-27 provides the TAC emissions for the acute assessment, and Table C-28 provides the TAC emissions for the chronic assessment.

Table C-27
TAC Emissions for Acute Health Risk Assessments for HGS and VGS

TAC	HGS Emissions (lbs/hr)	VGS Emissions (lbs/hr)
Arsenic	0.00E+00	1.73E04
1,3-Butadiene	3.79E-04	1.19E-04
Acetaldehyde	2.80E-01	0
Acrolein	3.89E-02	2.86E-04
Ammonia	1.48E+01	0
Benz(a)anthracene	5.14E-05	7.81E-05
Benzene	2.99E-02	1.24E-02
Benzo(a)pyrene	2.88E-05	7.16E-05
Benzo(b)fluoranthene	2.50E-05	1.15E-04
Benzo(k)fluoranthene	2.32E-05	1.12E-04
Beryllium	0.00E+00	4.62E-05
Cadmium	0.00E+00	2.78E-04
Chromium (Hex)	0.00E+00	9.21E-06
Chrysene (PAH)	5.27E-05	8.93E-05
Copper	0.00E+00	8.49E-04
Dibenz(a,h)anthracene	4.93E-05	7.18E-05
Dioxin: 4D Total	0.00E+00	3.20E-09
Dioxin: 5D Total	0.00E+00	6.11E-09
Dioxin: 6D Total	0.00E+00	7.69E-09
Dioxin: 7D Total	0.00E+00	1.44E-08
Dioxin: 8D	0.00E+00	9.13E-08
Ethylbenzene	3.66E-02	0
Formaldehyde	1.88E+00	6.28E-02
Furan: 4F Total	0.00E+00	2.86E-08
Furan: 5F Total	0.00E+00	3.99E-08
Furan: 6F Total	0.00E+00	2.06E-08
Furan: 7F Total	0.00E+00	1.43E-08
Furan: 8F	0.00E+00	7.73E-09
HCL	0.00E+00	6.91E-02
Hexane	5.30E-01	0
Indeno(1,2,3-cd)pyrene	4.91E-05	7.17E-05
Lead	0.00E+00	5.20E-04

Table C-27
TAC Emissions for Acute Health Risk Assessments for HGS and VGS

TAC	HGS Emissions (lbs/hr)	VGS Emissions (lbs/hr)
Manganese	0.00E+00	8.81E-03
Mercury	0.00E+00	2.32E-06
Naphthalene	4.59E-03	1.04E-02
Nickel	0.00E+00	4.18E-02
Propylene	1.58E+00	7.88E-03
Propylene Oxide	9.77E-02	0
Selenium	0.00E+00	7.18E-06
Toluene	1.46E-01	1.21E-03
Xylene(Total)	5.44E-02	7.91E-04
Zinc	0.00E+00	4.60E-02

Table C-28
TAC Emissions for Chronic Health Risk Assessments for HGS and VGS

TAC	HGS Emissions (lbs/yr)	VGS Emissions (lbs/yr)
Arsenic	1.04E-02	2.07E-03
1,3-Butadiene	2.28E+00	4.56E-01
Acetaldehyde	2.45E+03	4.91E+02
Acrolein	3.39E+02	6.77E+01
Ammonia	1.30E+05	2.60E+04
Benz(a)anthracene	4.09E-01	8.19E-02
Benzene	2.39E+02	4.78E+01
Benzo(a)pyrene	2.53E-01	5.07E-02
Benzo(b)fluoranthene	2.09E-01	4.19E-02
Benzo(k)fluoranthene	2.04E-01	4.08E-02
Beryllium	2.78E-03	5.56E-04
Cadmium	1.67E-02	3.33E-03
Chromium (Hex)	5.53E-04	1.11E-04
Chromium (total)	2.17E-02	4.35E-03
Chrysene (PAH)	4.57E-01	9.14E-02
Copper	5.11E-02	1.02E-02
Dibenz(a,h)anthracene	4.25E-01	8.51E-02
Dioxin: 4D Total	1.92E-07	3.83E-08
Dioxin: 5D Total	3.66E-07	7.33E-08
Dioxin: 6D Total	4.61E-07	9.22E-08
Dioxin: 7D Total	8.61E-07	1.72E-07
Dioxin: 8D	5.48E-06	1.10E-06
Ethylbenzene	3.21E+02	6.41E+01
Formaldehyde	1.64E+04	3.29E+03
Furan: 4F Total	1.71E-06	3.42E-07
Furan: 5F Total	2.39E-06	4.79E-07
Furan: 6F Total	1.23E-06	2.47E-07
Furan: 7F Total	8.56E-07	1.71E-07
Furan: 8F	4.41E-07	8.82E-08
HCL	4.15E+00	8.29E-01
Hexane	4.64E+03	9.28E+02
Indeno(1,2,3-cd)pyrene	4.25E-01	8.51E-02

Table C-28
TAC Emissions for Chronic Health Risk Assessments for HGS and VGS

TAC	HGS Emissions (lbs/yr)	VGS Emissions (lbs/yr)
Lead	3.12E-02	6.23E-03
Manganese	5.28E-01	1.06E-01
Mercury	1.39E-04	2.78E-05
Naphthalene	3.03E+01	6.07E+00
Nickel	2.50E+00	5.00E-01
Propylene	1.38E+04	2.76E+03
Propylene Oxide	8.56E+02	1.71E+02
Selenium	4.30E-04	8.60E-05
Toluene	1.27E+03	2.54E+02
Xylene(Total)	4.69E+02	9.39E+03
Zinc	2.76E+00	5.51E-01

At the SGS site ammonia was the only TAC modeled. Emissions of ammonia result from the ammonia slippage associated with the SCR technology operation on the three boilers. Emissions were estimated using the SCAQMD BACT emission limit. Table C-29 provides the ammonia emissions for the SGS site.

Table C-29
TAC Emissions for Health Risk Assessments for the SGS Site

TAC	Acute Assessement (lbs/hr)	Chronic Assessment (lbs/yr)
Ammonia	36.28	317,813

C.4 EMISSIONS SUMMARY (MITIGATED)

C.4.1 Construction Emissions Summary (Mitigated)

As indicated in Table C-17, simultaneous construction-related activities at the three project sites may result in significant unmitigated air quality impacts from CO, VOC, NO_X, and PM_{10} emissions.

The emissions from construction-related activities are primarily from four main sources: 1) onsite fugitive dust, 2) onsite storage tank degassing, 3) onsite construction equipment operation, and 4) offsite motor vehicles (e.g., worker commuting and material delivery trips). The mitigation measures listed below are intended to minimize the emissions associated with these sources.

Table C-30 lists mitigation measures for each emission source and identifies the estimated control efficiency of each mitigation measure. As shown in the table, no feasible mitigation have been identified for the emissions from on-road (offsite) vehicle trips. Additionally, no other feasible mitigation measures have been identified to further reduce emissions from this source or the sources for which mitigation measures have been identified[5].

Table C-30
Construction-Related Mitigation Measures and Control Efficiency

Mitigation Measure	Mitigation	Source	Pollutant	Control Efficiency (%)
AQ-1	Increase watering of active sites by one additional time per day[a]	Onsite Fugitive Dust PM_{10}	PM_{10}	16[a]
AQ-2	Proper equipment maintenance	Construction Equipment Exhaust	VOC NOx SOx PM_{10} CO	5 5 5 5 0
AQ-3	Control VOC emissions during storage tank degassing	Storage Tank Degassing	VOC	90
AQ-4	Cover haul trucks with full tarp	Haul Truck Soil Loss	PM_{10}	90

[5] 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 C-30
Construction-Related Mitigation Measures and Control Efficiency

Mitigation Measure	Mitigation	Source	Pollutant	Control Efficiency (%)
	No feasible measures identified[b]	On-Road Motor Vehicles	VOC NOx PM_{10} CO	N/A N/A N/A N/A

[a] It is assumed that construction activities will comply with SCAQMD Rule 403 – Fugitive Dust, by watering active sites two times per day, reducing fugitive dust by 50 percent. This mitigation measure assumes an incremental increase in the number of times per day active sites are 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 C-31 lists estimated peak daily mitigated emissions by construction activity and project site. Table C-32 summarizes the overall peak daily mitigated construction-related emissions. The overall peak daily mitigated construction-related CO, and PM_{10} emissions are anticipated to occur during simultaneous foundation construction and paving at all three project sites. Overall peak daily mitigated construction-related VOC, NO_X and SO_X emissions are anticipated to occur during simultaneous equipment installation at all three project sites. Table C-15 includes the emissions associated with each source and an estimate of the reductions associated with mitigation. The implementation of mitigation measures, while reducing emissions, does not reduce the construction-related CO, VOC, NO_X, or PM_{10} impacts below significance.

Table C-31
Peak Daily Construction Emissions by Project Site for Each Construction Phase (Mitigated)

Activity	Location	CO (lb/day)	VOC (lb/day)	NO_X (lb/day)	SO_X (lb/day)	Exhaust PM_{10} (lb/day)	Fugitive PM_{10}[a] (lb/day)	Total PM_{10} (lb/day)
HGS Tank Demolition	Onsite	131.8	49.8	226.2	19.3	13.2	13.4	26.6
	Offsite	30.6	4.5	22.3	0.0	1.4	69.8	71.2
HGS Backfill	Onsite	151.9	31.0	287.8	25.9	14.0	78.3	92.2
	Offsite	48.8	7.3	41.5	0.0	2.6	133.2	135.8
HGS Grading	Onsite	52.0	9.9	74.9	6.6	4.3	2.3	6.5
	Offsite	1.5	0.2	0.2	0.0	0.0	0.1	0.1
HGS Foundations	Onsite	254.5	22.0	125.1	10.2	7.6	33.6	41.2
	Offsite	150.0	20.2	44.4	0.0	1.7	89.4	91.1
HGS Paving	Onsite	47.7	9.3	65.4	5.5	3.7	4.3	8.0
	Offsite	21.4	3.2	17.5	0.0	1.1	49.3	50.4
HGS Equipment Installation	Onsite	180.0	73.9	324.5	25.9	18.6	15.8	34.3
	Offsite	202.4	26.6	36.1	0.0	0.5	43.2	43.7
SGS Slab Demolition	Onsite	40.6	7.0	52.2	4.7	2.6	4.8	7.5
	Offsite	16.5	2.4	13.4	0.0	0.8	42.7	43.6
SGS Grading	Onsite	22.0	5.6	40.3	3.7	2.1	3.1	5.2
	Offsite	1.5	0.2	0.2	0.0	0.0	0.1	0.1
SGS Foundations	Onsite	31.6	3.1	19.6	1.6	1.2	4.6	5.7
	Offsite	13.3	1.9	7.4	0.0	0.4	19.3	19.7
SGS Paving	Onsite	16.8	2.4	30.5	2.6	1.5	2.3	3.8
	Offsite	6.7	1.0	5.1	0.0	0.3	14.2	14.5
SGS Equipment Installation	Onsite	64.1	48.2	114.0	9.8	6.4	6.1	12.5
	Offsite	58.1	7.8	16.0	0.0	0.6	30.7	31.3
VGS Demolition	Onsite	84.0	15.5	136.1	12.0	7.6	4.1	11.6
	Offsite	17.0	2.4	9.3	0.0	0.5	27.4	27.9
VGS Grading	Onsite	21.7	5.6	40.3	3.7	2.1	2.3	4.4
	Offsite	1.5	0.2	0.2	0.0	0.0	0.1	0.1
VGS Foundations	Onsite	54.1	4.8	27.9	2.2	1.7	7.9	9.5
	Offsite	46.2	6.5	23.9	0.0	1.3	60.8	62.1
VGS Paving	Onsite	17.1	2.9	30.6	2.6	1.5	2.8	4.3
	Offsite	8.5	1.3	6.7	0.0	0.4	18.8	19.2
VGS Equipment Installation	Onsite	74.5	21.8	124.2	10.4	7.0	6.6	13.6
	Offsite	59.6	8.0	15.5	0.0	0.5	28.5	29.1

[a] It is assumed that construction activities will comply with SCAQMD Rule 403 - Fugitive Dust, by watering active sites two times per day, reducing fugitive dust by 50 percent.

Table C-32
Overall Peak Daily Emissions During Construction (Mitigated)

Source	CO (lb/day)	VOC (lb/day)	NO_X (lb/day)	SO_X (lb/day)	Exhaust PM_{10} (lb/day)	Fugitive PM_{10}[a] (lb/day)	Total PM_{10} (lb/day)
Onsite Construction Equipment Exhaust	408.3	69.1	590.5	48.6	18.1	--	18.1
Mitigation Reduction (%)	0%	5%	5%	5%	5%	--	0.0
Mitigation Reduction (lb/day)	0.0	-3.5	-29.5	-2.4	-0.9	--	-0.9
Remaining Emissions	**408.3**	**65.6**	**561.0**	**46.2**	**17.2**	**--**	**17.2**
Onsite Motor Vehicles	13.5	1.3	1.6	0.0	0.1	--	0.1
Mitigation Reduction (%)	0%	0%	0%	0%	0%	--	--
Mitigation Reduction (lb/day)	0.0	0.0	0.0	0.0	0.0	--	0.0
Remaining Emissions	**13.5**	**1.3**	**1.6**	**0.0**	**0.1**	**--**	**0.1**
Onsite Fugitive PM10	--	--	--	--	--	66.0	66.0
Mitigation Reduction (%)	--	--	--	--	--	16%	--
Mitigation Reduction (lb/day)	--	--	--	--	--	-10.6	-10.6
Remaining Emissions	**--**	**--**	**--**	**--**	**--**	**55.5**	**55.5**
Architectural Coating	--	77.0	--	--	--	--	--
Mitigation Reduction (%)	--	0%	--	--	--	--	--
Mitigation Reduction (lb/day)	--	0.0	--	--	--	--	--
Remaining Emissions	**--**	**77.0**	**--**	**--**	**--**	**--**	**--**
Total Onsite	**421.8**	**143.9**	**562.6**	**46.2**	**17.3**	**55.5**	**72.7**
Offsite Motor Vehicles	246.2	42.4	67.6	0.0	5.3	251.8	257.1
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	**246.2**	**42.4**	**67.6**	**0.0**	**5.3**	**251.8**	**257.1**
Total Offsite	**246.2**	**42.4**	**67.6**	**0.0**	**5.3**	**251.8**	**257.1**
TOTAL	**668.0**	**186.3**	**630.2**	**46.2**	**22.6**	**307.3**	**329.8**
CEQA Significance Level	*550*	*75*	*100*	*150*	--	--	*150*
Significant? (Yes/No)	**Yes**	**Yes**	**Yes**	No	--	--	**Yes**
Note: Totals may not match sum of individual values because of rounding							

C.4.2 Operational Emissions Summary (Mitigated)

As indicated in Tables C-18 and C-19 above and as also shown in the localized ambient air quality impacts analyses in Subsection 4.2.3.2 of this Final EIR, operation-related activities associated with the proposed project may have significant unmitigated air quality impacts for CO, VOC, NO_X, and PM_{10}. Offsets for these emissions will be acquired prior to construction of the proposed project. However, offsets cannot be used to mitigate significant CO, NO_X or PM_{10} impacts. VOC is an ozone precursor and is considered to be a regional pollutant. Therefore, offsets can be used to mitigate significant VOC impacts. The proposed project utilizes state-of-the-art emission controls for these pollutants, and additional reductions in emissions are not feasible. Therefore, mitigation measures are not available, so the emissions cannot be mitigated below the threshold significance levels.

C.5 Project Alternatives

The following emission summary tables for the feasible alternatives to the proposed project are based on the same methodologies discussed above that were used to estimate the construction and operational emissions associated with the implementation of the proposed project.

C.5.1 Alternative A - No Project

Alternative A (No Project) would not generate any of the secondary adverse air quality impacts from construction-related activities needed to implement the proposed project. Furthermore, since the CTs and SCR systems would not be installed, no additional operational-related emissions from equipment operation or the delivery of aqueous ammonia would be generated.

C.5.2 Alternative B – Install Two New 20,000-gallon Ammonia Tanks at HGS

Under this alternative, rather than transporting the aqueous ammonia from the existing onsite tanks to the SCR systems associated with the five new CTs, the incremental aqueous ammonia would be stored onsite in two new 20,000-gallon aboveground storage tanks. This alternative may be necessary in the event that there are engineering design limitations to installing the proposed pipeline to transport the ammonia from two existing onsite tanks to the new SCR systems.

This alternative will require the construction of a foundation for the tanks of approximately 5,000 square feet with secondary containment walls. Given the time constraints of the project, an additional concrete crew of 25 workers will be required, with a gasoline-fueled concrete vibrator, and a small concrete pump (Means, 033-130-0840). The construction of the foundation would occur concurrently with the construction of the foundations for the five new CTs.

With this project alternative, trenching of approximately 775 linear feet onsite and crossing of a city street will not be required for the ammonia piping. However, trenching will still be required for approximately 200 feet onsite for the natural gas piping associated with the connector pipeline. Consequently, no adjustments to worker or equipment requirements were made for the peak day emissions estimates for the equipment installation phase of the project.

Construction-related emissions during construction of foundations and during equipment installation at HGS for Alternative B are listed in Table C-33, and overall peak daily construction-related emissions associated with Alternative B are listed in Table C-34. Under Alternative B, The overall construction-related peak daily CO emissions occur during foundation construction and paving at HGS, SGS, and VGS; the overall construction-related peak daily VOC emissions occur during demolition at HGS, SGS and VGS; the construction-related overall peak daily NO_X and SO_X peaks occur during equipment installation at HGS, SGS, and VGS; and the construction-related overall peak daily PM_{10} emissions occur during backfill and grading at HGS, grading at SGS, and foundation construction at VGS.

Table C-33
Peak Daily Construction Emissions During Foundations Construction and Equipment Installation at HGS for Alternative B (Pre-Mitigation)

Activity	Location	CO (lb/day)	VOC (lb/day)	NO_X (lb/day)	SO_X (lb/day)	Exhaust PM_{10} (lb/day)	Fugitive PM_{10}[a] (lb/day)	Total PM_{10} (lb/day)
HGS Foundations	Onsite	275.2	24.7	139.7	11.4	8.5	40.0	48.5
	Offsite	162.1	21.8	46.2	0.0	1.7	90.7	92.4
HGS Equipment Installation	Onsite	171.2	74.2	328.6	26.1	19.0	17.5	36.5
	Offsite	199.0	26.2	35.7	0.0	0.5	42.8	43.4

[a] It is assumed that construction activities will comply with SCAQMD Rule 403 - Fugitive Dust, by watering active sites two times per day, reducing fugitive dust by 50 percent.

Table C-34
Overall Peak Daily Emissions During Construction for Alternative B (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}[a] (lb/day)	Total PM_{10} (lb/day)
Onsite Construction Equipment Exhaust	429.0	46.2	577.6	47.4	23.1	--	23.1
Onsite Motor Vehicles	13.5	0.8	1.6	0.0	0.1	--	0.1
Onsite Fugitive PM10	--	--	--	--	--	108.9	108.9

Table C-34
Overall Peak Daily Emissions During Construction for Alternative B (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}[a] (lb/day)	Total PM_{10} (lb/day)
Onsite Tank Degassing	--	269.6	--	--	--	--	--
Total Onsite	**442.5**	**316.7**	**579.2**	**47.4**	**23.2**	**108.9**	**132.1**
Offsite Haul Truck Soil Loss	--	--	--	--	--	80.1	80.1
Offsite Motor Vehicles	258.3	9.3	67.1	0.0	3.9	178.3	182.2
Total Offsite	**258.3**	**9.3**	**67.1**	**0.0**	**3.9**	**258.4**	**262.3**
TOTAL	**700.8**	**326.0**	**646.3**	**47.4**	**27.1**	**367.4**	**394.4**
CEQA Significance Level	*550*	*75*	*100*	*150*	--	--	*150*
Significant? (Yes/No)	**Yes**	**Yes**	**Yes**	No	--	--	**Yes**
Note: Totals may not match sum of individual values because of rounding							

Mitigated construction-related emissions during construction of foundations and during equipment installation at HGS for Alternative B are listed in Table C-35, and overall peak daily construction-related emissions associated with Alternative B are listed in Table C-36. The overall construction-related mitigated peak daily CO and PM_{10} emissions occur during foundation construction and paving at HGS, SGS, and VGS; the overall construction-related peak daily VOC NO_X, and SO_X emissions occur during equipment installation at HGS, SGS, and VGS.

Table C-35
Peak Daily Construction Emissions During Foundations Construction and Equipment Installation at HGS for Alternative B (Mitigated)

Activity	Location	CO (lb/day)	VOC (lb/day)	NO_X (lb/day)	SO_X (lb/day)	Exhaust PM_{10} (lb/day)	Fugitive PM_{10}[a] (lb/day)	Total PM_{10} (lb/day)
HGS Foundations	Onsite	275.2	23.5	132.8	10.8	8.1	33.6	41.6
	Offsite	162.1	21.8	46.2	0.0	1.7	90.7	92.4
HGS Equipment Installation	Onsite	171.2	72.3	312.2	24.8	18.0	14.7	32.7
	Offsite	199.0	26.2	35.7	0.0	0.5	42.8	43.4
[a] It is assumed that construction activities will comply with SCAQMD Rule 403 - Fugitive Dust, by watering active sites two times per day, reducing fugitive dust by 50 percent.								

Table C-36
Overall Peak Daily Emissions During Construction for Alternative B (Mitigated)

Source	CO (lb/day)	VOC (lb/day)	NO_X (lb/day)	SO_X (lb/day)	Exhaust PM_{10} (lb/day)	Fugitive PM_{10}[a] (lb/day)	Total PM_{10} (lb/day)
Onsite Construction Equipment Exhaust	429.0	67.3	577.6	47.4	18.6	--	18.1
Mitigation Reduction (%)	0%	5%	5%	5%	5%	--	0.0
Mitigation Reduction (lb/day)	0.0	-3.4	-28.9	-2.4	-0.9	--	-0.9
Remaining Emissions	**429.0**	**63.9**	**548.7**	**45.1**	**17.6**	**--**	**17.6**
Onsite Motor Vehicles	13.5	1.3	1.6	0.0	0.1	--	0.1
Mitigation Reduction (%)	0%	0%	0%	0%	0%	--	--
Mitigation Reduction (lb/day)	0.0	0.0	0.0	0.0	0.0	--	0.0
Remaining Emissions	**13.5**	**1.3**	**1.6**	**0.0**	**0.1**	**--**	**0.1**
Onsite Fugitive PM10	--	--	--	--	--	66.0	66.0
Mitigation Reduction (%)	--	--	--	--	--	16%	--
Mitigation Reduction (lb/day)	--	--	--	--	--	-10.6	-10.6
Remaining Emissions	**--**	**--**	**--**	**--**	**--**	**55.5**	**55.5**
Architectural Coating	--	77.0	--	--	--	--	--
Mitigation Reduction (%)	--	0%	--	--	--	--	--
Mitigation Reduction (lb/day)	--	0.0	--	--	--	--	--
Remaining Emissions	**--**	**77.0**	**--**	**--**	**--**	**--**	**--**
Total Onsite	**442.5**	**142.2**	**550.3**	**45.1**	**17.8**	**55.5**	**73.1**
Offsite Motor Vehicles	258.3	42.0	67.1	0.0	5.3	253.1	257.1
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	**258.3**	**42.0**	**67.1**	**0.0**	**5.3**	**253.1**	**258.3**
Total Offsite	**258.3**	**42.0**	**67.1**	**0.0**	**5.3**	**253.1**	**258.3**
TOTAL	**700.8**	**184.2**	**617.5**	**45.1**	**23.0**	**308.6**	**331.5**
CEQA Significance Level	*550*	*75*	*100*	*150*	--	--	*150*
Significant? (Yes/No)	**Yes**	**Yes**	**Yes**	No	--	--	**Yes**
Note: Totals may not match sum of individual values because of rounding							

Operational emissions for Alternative B will be the same as for the proposed project.

C.5.3 Alternative C – No Tank Demolition and Demolition of One Cooling Tower at VGS

The existing out-of-service 80,000-barrel fuel-oil storage tank at VGS would not be decommissioned and removed from the site to accommodate the new ammonia tank. Instead, the new ammonia storage tank would be installed at a different location. Additionally, only one cooling tower of the existing four redwood cooling towers would be decommissioned. This alternative is being considered to reduce the time required for demolition of existing equipment at the VGS site.

With this project alternative, tank degassing would not be required, nor would the tank demolition crew of 3 workers with a backhoe, crane, and haul truck. Demolition of one cooling tower would still be required. Under Alternative C, because only one crew is anticipated for cooling tower demolition for the proposed project, the crew would be onsite fewer days to remove one tower than to remove four towers. However, the peak day manpower and equipment requirements remain unchanged from the proposed project.

Construction-related emissions during demolition at VGS for Alternative C are listed In Table C-37, and overall peak daily construction-related emissions associated with Alternative C are listed in Table C-38. The overall construction-related peak daily CO emissions occur during foundation construction and paving at HGS, SGS, and VGS; the overall construction-related peak daily VOC emissions occur during demolition at HGS, SGS, and VGS; the construction-related overall peak daily NO_X and SO_X peaks occur during equipment installation at HGS, SGS, and VGS; and the construction-related overall peak daily PM_{10} emissions occur during backfill and grading at HGS, grading at SGS, and foundation construction at VGS.

Table C-37
Peak Daily Construction Emissions During Demolition at VGS for Alternative C (Pre-Mitigation)

Activity	Location	CO (lb/day)	VOC (lb/day)	NO_X (lb/day)	SO_X (lb/day)	Exhaust PM_{10} (lb/day)	Fugitive PM_{10}[a] (lb/day)	Total PM_{10} (lb/day)
VGS Demolition	Onsite	55.6	8.7	88.5	7.8	4.9	4.6	9.4
	Offsite	15.6	2.2	9.1	0.0	0.5	40.1	40.6

[a] It is assumed that construction activities will comply with SCAQMD Rule 403 - Fugitive Dust, by watering active sites two times per day, reducing fugitive dust by 50 percent.

Table C-38
Overall Peak Daily Emissions During Construction for Alternative C (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}[a] (lb/day)	Total PM_{10} (lb/day)
Onsite Construction	408.3	39.0	590.5	48.6	23.1	--	23.1

Table C-38
Overall Peak Daily Emissions During Construction for Alternative C (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}[a] (lb/day)	Total PM_{10} (lb/day)
Equipment Exhaust							
Onsite Motor Vehicles	13.5	0.8	1.6	0.0	0.1	--	0.1
Onsite Fugitive PM_{10}	--	--	--	--	--	108.9	108.9
Onsite Tank Degassing	--	269.3	--	--	--	--	--
Total Onsite	**421.8**	**309.1**	**592.1**	**48.6**	**23.2**	**108.9**	**132.1**
Offsite Haul Truck Soil Loss	--	--	--	--	--	80.1	80.1
Offsite Motor Vehicles	246.2	9.1	67.6	0.0	3.9	178.3	182.2
Total Offsite	**246.2**	**9.1**	**67.6**	**0.0**	**3.9**	**258.4**	**262.3**
TOTAL	**668.0**	**318.2**	**659.8**	**48.6**	**27.1**	**367.4**	**394.4**
CEQA Significance Level	*550*	*75*	*100*	*150*	--	--	*150*
Significant? (Yes/No)	**Yes**	**Yes**	**Yes**	No	--	--	**Yes**
Note: Totals may not match sum of individual values because of rounding							

Mitigated construction-related emissions during demolition at VGS for Alternative C are listed In Table C-39, and overall peak daily construction-related emissions associated with Alternative C are listed in Table C-40. The overall construction-related mitigated peak daily CO and PM_{10} emissions occur during foundation construction and paving at HGS, SGS, and VGS; the overall construction-related peak daily VOC NO_X, and SO_X emissions occur during equipment installation at HGS, SGS, and VGS.

Table C-39
Peak Daily Construction Emissions During Demolition at VGS for Alternative B (Mitigated)

Activity	Location	CO (lb/day)	VOC (lb/day)	NO_X (lb/day)	SO_X (lb/day)	Exhaust PM_{10} (lb/day)	Fugitive PM_{10}[a] (lb/day)	Total PM_{10} (lb/day)
VGS Demolition	Onsite	55.6	8.5	84.1	7.4	4.6	3.8	8.4
	Offsite	15.6	2.2	9.1	0.0	0.5	27.2	27.8
[a] It is assumed that construction activities will comply with SCAQMD Rule 403 - Fugitive Dust, by watering active sites two times per day, reducing fugitive dust by 50 percent.								

Table C-40
Overall Peak Daily Emissions During Construction for Alternative C (Mitigated)

Source	CO (lb/day)	VOC (lb/day)	NO_X (lb/day)	SO_X (lb/day)	Exhaust PM_{10} (lb/day)	Fugitive PM_{10}[a] (lb/day)	Total PM_{10} (lb/day)
Onsite Construction Equipment Exhaust	408.3	69.1	590.5	48.6	18.1	--	18.1
Mitigation Reduction (%)	0%	5%	5%	5%	5%	--	0.0
Mitigation Reduction (lb/day)	0.0	-3.5	-29.5	-2.4	-0.9	--	-0.9
Remaining Emissions	**408.3**	**65.6**	**561.0**	**46.2**	**17.2**	**--**	**17.2**
Onsite Motor Vehicles	13.5	1.3	1.6	0.0	0.1	--	0.1
Mitigation Reduction (%)	0%	0%	0%	0%	0%	--	--
Mitigation Reduction (lb/day)	0.0	0.0	0.0	0.0	0.0	--	0.0
Remaining Emissions	**13.5**	**1.3**	**1.6**	**0.0**	**0.1**	**--**	**0.1**
Onsite Fugitive PM10	--	--	--	--	--	66.0	66.0
Mitigation Reduction (%)	--	--	--	--	--	16%	--
Mitigation Reduction (lb/day)	--	--	--	--	--	-10.6	-10.6
Remaining Emissions	**--**	**--**	**--**	**--**	**--**	**55.5**	**55.5**
Architectural Coating	--	77.0	--	--	--	--	--
Mitigation Reduction (%)	--	0%	--	--	--	--	--
Mitigation Reduction (lb/day)	--	0.0	--	--	--	--	--
Remaining Emissions	**--**	**77.0**	**--**	**--**	**--**	**--**	**--**
Total Onsite	**421.8**	**143.9**	**562.6**	**46.2**	**17.3**	**55.5**	**72.7**
Offsite Motor Vehicles	246.2	42.4	67.6	0.0	5.3	251.8	257.1
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	**246.2**	**42.4**	**67.6**	**0.0**	**5.3**	**251.8**	**257.1**
Total Offsite	**246.2**	**42.4**	**67.6**	**0.0**	**5.3**	**251.8**	**257.1**
TOTAL	**668.0**	**186.3**	**630.2**	**46.2**	**22.6**	**307.3**	**329.8**
CEQA Significance Level	*550*	*75*	*100*	*150*	--	--	*150*
Significant? (Yes/No)	**Yes**	**Yes**	**Yes**	No	--	--	**Yes**
Note: Totals may not match sum of individual values because of rounding							

Operational emissions for Alternative C will be the same as for the proposed project.

C.6 Construction Fuel Consumption

Fuel consumption associated with construction-related activities was also estimated for use in evaluating the significance of impacts on energy resources. Fuel usage by onsite construction equipment was calculated using a diesel fuel use rate of 0.05 gallons per brake-horsepower-hour and a gasoline fuel use rate of 0.12 gallons per brake-horsepower-hour from Table A9-3-E of the

SCAQMD's CEQA Air Quality Handbook (1993). Motor vehicle fuel usage was estimated by assuming an average fuel efficiency for all vehicles of 20 miles per gallon. The resulting estimated fuel consumption associated with construction activities for the proposed project is summarized in Table C-41. Estimated fuel consumption associated with construction for Alternatives B and C to the proposed project are summarized in Tables C-42 and C-43, respectively.

Table C-41
Construction Related Fuel Usage for Proposed Project

Activity	Start	End	Working Days	Construction Equipment: Daily Gasoline Use (gal)	Construction Equipment: Daily Diesel Use (gal)	Construction Equipment: Total Gasoline Use (gal)	Construction Equipment: Total Diesel Use (gal)	Motor Vehicles: Daily Gasoline VMT	Motor Vehicles: Daily Diesel VMT	Motor Vehicles: Gasoline Use (gal)	Motor Vehicles: Diesel Use (gal)	Total: Gasoline Use (gal)	Total: Diesel Use (gal)
HGS Tank Demolition	1	10	10	0.0	508.0	0	5,080	642	1,055	321	528	**321**	**5,607**
HGS Backfill	11	20	10	0.0	681.3	0	6,813	400	2,070	200	1,035	**200**	**7,848**
HGS Grading	18	20	3	0.0	173.2	0	520	120	1	18	0	**18**	**520**
HGS Foundations	21	28	8	29.8	264.9	238	2,119	10,100	1,353	4,040	541	**4,278**	**2,660**
HGS Paving	21	28	8	0.0	144.1	0	1,153	242	854	97	342	**97**	**1,495**
HGS Equipment Installation	29	150	122	0.0	681.4	0	83,136	16,020	410	97,722	2,501	**97,722**	**85,637**
SGS Slab Demolition	1	10	10	0.0	123.6	0	1,236	201	656	101	328	**101**	**1,564**
SGS Grading	18	20	3	0.0	97.3	0	292	121	1	18	0	**18**	**292**
SGS Foundations	21	28	8	3.0	41.7	24	333	530	328	212	131	**236**	**465**
SGS Paving	21	28	8	0.0	68.2	0	546	122	246	49	98	**49**	**644**
SGS Equipment Installation	29	150	122	0.0	259.1	0	31,614	4,005	451	24,431	2,751	**24,431**	**34,365**
VGS Demolition	1	10	10	0.0	315.4	0	3,154	681	412	341	206	**341**	**3,360**
VGS Grading	11	15	5	0.0	97.3	0	487	120	1	30	0	**30**	**487**
VGS Foundations	16	22	7	6.0	52.1	42	365	2,006	1,025	702	359	**744**	**723**
VGS Paving	21	25	5	0.0	68.2	0	341	122	328	31	82	**31**	**423**
VGS Equipment Installation	29	150	122	0.0	275.0	0	33,550	4,204	410	25,644	2,501	**25,644**	**36,051**
TOTAL						**304**	**170,737**			**153,955**	**11,403**	**154,259**	**182,140**

Table C-42
Construction Related Fuel Usage for Alternative B

				Construction Equipment				Motor Vehicles				Total	
Activity	Start	End	Working Days	Daily Gasoline Use (gal)	Daily Diesel Use (gal)	Total Gasoline Use (gal)	Total Diesel Use (gal)	Daily Gasoline VMT	Daily Diesel VMT	Gasoline Use (gal)	Diesel Use (gal)	Gasoline Use (gal)	Diesel Use (gal)
HGS Tank Demolition	1	10	10	0.0	508.0	0	5,080	642	1,055	321	528	**321**	**5,607**
HGS Backfill	11	20	10	0.0	681.3	0	6,813	400	2,070	200	1,035	**200**	**7,848**
HGS Grading	18	20	3	0.0	173.2	0	520	120	1	18	0	**18**	**520**
HGS Foundations	21	28	8	32.7	281.2	262	2,250	11,100	1,353	4,440	541	**4,702**	**2,791**
HGS Paving	21	28	8	0.0	144.1	0	1,153	242	854	97	342	**97**	**1,495**
HGS Equipment Installation	29	150	122	0.0	652.1	0	79,550	15,740	410	96,014	2,501	**96,014**	**82,051**
SGS Slab Demolition	1	10	10	0.0	123.6	0	1,236	201	656	101	328	**101**	**1,564**
SGS Grading	18	20	3	0.0	97.3	0	292	121	1	18	0	**18**	**292**
SGS Foundations	21	28	8	3.0	41.7	24	333	530	328	212	131	**236**	**465**
SGS Paving	21	28	8	0.0	68.2	0	546	122	246	49	98	**49**	**644**
SGS Equipment Installation	29	150	122	0.0	259.1	0	31,614	4,005	451	24,431	2,751	**24,431**	**34,365**
VGS Demolition	1	10	10	0.0	315.4	0	3,154	681	412	341	206	**341**	**3,360**
VGS Grading	11	15	5	0.0	97.3	0	487	120	1	30	0	**30**	**487**
VGS Foundations	16	22	7	6.0	52.1	42	365	2,006	1,025	702	359	**744**	**723**
VGS Paving	21	25	5	0.0	68.2	0	341	122	328	31	82	**31**	**423**
VGS Equipment Installation	29	150	122	0.0	275.0	0	33,550	4,204	410	25,644	2,501	**25,644**	**36,051**
TOTAL						**327**	**167,282**			**152,647**	**11,403**	**152,975**	**178,686**

Table C-43
Construction Related Fuel Usage for Alternative C

Activity	Start	End	Working Days	Construction Equipment: Daily Gasoline Use (gal)	Construction Equipment: Daily Diesel Use (gal)	Construction Equipment: Total Gasoline Use (gal)	Construction Equipment: Total Diesel Use (gal)	Motor Vehicles: Daily Gasoline VMT	Motor Vehicles: Daily Diesel VMT	Motor Vehicles: Gasoline Use (gal)	Motor Vehicles: Diesel Use (gal)	Total: Gasoline Use (gal)	Total: Diesel Use (gal)
HGS Tank Demolition	1	10	10	0.0	508.0	0	5,080	642	1,055	321	528	321	5,607
HGS Backfill	11	20	10	0.0	681.3	0	6,813	400	2,070	200	1,035	200	7,848
HGS Grading	18	20	3	0.0	173.2	0	520	120	1	18	0	18	520
HGS Foundations	21	28	8	29.8	264.9	238	2,119	10,100	1,353	4,040	541	4,278	2,660
HGS Paving	21	28	8	0.0	144.1	0	1,153	242	854	97	342	97	1,495
HGS Equipment Installation	29	150	122	0.0	681.4	0	83,136	16,020	410	97,722	2,501	97,722	85,637
SGS Slab Demolition	1	10	10	0.0	123.6	0	1,236	201	656	101	328	101	1,564
SGS Grading	18	20	3	0.0	97.3	0	292	121	1	18	0	18	292
SGS Foundations	21	28	8	3.0	41.7	24	333	530	328	212	131	236	465
SGS Paving	21	28	8	0.0	68.2	0	546	122	246	49	98	49	644
SGS Equipment Installation	29	150	122	0.0	259.1	0	31,614	4,005	451	24,431	2,751	24,431	34,365
VGS Demolition	1	10	10	0.0	194.0	0	1,940	561	412	281	206	281	2,146
VGS Grading	11	15	5	0.0	97.3	0	487	120	1	30	0	30	487
VGS Foundations	16	22	7	6.0	58.0	42	406	2,006	1,025	702	359	744	765
VGS Paving	21	25	5	0.0	68.2	0	341	122	328	31	82	31	423
VGS Equipment Installation	29	150	122	0.0	275.0	0	33,550	4,204	410	25,644	2,501	25,644	36,051
TOTAL						304	169,564			153,895	11,403	154,199	180,968