



Appendix I

Energy Analysis for the Carryover Storage and San Vicente Dam Raise EIR/EIS

Prepared by SRA

Draft Energy Analysis Carryover Storage and San Vicente Dam Raise EIR/EIS

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1.1 INTRODUCTION

This section evaluates energy use in terms of requirements and consumption of nonrenewable energy resources and electrical energy. The analysis is based on a review of the *Engineering Summary Reports* prepared by GEI Consultants for the Proposed Action (San Vicente 100,000 Acre-Feet [AF] Dam Raise), the Moosa 100,000 AF (Moosa 100K) Alternative, and the San Vicente 50,000 AF/Moosa 50,000 AF (SV 50K/Moosa 50K) Alternative (GEI 2006c, 2006d, 2006e) and information obtained in consultation with the California Energy Commission and the San Diego Regional Energy Office (SDREO).

1.2 DEFINITION OF RESOURCE

The Carryover Storage and San Vicente Dam Raise Project (CSP) would require both the consumption of nonrenewable energy resources to facilitate construction and consumption of electrical energy for operations. These resources are described below.

1.2.1 Nonrenewable Energy Resources

Fossil fuels are nonrenewable materials extracted from the earth and burned to produce heat or power. Petroleum products are derived from fossil fuel (crude oil) that is typically used to power construction equipment. Crude oil, a complex mixture of hydrocarbons, can be refined for use as a fuel for internal combustion engines (e.g., gasoline or diesel fuel). Fossil fuels, specifically diesel fuel, are evaluated because they are the means by which the majority of the construction equipment used to raise the dam and build other components would be powered. Construction of the project could require approximately 46 months total using a variety of heavy equipment and vehicles. In addition, electrical energy will be supplied to the construction site during construction activities through the operation of diesel-fired generators.

1.2.2 Electrical Energy

Electricity will be used during both construction and operation of the CSP. Electrical energy would be required to power the pumps for distributing carryover storage water throughout the County and for performing annual reservoir operations. In the discussion of operations, the terms “electrical power” and “energy” are used synonymously. As discussed above, electrical energy would also be used during construction, but would be supplied through on-site generators.

1.3 METHODS OF ANALYSIS

The requirements under CEQA are to evaluate the project’s impacts in comparison with baseline and no project conditions, to address compliance with local rules and regulations, and to evaluate the potential for energy impacts.

1.3.1 General Approach – Construction

A quantitative and qualitative evaluation was used to compare energy demands for nonrenewable energy resources and electrical power required for construction of the CSP in comparison with levels of consumption and availability of energy for the San Diego region. Construction energy demands were calculated in terms of the amount of diesel fuel needed to construct proposed components associated with the CSP. Because electrical power use would be provided by on-site diesel generators, diesel fuel use was the resource evaluated for the construction of the project. Although most of the equipment proposed to be used is typical of large urban development or infrastructure construction projects, variation in quantities of fuel used by different types of construction equipment makes precise determination of nonrenewable resource use difficult. As an approximation, the total estimated hours of construction equipment use and an average of the estimated gallons of diesel fuel required were applied to estimate the total amount of diesel fuel that would be consumed during the estimated 4-year construction period.

1.3.2 General Approach – Operation

For operational energy demands, the principal use of energy for the CSP would be the requirement for pump station operation. Energy use during operation of pump stations would be required during removal and addition of reservoir water to meet annual turnover and seasonal storage requirements for water quality maintenance; replacement of evaporative, seepage, and other losses; and exercising pump and valve facilities. The annual energy requirements were compared to an estimated demand of approximately 1.5 billion kilowatt-hours (kWh) for electrical energy in the year 2010 (SANDAG, 1994).

1.4 ALTERNATIVE 1: SAN VICENTE 100,000 AF (PROPOSED ACTION)

1.4.1 Affected Environment

The San Vicente Dam and Reservoir are located in south central San Diego County. The reservoir is formed by a 220-foot-high concrete gravity dam. The dam and reservoir are owned and operated by the City of San Diego for water supply purposes, mainly to supply the Alvarado Water Treatment Plant. The reservoir is bordered on the south by the community of Lakeside, on the east by the Barona Tribal lands, and on the north and west by mostly undeveloped land that is within the jurisdiction of the County of San Diego. Scattered residences occur both to the north and south of the reservoir, and extensive mining operations occur to the southwest. The site is within the USGS 7.5' San Vicente Reservoir Quadrangle, Township 14 South, Range 1 West, Sections 13, 14, 25, and 36; and Township 14 South, Range 1 East, Sections 16 – 20, 23, 24, and 29 - 31. Access to the dam site is via Vigilante Road and Moreno Avenue.

1.4.2 Existing Energy Conditions

Nonrenewable energy demands in San Diego County are dominated by the transportation sector. According to the SDREO (2006), over half the energy used in the United States goes toward transportation, with 98 percent of the transportation energy use fueled by petroleum. According to the California Department of Transportation (Caltrans 2003), statewide consumption of

petroleum is anticipated to total 20.489 billion gallons in 2010. Of that total, San Diego County is projected to consume approximately 1.75 billion gallons of petroleum fuel, with 1.56 billion gallons of gasoline and 191 million gallons of diesel fuel contributing to the total projected fuel consumption. Most of the supply imported into the region is from domestic sources in California and Alaska.

San Diego Gas & Electric (SDG&E) is the regional supplier of electrical power. SDG&E provides services to customers in San Diego County and the southern portion of Orange County. Future demands would be met by increased power purchases from outside the area and new generation within San Diego County. Existing electrical supplies to the San Vicente Dam and Reservoir are limited to 12 kilo-Volt (kV) facilities. According to information provided by SDG&E to the California Energy Commission, base demand is anticipated to be 22,786 gigawatts (gWh) by 2010, with a projected growth in demand of 1.4 percent per year.

1.4.3 Thresholds of Significance

To quantify energy consumption as it relates to construction and operation, the estimated energy consumption for each alternative was compared to the consumption of petroleum and electrical energy in the region. A significant construction impact would occur if the Proposed Action would require more than 5 percent of the region's annual demand for petroleum associated with transportation in the year 2010. This threshold was selected because most of the construction energy demands would be related to fuel usage for equipment and vehicular travel. A value of 5 percent was selected because the Proposed Action would represent one of between 20-30 projects that could be implemented during the CSP construction period.

A significant impact would occur for average annual or emergency operations if the Proposed Action would require more than 3.4 percent of the region's non-defense, public services related electrical energy needs in the year 2010. This threshold was selected because these electrical energy demands are projected by the *San Diego Regional Energy Strategy 2030* (SDREO 2003) to increase by 3.4 percent per year.

Criteria for the significance of impacts were also based on whether the consumption would be wasteful. A qualitative measurement was used based on the assumption that wasteful consumption would result if the project design did not incorporate measures utilizing energy conservation.

1.4.4 Environmental Consequences

The following energy impacts were evaluated:

- Impacts from consumption of nonrenewable energy resources for construction equipment
- Impacts from consumption of electrical power for dam and pump station operations during average annual conditions
- Impacts from consumption of electrical power for dam and pump station operations during the 2-month emergency event.

Impacts from Consumption of Nonrenewable Energy Resources for Construction Equipment

Under the Proposed Action, two optional construction scenarios have been considered. The first scenario involves development of an on-site quarry to provide construction materials for the dam raise. The second scenario involves importing of construction materials by trucking in materials on heavy-duty trucks. The two options would result in differences in construction requirements and, therefore, nonrenewable energy usage associated with construction.

Construction under both optional construction scenarios would require approximately 4 years. The construction of the dam raise would require the operation of heavy construction equipment, truck traffic, and construction worker travel to the site, all of which would be powered by petroleum.

Average annual petroleum energy requirements for the construction phase of the Proposed Action for heavy equipment were estimated based on the assumption that, on average, the heating value of diesel fuel is assumed to be 130,000 BTU/gallon (www.chevron.com 2006), and the average brake-specific fuel consumption is 7,000 BTU/hp-hr (U.S. EPA 1996). There would therefore be 0.05385 gallon/hp-hr of fuel consumption. This factor was used to estimate fuel usage requirements for diesel fuel during construction. Petroleum use in on-road vehicles was estimated based on the miles per gallon estimates in the EMFAC2002 model. In addition, fuel usage for the power generators was provided by the *Engineering Summary Report* for the Proposed Action (GEI 2006c). For the San Vicente Dam construction, the on-site quarry alternative would require a total of 2.9 million gallons of diesel; for the off-site trucked alternative, a total of 2.6 million gallons of diesel would be required to operate the on-site generators.

Table 1-1 presents a summary of the average annual construction petroleum requirements for the Proposed Action.

Table 1-1. Average Annual Construction Petroleum Requirements for Proposed Action

Alternative	Construction Requirement for Petroleum (gallons)	Regional Demand for Petroleum (gallons)	Percentage of Regional Demand
<i>San Vicente 100,000 AF – On-site Quarry</i>			
Construction Heavy Equipment	10,175,518		
Generators	2,900,000		
On-Road Trucks	936,225		
Worker Vehicles (gasoline)	3,375,730		
Total	17,387,473	1,751,000,000	0.99
<i>San Vicente 100,000 AF – Off-site Trucked</i>			
Construction Heavy Equipment	10,064,668		
Generators	2,600,000		
On-Road Trucks	3,768,435		
Worker Vehicles (gasoline)	3,299,325		
Total	19,732,428	1,751,000,000	1.13

Vehicular fuel consumption would be one of the largest single energy requirements for the construction phase. One of the primary opportunities for energy conservation would be the regular maintenance of vehicles and equipment to maximize their fuel efficiency. Construction practices and methods proposed for each of the components are generally the most current available, therefore, it is not anticipated that fuel used during construction would be wasted.

As shown in Table 1-1, diesel use would be less than 5 percent of the annual demand and thus would not result in a significant impact.

Impacts from Consumption of Electrical Power for Operations

In general, the principal use of energy for the Proposed Action would be the requirement for pump station operation. Estimates of annual electrical consumption for the San Vicente Dam and Pump Station 1 would remain the same as estimated for the Emergency Storage Project (ESP). The estimated annual consumption is listed in Table 1-2. The energy demand would not, however, be anticipated to be more than projected for the ESP; thus additional energy requirements for the Proposed Action above the ESP would be negligible.

Table 1-2. Annual Electrical Power Consumption by Component for the Proposed Action

Component	Estimated Annual Consumption, kWh
San Vicente Dam	9,000
Pump Station 1	3,514,000
Total	3,523,000
Estimated Regional Demand	1,500,000,000
Percentage of Regional Demand	0.23

Normal Operations. The existing reservoir can only be filled by precipitation or by deliveries from the Water Authority’s First Aqueduct. The reservoir can only be drained by the San Diego Pipelines 1 and 2, which convey water to City’s Alvarado Water Treatment Plant via the El Monte Pipeline. The largest increase in reservoir level in any 12-month period between 1975 and 2005 occurred in 1997-98, when the reservoir level rose about 35 feet, from about El 610 to 645. The largest decrease in reservoir level in any 12-month period between 1975 and 2005 occurred in 1983-84, when the reservoir level dropped about 30 feet, from about El 650 to 620.

The City has collected reservoir storage data since the time of dam construction in the 1940’s. Based on data, runoff and rain on the reservoir surface (and excluding evaporation) averaged about 7,850 AF per year, with a median of about 2,470 AF per year. However, the amount for any one year has varied widely, ranging from a low of 94 AF in 1956 to a maximum of 70,005 AF in 1980. Runoff is concentrated in the winter months, with the most runoff in any one month being 31,885 AF in February, 1980.

Reservoir losses from net evaporation (gross evaporation minus rainfall that lands on the reservoir surface) have averaged about 38 inches per year at San Vicente Reservoir. The net evaporation depends, in part, on the surface area of the reservoir which varies with reservoir

level. For a typical expanded reservoir surface area of say 1,400 acres, the estimated net evaporation loss would be about 4,400 AF per year.

Construction of new conveyance facilities by the Water Authority will increase the ability to fill and drain San Vicente Reservoir. These conveyance facilities include the San Vicente Pipeline, San Vicente Pump Station, Surge Control Facility, new outlet works for the raised dam, and interconnection pipelines downstream of the dam. The expanded reservoir will be able to be filled by deliveries from the Water Authority's First Aqueduct and Second Aqueduct (via the San Vicente Pipeline), as well as from precipitation. The expanded reservoir will be able to be drained by the San Vicente Pipeline/Pump Station system as well as by San Diego Pipelines 1 and 2.

As is the case for the existing reservoir, the storage volume in the expanded reservoir will vary from month to month, and from year to year. Future reservoir fluctuations will depend on many factors. Four example scenarios of possible reservoir elevations and storage volumes for a 12-month period in Year 2030 were evaluated in the *Engineering Summary Report* for the Proposed Action (GEI 2006c). Actual reservoir fluctuations will be determined jointly by the Water Authority and City on an annual basis. Note that these example scenarios always result in at least 35,000 AF of impound capacity for flood control purposes on October 1st.

The normal operation of the reservoir includes withdrawal of water from the carryover storage pool during years of below normal availability of imported water and replenishment of the carryover storage pool during periods of above normal availability of imported water. The Water Authority's carryover storage capacity is about 100,000 acre feet. Carryover storage operations will be identified each year as part of the review of the Reservoir Regulating Plan.

The new outlet works of the raised dam will have ports at various elevations. This will allow the City to selectively withdraw water at various water depths based on water quality considerations. The normal operation of the reservoir is expected to maintain Total Dissolved Solids (TDS) levels within an acceptable range. Monitoring of TDS levels will be performed on a routine basis, and annual operations plans will consider the need for additional turnover of the reservoir storage to control TDS levels.

The City has all local yield rights, and will continue to have local yield rights following dam raise construction. Except for spills that occur during major storm events, the City currently does not release water into the stream channel downstream of the dam. Operations following dam raise construction are not expected to alter this procedure.

Dam Safety Operations. The outlet works of the raised dam include provisions to discharge reservoir water to the streambed downstream of the dam if necessary due to a dam safety emergency. The discharge rate of this system is in compliance with guidelines established by the California Division of Safety of Dams. These guidelines indicate that the outlet works should be capable of 1) lowering the height of a full reservoir by 10 percent in a 7 to 10 day period, and 2) emptying the reservoir to Dead Storage level (5,261 AF) in less than six months.

Electrical energy use would be required at dams to provide power to gatekeeper's facilities and for operation of valves and gates associated with the outlet works. Estimates of electrical energy use were based on energy requirements to operate the lowest-level outlet gate at full normal reservoir head. Gates were assumed to be operated for 40 hours per year.

With regard to pumping facilities, pumps are used to pump water from the reservoir to and through the Water Authority's distribution facilities (during both emergency and average conditions), and to fill the reservoir during annual operations.

Based on the analysis, the percentage of regional demand would be negligible and the Proposed Action would not result in a significant energy impact.

1.5 ALTERNATIVE 2: MOOSA 100,000 AF

1.5.1 Affected Environment

Moosa Canyon is located in a relatively unpopulated area 3.5 miles northwest of Valley Center in San Diego County. The site is approximately 15 miles north of the City of Escondido and four miles east of Interstate 15 (I-15). Existing uses within Moosa Canyon include Turner Lake, scattered residences, agricultural lands and undeveloped areas. Access to the site is via Old Castle Road, Lilac Road and Betsworth Road.

1.5.2 Existing Energy Conditions

The existing energy conditions for the Moosa 100K Alternative would be the same as for the Proposed Action.

1.5.3 Thresholds of Significance

Thresholds of significance would be the same for the Moosa 100K Alternative as for the Proposed Action.

1.5.4 Environmental Consequences

The following energy impacts were evaluated:

- Impacts from consumption of nonrenewable energy resources for construction equipment
- Impacts from consumption of electrical power for dam and pump station operations during average annual conditions
- Impacts from consumption of electrical power for dam and pump station operations during the 2-month emergency event.

Impacts from Consumption of Nonrenewable Energy Resources for Construction Equipment

Average annual petroleum energy requirements for the construction phase of the project for heavy equipment were estimated based on the assumption that, on average, the heating value of diesel fuel is assumed to be 130,000 BTU/gallon (www.chevron.com 2006), and the average brake-specific fuel consumption is 7000 BTU/hp-hr (U.S. EPA 1996). There would therefore be 0.05385 gallon/hp-hr of fuel consumption. This factor was used to estimate fuel usage requirements for diesel fuel during construction. Petroleum use in on-road vehicles was estimated based on the miles per gallon estimates in the EMFAC2002 model. In addition, fuel usage for the power generators was provided by the *Engineering Summary Report* for the Moosa 100K Alternative (GEI 2006d). For the Moosa Dam construction, a total of 2.9 million gallons of diesel would be required for on-site quarrying operations, including the use of on-site generators.

Table 1-3 presents a summary of the average annual construction petroleum requirements for the Moosa 100K Alternative. Vehicular fuel consumption would be one of the largest single energy requirements for the construction phase. One of the primary opportunities for energy conservation would be the regular maintenance of vehicles and equipment to maximize their fuel efficiency. Construction practices and methods proposed for each of the components are generally the most current available, therefore, it is not anticipated that fuel used during construction would be wasted.

Table 1-3. Average Annual Construction Petroleum Requirements for the Moosa 100K Alternative

Alternative	Construction Requirement for Petroleum (gallons)	Regional Demand for Petroleum (gallons)	Percentage of Regional Demand
Construction Heavy Equipment	23,019,924		
On-Road Trucks	5,868,839		
Worker Vehicles (gasoline)	4,767,070		
Total	33,655,833	1,751,000,000	1.92

As shown in Table 1-3, diesel use would be less than 5 percent of the annual demand and thus would not result in a significant impact.

Impacts from Consumption of Electrical Power for Operations

As discussed above for the Proposed Action, the principal use of energy for the Moosa 100K Alternative would be the requirement for pump station operation. The annual energy requirements were compared to an estimated demand of approximately 1,500,000,000 kWh for electrical energy in the year 2010 (SANDAG 1994).

Energy use would be required during draining and filling the reservoir to meet annual turnover and seasonal storage requirements for water quality maintenance; replacement of evaporative,

seepage, and other losses; and exercising pump and valve facilities. The Valley Center Municipal Water District (VCMWD) pump stations (North and South) would be relocated under this alternative, but would not have increases in energy requirements. The estimated annual consumption of energy would be above current energy consumption levels. The total estimated annual consumption is listed in Table 1-4. Based on the analysis, the percentage of regional demand would be negligible and the Moosa 100K Alternative would not result in a significant energy impact.

Table 1-4. Annual Electrical Power Consumption by Component for the Moosa 100K Alternative

Component	Estimated Annual Consumption, kWh
Moosa Dam	10,000
Moosa Pump Station	1,102,000
Total	1,112,000
Estimated Regional Demand	1,500,000,000
Percentage of Regional Demand	0.074

1.6 ALTERNATIVE 3: SAN VICENTE 50,000 AF AND MOOSA 50,000 AF (SV 50K/MOOSA 50K)

1.6.1 Affected Environment

The affected environment for the SV 50K/Moosa 50K Alternative is the same as that described above for the Proposed Action and the Moosa 100K Alternative.

1.6.2 Existing Energy Conditions

The existing energy conditions for the individual SV 50K and Moosa 50K components of this alternative would be the same as for the Proposed Action.

1.6.3 Thresholds of Significance

Thresholds of significance would be the same for the SV 50K/Moosa 50K Alternative as for the Proposed Action.

1.6.4 Environmental Consequences

The following energy impacts were evaluated:

- Impacts from consumption of nonrenewable energy resources for construction equipment
- Impacts from consumption of electrical power for dam and pump station operations during average annual conditions
- Impacts from consumption of electrical power for dam and pump station operations during the 2-month emergency event.

Impacts from Consumption of Nonrenewable Energy Resources for Construction Equipment

Average annual petroleum energy requirements for the construction phase of this alternative for heavy equipment were estimated based on the assumption that, on average, the heating value of diesel fuel is assumed to be 130,000 BTU/gallon (www.chevron.com 2006), and the average brake-specific fuel consumption is 7000 BTU/hp-hr (U.S. EPA 1996). There would therefore be 0.05385 gallon/hp-hr of fuel consumption. This factor was used to estimate fuel usage requirements for diesel fuel during construction. Petroleum use in on-road vehicles was estimated based on the miles per gallon estimates in the EMFAC2002 model. In addition, fuel usage for the power generators was provided by the *Engineering Summary Report* for the SV 50K/Moosa 50K Alternative (GEI 2006e). For the SV 50K dam raise, the on-site quarry alternative would require a total of 2.9 million gallons of diesel; for the off-site trucked alternative, a total of 2.6 million gallons of diesel would be required to operate the on-site generators.

Table 1-5 presents a summary of the average annual construction petroleum requirements for the SV 50K/Moosa 50K Alternative.

Table 1-5. Average Annual Construction Petroleum Requirements for the SV 50K/Moosa 50K Alternative

Alternative	Construction Requirement for Petroleum (gallons)	Regional Demand for Petroleum (gallons)	Percentage of Regional Demand
<i>Moosa 50K Component</i>			
Construction Heavy Equipment	20,579,015		
On-Road Trucks	5,547,611		
Worker Vehicles (gasoline)	4,151,350		
<i>San Vicente 50K Component – On-site Quarry</i>			
Construction Heavy Equipment	8,316,439		
Generators	2,900,000		
On-Road Trucks	792,827		
Worker Vehicles (gasoline)	3,011,156		
Total	45,298,398	1,751,000,000	2.59
<i>Moosa 50K Component</i>			
Construction Heavy Equipment	20,579,015		
On-Road Trucks	5,547,611		
Worker Vehicles (gasoline)	4,151,350		
<i>San Vicente 50K Component – Off-site Trucked</i>			
Construction Heavy Equipment	8,041,545		
Generators	2,600,000		
On-Road Trucks	3,431,080		
Worker Vehicles (gasoline)	3,011,156		
Total	47,361,757	1,751,000,000	2.70

Vehicular fuel consumption would be one of the largest single energy requirements for the construction phase. One of the primary opportunities for energy conservation would be the regular maintenance of vehicles and equipment to maximize their fuel efficiency. Construction practices and methods proposed for each of the components are generally the most current available, therefore, it is not anticipated that fuel used during construction would be wasted. As shown in Table 1-5, diesel use would be less than 5 percent of the annual demand and thus would not result in a significant impact.

Impacts from Consumption of Electrical Power for Operations

As discussed above for the Proposed Action, the principal use of energy for the SV 50K/Moosa 50K Alternative would be the requirement for pump station operation. The annual energy requirements were compared to an estimated demand of approximately 1,500,000,000 kWh for electrical energy in the year 2010 (SANDAG 1994).

Energy use would be required during draining and filling the reservoirs to meet annual turnover and seasonal storage requirements for water quality maintenance; replacement of evaporative, seepage, and other losses; and exercising pump and valve facilities. The estimated annual consumption of energy for the SV 50K component of this alternative would be anticipated to be the same as for the Proposed Action. As stated above, no additional energy would be required above that evaluated for the ESP. For the Moosa 50K component, energy use for the dam itself would be the same as for the Moosa 100K Alternative, with approximately 50 percent of the energy requirements for operation of the Moosa Pump Station for recirculation. The VCMWD pump stations (North and South) would be relocated under this alternative, but would not have increases in energy requirements. The estimated annual consumption of energy would be above current energy consumption levels. The estimated additional annual consumption for each dam and pump station is listed in Table 1-6.

Table 1-6. Annual Electrical Power Consumption by Component for the SV 50K/Moosa 50K Alternative

Component	Estimated Annual Consumption, kWh
San Vicente Dam	9,000
Pump Station 1	3,514,000
Subtotal	3,523,000
Moosa Dam	10,000
Moosa Pump Station	501,000
Subtotal	511,000
Total	4,034,000
Estimated Regional Demand	1,500,000,000
Percentage of Regional Demand	0.27

Based on the analysis, the percentage of regional demand would be negligible and the SV 50K/Moosa 50K Alternative would not result in a significant energy impact.

5.0 REFERENCES

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Appendix A
Energy Use Calculations

Table A-1
Heavy Construction Equipment Diesel Usage Estimates
Carryover Storage and San Vicente Dam Raise
Onsite Quarry

Energy Use Factor,
gallons/hp-hr

Equipment	FUEL HP	Load Factor	Mobilization		RCC Test Section		Foundation Treatment		Dam Crest Demo Surface Prep		Agg. Supply		RCC Placement		Dam Seepage Control		Outlet Facilities		Saddle Dams		Bypass Pipeline Diversion Structures		Turnout-Bifurcator Structures		Clearing-Grubbing		Demobilization		Diesel Use gallons			
			No of Equip	Hrs Per Day	No of Equip	Hrs Per Day	No of Equip	Hrs Per Day	No of Equip	Hrs Per Day	No of Equip	Hrs Per Day	No of Equip	Hrs Per Day	No of Equip	Hrs Per Day	No of Equip	Hrs Per Day	No of Equip	Hrs Per Day	No of Equip	Hrs Per Day	No of Equip	Hrs Per Day	No of Equip	Hrs Per Day	No of Equip	Hrs Per Day		No of Equip	Hrs Per Day	
Cranes																																
100 T Truck Crane	DIESEL	194	43	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	2	8	360	1	8	120	8	180	8	60	175507.92
Grove Crane 15T	DIESEL	194	43	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	2	8	360	1	8	120	8	180	8	60	130377.31
Plant Erection Cranes	DIESEL	194	43	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	2	8	360	1	8	120	8	180	8	60	173000.66
Tower Crane	DIESEL	194	43	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	2	8	360	1	8	120	8	180	8	60	60174.14
Bull Dozers/Wheel Loaders																																0.00
966G Wheel Loaders	DIESEL	238	46.5	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	2	8	360	1	8	120	8	180	8	60	336350.32
988G Wheel Loaders	DIESEL	475	46.5	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	2	8	360	1	8	120	8	180	8	60	288528.30
D7G Dozers(Track type)	DIESEL	200	59	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	2	8	360	1	8	120	8	180	8	60	307591.20
D4 Dozer	DIESEL	105	59	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	2	8	360	2	8	120	8	180	8	60	175055.58
Compactors																																0.00
CS-683E Vib Compactors	DIESEL	173	43	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	1	8	360	1	8	120	8	180	8	60	55896.30
Double Drum Roller 224D	DIESEL	31	57.5	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	1	8	360	1	8	120	8	180	8	60	18028.98
Double Drum Roller 434C	DIESEL	66	57.5	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	1	8	360	1	8	120	8	180	8	60	36384.28
Smooth Drum Roller 583C	DIESEL	153	57.5	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	1	8	360	1	8	120	8	180	8	60	88981.74
Graders/Scrapers/Excavators																																0.00
Backhoe w/Breaker Attachment	DIESEL	79	46.5	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	2	8	360	2	8	120	8	180	8	60	109246.57
Backhoe w/GEVR Attachment	DIESEL	79	46.5	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	2	8	360	2	8	120	8	180	8	60	53091.79
Backhoe w/Compactor Attachment	DIESEL	79	46.5	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	1	8	360	1	8	120	8	180	8	60	45944.82
Backhoe w/Joint Machine Atch.	DIESEL	79	46.5	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	1	8	360	1	8	120	8	180	8	60	45944.82
Excavator Cat 312	DIESEL	84	58	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	3	8	360	2	8	120	8	180	8	60	141130.08
Motor Grader 163H Global	DIESEL	180	57.5	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	1	8	360	1	8	120	8	180	8	60	86073.84
Various Trucks																																0.00
769D Dump Trucks	DIESEL	518	41	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	4	8	360	2	8	120	8	180	8	60	1559849.26
Blasting Powder Truck Cat IT28G w/Broom Attachment	DIESEL	489	41	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	1	8	360	1	8	120	8	180	8	60	271752.95
Concrete pump	DIESEL	125	41	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	1	8	360	1	8	120	8	180	8	60	84006.00
End Dump Trucks	DIESEL	23	74	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	1	8	360	1	8	120	8	180	8	60	21699.40
Flat Bed	DIESEL	489	41	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	1	8	360	1	8	120	8	180	8	60	297032.29
Groat Truck	DIESEL	489	41	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	1	8	360	1	8	120	8	180	8	60	644623.27
Mixer Truck	DIESEL	489	41	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	2	8	360	2	8	120	8	180	8	60	284392.62
Pressure Washer Truck	DIESEL	489	41	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	1	8	360	1	8	120	8	180	8	60	1042772.94
Vacuum Truck	DIESEL	489	41	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	1	8	360	1	8	120	8	180	8	60	657262.94
Plant/Conveyor Equipment																																0.00
Aggregate Crushing Plant	DIESEL	161	62	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	1	8	360	1	8	120	8	180	8	60	18726.88
Groat Mixing Plant	DIESEL	161	62	8	60	8	270	8	210	8	270	8	540	8	120	8	720	8	210	8	360	1	8	360	1	8	120	8	180	8	60	22888.40

Table A-1
Heavy Construction Equipment Diesel Usage Estimates
Carryover Storage and San Vicente Dam Raise
Onsite Quarry

Energy Use Factor,
gallons/hp-hr

0.054

FUEL HP	Load Factor	Mobilization	RCC Test Section	Foundation Treatment	Dam Crest Demo Surface Prep	Agg. Supply	RCC Placement	Dam Seepage Control	Outlet Facilities	Saddle Dams	Bypass Pipeline Diversion Structures	Turnout-Bifurcator Structures	Clearing-Grubbing	Demobilization	Diesel Use gallons	
		No of Equip Hrs Per Day Days In Service	No of Equip Hrs Per Day Days In Service	No of Equip Hrs Per Day Days In Service	No of Equip Hrs Per Day Days In Service	No of Equip Hrs Per Day Days In Service	No of Equip Hrs Per Day Days In Service	No of Equip Hrs Per Day Days In Service	No of Equip Hrs Per Day Days In Service	No of Equip Hrs Per Day Days In Service	No of Equip Hrs Per Day Days In Service	No of Equip Hrs Per Day Days In Service	No of Equip Hrs Per Day Days In Service	No of Equip Hrs Per Day Days In Service		
DIESEL 161	62	1	8	8	8	8	8	8	8	1	1	1	8	8	60	139411.19
DIESEL 161	62	8	8	8	8	8	8	8	8	8	8	8	8	8	60	37453.75
DIESEL 161	62	2	8	8	8	8	8	8	8	1	1	8	8	8	60	101957.44
DIESEL 161	62	8	8	8	8	8	8	8	8	8	8	8	8	8	60	243449.39
Miscellaneous Equipment																0.00
DIESEL 161	62	8	8	8	8	8	8	8	8	8	1	8	8	8	60	49938.34
DIESEL 37	48	8	8	8	8	8	8	8	8	2	2	8	8	8	60	98506.73
DIESEL 23	74	8	8	8	8	8	8	8	8	8	8	8	8	8	60	15457.10
DIESEL 161	62	8	8	8	8	8	8	8	8	3	3	8	8	8	60	634633.02
DIESEL 23	74	8	8	8	8	8	8	8	8	1	1	8	8	8	60	12781.84
DIESEL 161	62	8	8	8	8	8	8	8	8	1	1	8	8	8	60	93634.38
DIESEL 161	62	8	8	8	8	8	8	8	8	1	1	8	8	8	60	97795.91
DIESEL 37	48	8	8	8	8	8	8	8	8	2	2	8	8	8	60	75553.70
DIESEL 22	74	8	8	8	8	8	8	8	8	1	1	8	8	8	60	10235.81
DIESEL 56	73	8	8	8	8	8	8	8	8	8	8	8	8	8	60	20264.83
DIESEL 56	73	8	8	8	8	8	8	8	8	8	8	8	8	8	60	17369.86
DIESEL 489	41	8	8	8	8	8	8	8	8	2	2	8	8	8	60	1017493.60
DIESEL 22	74	8	8	8	8	8	8	8	8	2	2	8	8	8	60	20471.62
																10175518

Table A-2
 Carryover Storage and San Vicente Dam Raise
 Worker Trip Fuel Usage
 Onsite Quarry

2010 Construction Worker Estimates and Emission Calculations

Construction Phase	Vehicle Class	No. of Workers Per Construction Phase	Speed (mph)	VMT (mi/vehicle-day)	Miles per gallon	Fuel usage, gallons/day	Fuel usage, gallons/year
Mobilization	Light-duty truck, catalyst	12	27	14	24.044	188.65	11319.25
RCC Test Section	Light-duty truck, catalyst	46	27	14	24.044	723.17	43390.45
Foundation Treatment	Light-duty truck, catalyst	29	27	14	24.044	455.91	123096.82
Dam Crest/Demo Surface Prep	Light-duty truck, catalyst	26	27	14	24.044	408.75	85837.63
Aggregate Supply	Light-duty truck, catalyst	40	27	14	24.044	628.85	169788.72
RCC Placement Craft	Light-duty truck, catalyst	158	27	14	24.044	2483.95	1341330.89
RCC Placement Mechanic	Light-duty truck, catalyst	2	27	14	24.044	31.44	16978.87
RCC Placement Batch Plant & Setup	Light-duty truck, catalyst	12	27	14	24.044	188.65	101873.23
Spillway and Weir Crew	Light-duty truck, catalyst	20	27	14	24.044	314.42	37730.83
Outlet Facilities Front End	Light-duty truck, catalyst	20	27	14	24.044	314.42	226384.96
Outlet Facilities Craft	Light-duty truck, catalyst	21	27	14	24.044	330.14	237704.21
Outlet Facilities Tunnel Men 60"	Light-duty truck, catalyst	16	27	14	24.044	251.54	181107.97
Outlet Facilities Tunnel Men 120"	Light-duty truck, catalyst	16	27	14	24.044	251.54	181107.97
Remove Rock Dam	Light-duty truck, catalyst	15	27	14	24.044	235.82	14149.06
Dam Seepage Control	Light-duty truck, catalyst	17	27	14	24.044	267.26	32071.20
Saddle Dams	Light-duty truck, catalyst	34	27	14	24.044	534.52	112249.21
Bypass Pipeline Diversion Structure	Light-duty truck, catalyst	34	27	14	24.044	534.52	192427.22
Turnout/Bifurcation Structures	Light-duty truck, catalyst	22	27	14	24.044	345.87	41503.91
Clearing/Grubbing	Light-duty truck, catalyst	21	27	14	24.044	330.14	59426.05
Demobilization/Reclamation	Light-duty truck, catalyst	12	27	14	24.044	188.65	11319.25
Supervision/Inspection	Light-duty truck, catalyst	27	27	14	24.044	424.47	154932.21
						9432.71	3375730

Assuming workers would travel from El Cajon area to San Vicente Dam, average mileage is 7 miles each way.

Assume startup after 8 hours

Assume 45 minutes run time total

2010 Emission Factors from EMFAC2002, average temp 55F

Table A-3
 Carryover Storage and San Vicente Dam Raise
 Construction Truck Fuel Usage
 Onsite Quarry

Construction Phase	Vehicle Class	No. of Trucks Per Construction Phase	Speed (mph)	VMT (mi/vehicle-day)	Miles per gallon	Fuel usage, gallons/day	Days	Fuel usage, gallons/yr
Mobilization	Heavy-duty truck	1	27	10	4.646	58.11	60	3486.87
RCC Test Section	Heavy-duty truck	3	27	10	4.646	174.34	60	10460.61
Foundation Treatment	Heavy-duty truck	1	27	10	4.646	58.11	270	15690.92
Dam Crest Demo & Surface Prep	Heavy-duty truck	1	27	10	4.646	58.11	210	12204.05
Aggregate Supply	Heavy-duty truck	0	27	10	4.646	0.00	270	0.00
RCC Placement	Heavy-duty truck	20.5	27	10	4.646	1191.35	540	643327.59
Dam Seepage Control	Heavy-duty truck	2	27	10	4.646	116.23	120	13947.48
Outlet Facilities	Heavy-duty truck	3	27	10	4.646	174.34	720	125527.34
Saddle Dams	Heavy-duty truck	2	27	10	4.646	116.23	210	24408.09
Bypass Pipeline Diversion Structure	Heavy-duty truck	2	27	10	4.646	116.23	360	41842.45
Turnout/Bifurcation Structures	Heavy-duty truck	2	27	10	4.646	116.23	120	13947.48
Clearing/Grubbing	Heavy-duty truck	3	27	10	4.646	174.34	180	31381.83
Demobilization/Reclamation	Heavy-duty truck	0	27	10	4.646	0.00	60	0.00

2353.64

936225

Table A-4
Heavy Construction Equipment Diesel Usage Estimates
Carryover Storage and San Vicente Dam Raise
Offsite Trucked

Equipment	FUEL	HP	Load Factor	0.054		60		Mobilization	RCC Test Section	Foundation Treatment	Dam Crest Demo Surface Prep	Agg. Supply	RCC Placement	Dam Seepage Control	Outlet Facilities	Saddle Dams	Bypass Pipeline Diversion Structures	Turnout-Bifurcator Structures	Clearing-Grubbing	Demobilization	Diesel Use gallons							
				No of Equip	Hrs Per Day	No of Equip	Hrs Per Day															No of Equip	Hrs Per Day	No of Equip	Hrs Per Day	No of Equip	Hrs Per Day	No of Equip
Cranes																												
100 T Truck Crane	DIESEL	194	43	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	1	8	120	8	180	8	60	175507.92	
Grove Crane 15T	DIESEL	194	43	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	1	8	120	8	180	8	60	130377.31	
Plant Erection Cranes	DIESEL	194	43	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	2	8	120	8	180	8	60	173000.66	
Tower Crane	DIESEL	194	43	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	8	8	120	8	180	8	60	60174.14	
Bull Dozers/Wheel Loaders																												
966G Wheel Loaders	DIESEL	238	46.5	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	2	8	120	8	180	8	60	338350.32	
988G Wheel Loaders	DIESEL	475	46.5	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	2	8	120	8	180	8	60	288528.30	
D7G Dozers(Track type)	DIESEL	200	59	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	2	8	120	8	180	8	60	307591.20	
D4 Dozer	DIESEL	105	59	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	2	8	120	8	180	8	60	175055.58	
Compactors																												
CS-683E Vib Compactors	DIESEL	173	43	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	1	8	120	8	180	8	60	55896.30	
Double Drum Roller 224D	DIESEL	31	57.5	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	2	8	120	8	180	8	60	18028.98	
Double Drum Roller 434C	DIESEL	66	57.5	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	2	8	120	8	180	8	60	38384.28	
Smooth Drum Roller 583C	DIESEL	153	57.5	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	2	8	120	8	180	8	60	88981.74	
Graders/Scrapers/Excavators																												
966G w/Breaker Attachment	DIESEL	79	46.5	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	2	8	120	8	180	8	60	109246.57	
Backhoe w/GEVR Attachment	DIESEL	79	46.5	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	2	8	120	8	180	8	60	53091.79	
Backhoe w/Compactor Attachment	DIESEL	79	46.5	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	2	8	120	8	180	8	60	45944.82	
Backhoe w/Joint Machine Atch.	DIESEL	79	46.5	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	2	8	120	8	180	8	60	45944.82	
Excavator Cat 312	DIESEL	84	58	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	3	8	120	8	180	8	60	141130.08	
Motor Grader 163H Global	DIESEL	180	57.5	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	1	8	120	8	180	8	60	86073.84	
Various Trucks																												
769D Dump Trucks	DIESEL	518	41	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	2	8	120	8	180	8	60	1559849.26	
Blasting Powder Truck	DIESEL	489	41	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	4	8	120	8	180	8	60	271752.95	
Cat IT28G w/Broom Attachment	DIESEL	125	41	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	1	8	120	8	180	8	60	84006.00	
Concrete pump	DIESEL	23	74	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	2	8	120	8	180	8	60	21699.40	
End Dump Trucks	DIESEL	489	41	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	1	8	120	8	180	8	60	297032.29	
Flat Bed	DIESEL	489	41	1	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	1	8	120	8	180	8	60	644623.27	
Grout Truck	DIESEL	489	41	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	2	8	120	8	180	8	60	284392.62	
Mixer Truck	DIESEL	489	41	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	2	8	120	8	180	8	60	1042772.94	
Pressure Washer Truck	DIESEL	489	41	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	1	8	120	8	180	8	60	657262.94	
Vacuum Truck	DIESEL	489	41	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	1	8	120	8	180	8	60	252793.44	
Plant/Conveyor Equipment																												
Aggregate Crushing Plant	DIESEL	161	62	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	1	8	120	8	180	8	60	0.00	
Grout Mixing Plant	DIESEL	161	62	1	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	2	8	120	8	180	8	60	22888.40	
Conventional Concrete Plant	DIESEL	161	62	1	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	1	8	120	8	180	8	60	139411.19	
Ice Plant	DIESEL	161	62	2	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	1	8	120	8	180	8	60	37453.75	
RCC Batch Plant	DIESEL	161	62	2	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	2	8	120	8	180	8	60	101957.44	
Var Conveyors type /size	DIESEL	161	62	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	6	8	120	8	180	8	60	243449.39	
Miscellaneous Equipment																												
Brush Chipper	DIESEL	161	62	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	1	8	120	8	180	8	60	49938.34	
Compressors	DIESEL	37	48	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	2	8	120	8	180	8	60	81291.96	
Dewatering Pumps	DIESEL	23	74	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	2	8	120	8	180	8	60	15457.10	
Drills Various sizes and types	DIESEL	161	62	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	3	8	120	8	180	8	60	559725.52	
Grout Pump	DIESEL	23	74	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	1	8	120	8	180	8	60	12781.84	
Misc Grouting Equipment	DIESEL	161	62	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	1	8	120	8	180	8	60	93634.38	
Misc Mixing Equipment	DIESEL	161	62	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	2	8	120	8	180	8	60	97795.91	
Power Jet w/Compressor	DIESEL	37	48	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	2	8	120	8	180	8	60	75553.70	
Road Header	DIESEL	22	74	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	3	8	120	8	180	8	60	10235.81	
Saw Cutting Machines	DIESEL	56	73	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	1	8	120	8	180	8	60	20264.83	
Various Saws	DIESEL	56	73	8	60	8	270	8	270	8	210	8	540	8	120	8	210	8	360	2	8	120	8	180	8	60	17369.86	
Water Truck	DIESEL	489	4																									

Table A-5
 Carryover Storage and San Vicente Dam Raise
 Worker Fuel Usage
 Offsite Trucked

2010 Construction Worker Estimates and Emission Calculations

Construction Phase	Vehicle Class	No. of Trucks Per Construction Phase	Speed (mph)	VMT (mi/vehicle-day)	Miles per gallon	Fuel usage, gallons/day	Days	Fuel usage, gallons/yr
Mobilization	Light-duty truck, catalyst	12	27	14	24.044	188.65	60	11319.25
RCC Test Section	Light-duty truck, catalyst	46	27	14	24.044	723.17	60	43390.45
Foundation Treatment	Light-duty truck, catalyst	29	27	14	24.044	455.91	270	123096.82
Dam Crest Demo Surface Prep	Light-duty truck, catalyst	26	27	14	24.044	408.75	210	85837.63
Aggregate Supply	Light-duty truck, catalyst	22	27	14	24.044	345.87	270	93383.80
RCC Placement Craft	Light-duty truck, catalyst	158	27	14	24.044	2483.95	540	1341330.89
RCC Placement Mechanic	Light-duty truck, catalyst	2	27	14	24.044	31.44	540	16978.87
RCC Placement Batch Plant & Setup	Light-duty truck, catalyst	12	27	14	24.044	188.65	540	101873.23
Spillway and Weir Crew	Light-duty truck, catalyst	20	27	14	24.044	314.42	120	37730.83
Outlet Facilities Front End	Light-duty truck, catalyst	20	27	14	24.044	314.42	720	226384.96
Outlet Facilities Craft	Light-duty truck, catalyst	21	27	14	24.044	330.14	720	237704.21
Outlet Facilities Tunnel Men 60"	Light-duty truck, catalyst	16	27	14	24.044	251.54	720	181107.97
Outlet Facilities Tunnel Men 120"	Light-duty truck, catalyst	16	27	14	24.044	251.54	720	181107.97
Remove Rock Dam	Light-duty truck, catalyst	15	27	14	24.044	235.82	60	14149.06
Dam Seepage Control	Light-duty truck, catalyst	17	27	14	24.044	267.26	120	32071.20
Saddle Dams	Light-duty truck, catalyst	34	27	14	24.044	534.52	210	112249.21
Bypass Pipeline Diversion Structure	Light-duty truck, catalyst	34	27	14	24.044	534.52	360	192427.22
Turnout/Bifurcation Structures	Light-duty truck, catalyst	22	27	14	24.044	345.87	120	41503.91
Clearing/Grubbing	Light-duty truck, catalyst	21	27	14	24.044	330.14	180	59426.05
Demobilization/Reclamation	Light-duty truck, catalyst	12	27	14	24.044	188.65	60	11319.25
Supervision/Inspection	Light-duty truck, catalyst	27	27	14	24.044	424.47	365	154932.21

Assuming workers would travel from El Cajon area to San Vicente Dam, average mileage is 7 miles each

Assume startup after 8 hours

Assume 45 minutes run time total

2010 Emission Factors from EMFAC2002, average temp 55F

9149.73

3299325

Table A-7
Heavy Construction Equipment Diesel Usage Estimates
Moosa 100,000 AF Alternative

CECOR Construction Emissions Calculation: Off-Road equipment
YEAR: 2010

Energy Use Factor, gallons/hp-hr		0.05385		60																			
FUEL	HP	Mobilization		Earthwork		Clearing		Foundation		Spillway		Quarry		Outlet		Embankment		Demobilization		Diesel Use			
		No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	gallons
DIESEL	161	1	8	30	1	8	210	8	825	2	8	180	14	8	714	1	8	210	8	720	8	60	1205178.51
DIESEL	33		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	489		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	489		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	161		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	100		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	161		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	161		8	30	1	8	210	8	825		8	180		8	714		8	210	8	720	8	60	122765.08
DIESEL	240		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	76		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	20		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	153		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	173		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	214641.79
DIESEL	37		8	30	1	8	210	8	825	2	8	180	14	8	714	2	8	210	8	720	8	60	291790.32
DIESEL	23		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	16348.86
DIESEL	489		8	30		8	210	8	825	1	8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	365		8	30		8	210	8	825	1	8	180		8	714		8	210	8	720	8	60	330208.20
DIESEL	378		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	130		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	46203.30
DIESEL	177	1	8	30	3	8	210	8	825	3	8	180	2	8	714	2	8	210	8	720	8	60	813452.07
DIESEL	518		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	518		8	30	3	8	210	8	825		8	180		8	714		8	210	8	720	8	60	3836024.14
DIESEL	100		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	489	1	8	30	1	8	210	8	825	2	8	180		8	714		8	210	8	720	8	60	565625.32
DIESEL	238	1	8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	9227.74
DIESEL	238	1	8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	489	1	8	30	1	8	210	8	825	1	8	180		8	714	1	8	210	8	720	8	60	947975.40
DIESEL	23		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	24523.29
DIESEL	100		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	9055.85
DIESEL	238		8	30	2	8	210	8	825		8	180		8	714	1	8	210	8	720	8	60	558278.03
DIESEL	318		8	30		8	210	8	825		8	180		8	714	1	8	210	8	720	8	60	521948.66
DIESEL	475		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	194		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	180	1	8	30	1	8	210	8	825		8	180		8	714	1	8	210	8	720	8	60	151210.80
DIESEL	161		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	14565.35
DIESEL	99		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	489		8	30	1	8	210	8	825	2	8	180	5	8	714	1	8	210	8	720	8	60	1611558.18
DIESEL	74		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	74		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	74		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	74		8	30		8	210	8	825		8	180		8	714	1	8	210	8	720	8	60	6694.63
DIESEL	161		8	30		8	210	8	825		8	180		8	714	1	8	210	8	720	8	60	4161.53
DIESEL	157		8	30	1	8	210	8	825		8	180		8	714	1	8	210	8	720	8	60	52755.77
DIESEL	157		8	30		8	210	8	825	2	8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	22		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	20		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	200		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	4		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	0.00
DIESEL	489	1	8	30	2	8	210	8	825		8	180		8	714		8	210	8	720	8	60	1412483.35
DIESEL	22		8	30		8	210	8	825	1	8	180		8	714		8	210	8	720	8	60	5686.56
DIESEL	161		8	30		8	210	8	825		8	180		8	714		8	210	8	720	8	60	0.00

12772363 gallons

Table A-7
Heavy Construction Equipment Diesel Usage Estimates
Moosa 100,000 AF Alternative

Energy Use Factor, gallons/hp-hr		0.05385		60		Mobilization		Clearing		Excavation		Pipe Installation		Access roads		Demobilization		Diesel Use		
FUEL	HP	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	Diesel Use gallons
Drain/Fill Pipeline from Moosa Dam to Second Aqueduct																				
DIESEL	161		8	45		8	75	2		8	630	8	750	8	15	8	75	8	75	87392.09
DIESEL	33		8	45		8	75			8	630	8	750	8	15	8	75	1	8	1066.23
DIESEL	489		8	45		8	75			8	630	8	750	8	15	8	75	3	8	47398.77
DIESEL	489		8	45		8	75			8	630	8	750	8	15	8	75	1	8	15799.59
DIESEL	161		8	45		8	75			8	630	8	750	8	15	8	75			0.00
DIESEL	100		8	45		8	75			8	630	8	750	8	15	8	75			0.00
DIESEL	161		8	45		8	75		1	8	630	8	750	8	15	8	75			52019.10
DIESEL	161		8	45		8	75			8	630	8	750	8	15	8	75			5201.91
DIESEL	240		8	45		8	75			8	630	8	750	8	15	8	75			0.00
DIESEL	76		8	45		8	75			8	630	8	750	8	15	8	75	1	8	2455.56
DIESEL	20		8	45		8	75			8	630	8	750	8	15	8	75			129.24
DIESEL	153		8	45		8	75			8	630	8	750	8	15	8	75			0.00
DIESEL	173		8	45		8	75			8	630	8	750	8	15	8	75			55896.30
DIESEL	37		8	45		8	75			8	630	8	750	8	15	8	75	3	8	55948.00
DIESEL	23		8	45		8	75			8	630	8	750	8	15	8	75			0.00
DIESEL	489		8	45		8	75			8	630	8	750	8	15	8	75			0.00
DIESEL	365		8	45		8	75			8	630	8	750	8	15	8	75	4	8	471726.00
DIESEL	378		8	45		8	75			8	630	8	750	8	15	8	75			0.00
DIESEL	130		8	45		8	75			8	630	8	750	8	15	8	75			0.00
DIESEL	177	1	8	45		8	75		1	8	630	8	750	8	15	8	75			115521.17
DIESEL	518		8	45		8	75			8	630	8	750	8	15	8	75			0.00
DIESEL	518		8	45		8	75		5	8	630	8	750	8	15	8	75	2	8	733062.20
DIESEL	518		8	45		8	75			8	630	8	750	8	15	8	75			0.00
DIESEL	518		8	45		8	75			8	630	8	750	8	15	8	75			0.00
DIESEL	518		8	45		8	75			8	630	8	750	8	15	8	75			0.00
DIESEL	100		8	45		8	75			8	630	8	750	8	15	8	75			0.00
DIESEL	489	1	8	45		8	75			8	630	8	750	8	15	8	75	1	8	300192.21
DIESEL	238		8	45		8	75			8	630	8	750	8	15	8	75			0.00
DIESEL	238		8	45		8	75			8	630	8	750	8	15	8	75			0.00
DIESEL	489	1	8	45		8	75		1	8	630	8	750	8	15	8	75	2	8	489787.29
DIESEL	23		8	45		8	75			8	630	8	750	8	15	8	75			0.00
DIESEL	100		8	45		8	75			8	630	8	750	8	15	8	75			0.00
DIESEL	238	1	8	45		8	75		2	8	630	8	750	8	15	8	75	1	8	310667.11
DIESEL	318		8	45		8	75			8	630	8	750	8	15	8	75			0.00
DIESEL	475		8	45		8	75			8	630	8	750	8	15	8	75			0.00
DIESEL	194	1	8	45		8	75			8	630	8	750	8	15	8	75	1	8	66442.28
DIESEL	180	1	8	45		8	75		1	8	630	8	750	8	15	8	75	2	8	70952.76
DIESEL	161		8	45		8	75			8	630	8	750	8	15	8	75			0.00
DIESEL	99		8	45		8	75			8	630	8	750	8	15	8	75	1	8	3198.69
DIESEL	489		8	45		8	75			8	630	8	750	8	15	8	75			132716.56
DIESEL	74		8	45		8	75			8	630	8	750	8	15	8	75			23909.40
DIESEL	74		8	45		8	75			8	630	8	750	8	15	8	75			0.00
DIESEL	74		8	45		8	75			8	630	8	750	8	15	8	75			64077.19
DIESEL	161		8	45		8	75			8	630	8	750	8	15	8	75			5201.91
DIESEL	157		8	45		8	75		2	8	630	8	750	8	15	8	75	1	8	135947.56
DIESEL	157		8	45		8	75			8	630	8	750	8	15	8	75			5072.67
DIESEL	22		8	45		8	75		1	8	630	8	750	8	15	8	75			0.00
DIESEL	20		8	45		8	75			8	630	8	750	8	15	8	75			12924.00
DIESEL	200		8	45		8	75			8	630	8	750	8	15	8	75			0.00
DIESEL	4		8	45		8	75			8	630	8	750	8	15	8	75			2584.80
DIESEL	489	1	8	45		8	75		1	8	630	8	750	8	15	8	75	1	8	676222.45
DIESEL	22		8	45		8	75			8	630	8	750	8	15	8	75	2	8	14216.40
DIESEL	161		8	45		8	75			8	630	8	750	8	15	8	75			0.00

3957729 gallons

Table A-7
Heavy Construction Equipment Diesel Usage Estimates
Moosa 100,000 AF Alternative

Energy Use Factor, gallons/hp-hr		0.05385		60		Mobilization		Excavation		Building		Pumps		Electrical Systems		Electric Power		Demobilization		Diesel Use			
FUEL	HP	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	Diesel Use gallons
Pump Station at Moosa Creek																							
DIESEL	161		8	15	1	8	210		8	720		8	270		8	240		8	60		8	210	14565.35
DIESEL	33		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	489		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	489		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	161		8	15		8	210		8	720		8	270		8	240		8	60		8	210	4161.53
DIESEL	100		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	161		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	161		8	15	1	8	210		8	720		8	270		8	240		8	60		8	210	14565.35
DIESEL	240		8	15	1	8	210		8	720		8	270		8	240		8	60		1	210	43424.64
DIESEL	76		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	20		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	153		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	173		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	37		8	15	1	8	210		8	720		8	270		8	240		8	60		8	210	3347.32
DIESEL	23		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	489		8	15		8	210		8	720	1	8	270		8	240		8	60		8	210	151676.06
DIESEL	365		8	15		8	210		8	720	1	8	270		8	240		8	60		1	210	160386.84
DIESEL	378		8	15		8	210		8	720		8	270		8	240		8	60		8	210	43967.45
DIESEL	130		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	177	1	8	15		8	210		8	720		8	270		8	240		8	60		8	210	33169.45
DIESEL	518		8	15	1	8	210		8	720		8	270		8	240		8	60		8	210	140587.27
DIESEL	518		8	15	1	8	210		8	720		8	270		8	240		8	60		2	210	0.00
DIESEL	518		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	518		8	15	2	8	210		8	720		8	270		8	240		8	60		8	210	93724.85
DIESEL	518		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	100		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	489	1	8	15		8	210		8	720	1	8	270		8	240		8	60		8	210	255953.36
DIESEL	238	1	8	15		8	210		8	720	1	8	270		8	240		8	60		8	210	124574.44
DIESEL	238		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	489	1	8	15	1	8	210		8	720		8	270		8	240		8	60		8	210	91637.62
DIESEL	23		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	100		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	238		8	15	2	8	210		8	720		8	270		8	240		8	60		8	210	64594.15
DIESEL	318		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	475		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	194		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	180	1	8	15	1	8	210		8	720		8	270		8	240		8	60		8	210	33731.64
DIESEL	161		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	99		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	489		8	15	1	8	210		8	720		8	270		8	240		8	60		8	210	44238.85
DIESEL	74		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	74		8	15	2	8	210		8	720		8	270		8	240		8	60		8	210	13389.26
DIESEL	74		8	15	4	8	210		8	720		8	270		8	240		8	60		8	210	26776.53
DIESEL	161		8	15	4	8	210		8	720		8	270		8	240		8	60		8	210	14565.35
DIESEL	157		8	15	1	8	210		8	720		8	270		8	240		8	60		8	210	14203.48
DIESEL	157		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	22		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	20		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	200		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	4		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00
DIESEL	489	1	8	15	1	8	210		8	720	1	8	270		8	240		8	60		8	210	243313.69
DIESEL	22		8	15		8	210		8	720	1	8	270		8	240		8	60		8	210	9382.82
DIESEL	161		8	15		8	210		8	720		8	270		8	240		8	60		8	210	0.00

1639939 gallons

Table A-7
Heavy Construction Equipment Diesel Usage Estimates
Moosa 100,000 AF Alternative

Equipment	FUEL	HP	0.05385			60			Mobilization			Excavation			Vault construction			Install Valves and Pipes			Demobilization			No of Equipment	Hrs Per Day	Days In Service	Diesel Use gallons
			No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service							
Interconnection Between Moose Pipeline and Second Aqueduct																											
Air Track Drill Rig	DIESEL	161		8	15		8	30																		0.00	
Asphalt Broom	DIESEL	33		8	15		8	30																		0.00	
Asphalt Mix Truck	DIESEL	489		8	15		8	30																		0.00	
Asphalt Prime Truck	DIESEL	489		8	15		8	30																		0.00	
Auger Drill	DIESEL	161		8	15		8	30																		0.00	
Barge	DIESEL	100		8	15		8	30																		0.00	
Cement Grout Mixer	DIESEL	161		8	15		8	30																		0.00	
Chipper	DIESEL	161		8	15		8	30																		2080.76	
Compactor 815 Cat	DIESEL	240		8	15		8	30																		0.00	
Compactor Pneumatic	DIESEL	76		8	15		8	30																		0.00	
Compactor Sheepfoot	DIESEL	20		8	15		8	30																		775.44	
Compactor Smooth Drum	DIESEL	153		8	15		8	30																		0.00	
Compactor Vibratory	DIESEL	173		8	15		8	30																		0.00	
Compressor	DIESEL	37		8	15		8	30																		956.38	
Concrete Pump	DIESEL	23		8	15		8	30																		0.00	
Concrete Pump Truck	DIESEL	489		8	15		8	30																		12639.67	
Crane 35 ton	DIESEL	365		8	15		8	30																		23586.30	
Crane 75 ton	DIESEL	378		8	15		8	30																		0.00	
Dozer D5 Cat	DIESEL	130		8	15		8	30																		0.00	
Dozer D8 Cat	DIESEL	177		8	15		8	30																		8006.42	
Dump Truck 10 CY	DIESEL	518		8	15		8	30																		40167.79	
Dump Truck 12 CY	DIESEL	518		8	15		8	30																		0.00	
Dump Truck 20 CY	DIESEL	518		8	15		8	30																		0.00	
Dump Truck 25 CY	DIESEL	518		8	15		8	30																		0.00	
Dump Truck 35 CY	DIESEL	518		8	15		8	30																		0.00	
Dump Truck 50 ton	DIESEL	518		8	15		8	30																		0.00	
Electric Locomotive	DIESEL	100		8	15		8	30																		0.00	
Flatbed Truck	DIESEL	489		8	15		8	30																		47398.77	
Fork Loader	DIESEL	238		8	15		8	30																		0.00	
Fork Loader 966 Cat	DIESEL	238		8	15		8	30																		23069.34	
Fuel Truck	DIESEL	489		8	15		8	30																		0.00	
Grout Pump	DIESEL	23		8	15		8	30																		0.00	
Jumbo	DIESEL	100		8	15		8	30																		0.00	
Loader 966 Cat	DIESEL	238		8	15		8	30																		12303.65	
Loader 980 Cat	DIESEL	318		8	15		8	30																		0.00	
Loader 988 Cat	DIESEL	475		8	15		8	30																		0.00	
Mobile Crane	DIESEL	194		8	15		8	30																		0.00	
Motor Grader	DIESEL	180		8	15		8	30																		3489.48	
Mucker	DIESEL	161		8	15		8	30																		0.00	
Paver	DIESEL	99		8	15		8	30																		0.00	
Powder Truck	DIESEL	489		8	15		8	30																		0.00	
Pressure Testing Pump	DIESEL	74		8	15		8	30																		0.00	
Pump Portable & Gen Set	DIESEL	74		8	15		8	30																		0.00	
Pump Submersible	DIESEL	74		8	15		8	30																		0.00	
Seeder	DIESEL	161		8	15		8	30																		0.00	
Track Backhoe	DIESEL	157		8	15		8	30																		2029.07	
Tractor Logger	DIESEL	157		8	15		8	30																		0.00	
Tunnel Boring Machine	DIESEL	22		8	15		8	30																		0.00	
Ventilation Fan 20 HP	DIESEL	20		8	15		8	30																		0.00	
Ventilation Fan 200 HP	DIESEL	200		8	15		8	30																		0.00	
Vibratory Pneumatic Tamper	DIESEL	4		8	15		8	30																		0.00	
Water Truck	DIESEL	489		8	15		8	30																		22119.43	
Welder & Gen Set	DIESEL	22		8	15		8	30																		1421.64	
Winch	DIESEL	161		8	15		8	30																		0.00	

200044 gallons

Table A-7
Heavy Construction Equipment Diesel Usage Estimates
Moosa 100,000 AF Alternative

Energy Use Factor, gallons/hp-hr		0.05385		60		Mobilization		Clearing		Excavation		Pipeline - Trenching		Pipeline - Tunneling		Tunneling		Access roads		Demobilization		Diesel Use			
FUEL	HP	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	Diesel Use gallons		
Relocate First Aqueduct																									
DIESEL	161		8	45	2	8	135	8	120	8	105	8	441	2	8	45	8	15	1	8	45	8	15	24969.17	
DIESEL	33		8	45		8	135	8	120	8	105	8	441		8	45	1	8	45	1	8	45	8	15	213.25
DIESEL	489		8	45		8	135	8	120	8	105	8	441		8	45	3	8	45	3	8	45	8	15	9479.75
DIESEL	489		8	45		8	135	8	120	8	105	8	441		8	45	1	8	45	1	8	45	8	15	3159.92
DIESEL	161		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	0.00
DIESEL	100		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	0.00
DIESEL	161		8	45		8	135	8	120	8	105	8	441	1	8	45	1	8	45	1	8	45	8	15	15605.73
DIESEL	161		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	4161.53
DIESEL	240		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	0.00
DIESEL	76		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	0.00
DIESEL	20		8	45		8	135	8	120	8	105	8	441	1	8	45	1	8	45	1	8	45	8	15	4187.38
DIESEL	153		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	0.00
DIESEL	173		8	45		8	135	8	120	8	105	8	441	1	8	45	1	8	45	1	8	45	8	15	8943.41
DIESEL	37		8	45		8	135	8	120	8	105	8	441	2	8	45	2	8	45	2	8	45	8	15	11476.51
DIESEL	23		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	0.00
DIESEL	489		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	0.00
DIESEL	365		8	45		8	135	8	120	8	105	8	441	3	8	45	3	8	45	3	8	45	8	15	89627.94
DIESEL	378		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	0.00
DIESEL	130		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	0.00
DIESEL	177	1	8	45		8	135	8	120	8	105	8	441	1	8	45	1	8	45	1	8	45	8	15	67940.18
DIESEL	518		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	0.00
DIESEL	518		8	45		8	135	8	120	8	105	8	441	4	8	45	4	8	45	4	8	45	8	15	200838.96
DIESEL	518		8	45		8	135	8	120	8	105	8	441	2	8	45	2	8	45	2	8	45	8	15	196822.18
DIESEL	518		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	0.00
DIESEL	518		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	0.00
DIESEL	100		8	45		8	135	8	120	8	105	8	441	1	8	45	1	8	45	1	8	45	8	15	57051.83
DIESEL	489		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	72678.11
DIESEL	238		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	0.00
DIESEL	238		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	0.00
DIESEL	489		8	45		8	135	8	120	8	105	8	441	1	8	45	1	8	45	1	8	45	8	15	197178.88
DIESEL	23		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	0.00
DIESEL	100		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	0.00
DIESEL	238	1	8	45		8	135	8	120	8	105	8	441	2	8	45	2	8	45	2	8	45	8	15	165791.66
DIESEL	318		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	0.00
DIESEL	475		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	0.00
DIESEL	194	1	8	45		8	135	8	120	8	105	8	441	1	8	45	1	8	45	1	8	45	8	15	13789.91
DIESEL	180	1	8	45		8	135	8	120	8	105	8	441	6	8	45	6	8	45	6	8	45	8	15	19773.72
DIESEL	161		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	183523.38
DIESEL	99		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	6397.74
DIESEL	489		8	45		8	135	8	120	8	105	8	441	1	8	45	1	8	45	1	8	45	8	15	37919.02
DIESEL	74		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	7172.82
DIESEL	74		8	45		8	135	8	120	8	105	8	441	1	8	45	1	8	45	1	8	45	8	15	0.00
DIESEL	74		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	0.00
DIESEL	74		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	12432.89
DIESEL	161		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	1040.38
DIESEL	157		8	45		8	135	8	120	8	105	8	441	1	8	45	1	8	45	1	8	45	8	15	17247.08
DIESEL	157		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	1014.53
DIESEL	22		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	4179.62
DIESEL	20		8	45		8	135	8	120	8	105	8	441	1	8	45	1	8	45	1	8	45	8	15	2972.52
DIESEL	200		8	45		8	135	8	120	8	105	8	441		8	45		8	45		8	45	8	15	113989.68
DIESEL	4		8	45		8	135	8	120	8	105	8	441	2	8	45	2	8	45	2	8	45	8	15	413.57
DIESEL	489	1	8	45		8	135	8	120	8	105	8	441	4	8	45	4	8	45	4	8	45	8	15	219296.31
DIESEL	22		8	45		8	135	8	120	8	105	8	441	3	8	45	3	8	45	3	8	45	8	15	5402.23
DIESEL	161		8	45		8	135	8	120	8	105	8	441	2	8	45	2	8	45	2	8	45	8	15	14565.35

1785501 gallons

Table A-7
Heavy Construction Equipment Diesel Usage Estimates
Moosa 100,000 AF Alternative

Energy Use Factor, gallons/hp-hr		0.05385		60		Mobilization		Clearing		Excavation		Building		Tanks		Pumps		Electrical Systems		Pipeline Installation		Demobilization		Diesel Use					
FUEL	HP	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	Diesel Use gallons			
Pump Station and Water Line for VCMWD North																													
DIESEL	161		8	15	1	8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	10403.82
DIESEL	33		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	2558.95
DIESEL	489		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	37919.02
DIESEL	489		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	37919.02
DIESEL	161		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	0.00
DIESEL	100		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	0.00
DIESEL	161		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	0.00
DIESEL	161		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	4161.53
DIESEL	240		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	0.00
DIESEL	76		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	0.00
DIESEL	20		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	0.00
DIESEL	153		8	15		8	60		8	150	1	8	240		8	60		8	150		8	120	1	8	240		8	180	4911.12
DIESEL	173		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	0.00
DIESEL	37		8	15		8	60		8	150	1	8	240		8	60		8	150		8	120		8	240		8	180	10041.95
DIESEL	23		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	0.00
DIESEL	489		8	15		8	60		8	150		8	240	1	8	60		8	150		8	120		8	240		8	180	63198.36
DIESEL	365		8	15		8	60		8	150		8	240	1	8	60		8	150		8	120		8	240		8	180	141517.80
DIESEL	378		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	24426.36
DIESEL	130		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	0.00
DIESEL	177		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	49182.28
DIESEL	518	1	8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	294563.81
DIESEL	518		8	15		8	60		8	150	2	8	240		8	60		8	150		8	120		8	240		8	180	0.00
DIESEL	518		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	0.00
DIESEL	518		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	0.00
DIESEL	518		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	0.00
DIESEL	100		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	0.00
DIESEL	489	1	8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	66358.28
DIESEL	238	1	8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	59980.28
DIESEL	238		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	0.00
DIESEL	489	1	8	15		8	60		8	150	1	8	240		8	60		8	150		8	120		8	240		8	180	135876.47
DIESEL	23		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	0.00
DIESEL	100		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	0.00
DIESEL	238		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	0.00
DIESEL	318		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	70745.98
DIESEL	475		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	0.00
DIESEL	194	1	8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	21311.68
DIESEL	180	1	8	15		8	60		8	150	1	8	240		8	60		8	150		8	120		8	240		8	180	31405.32
DIESEL	161		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	0.00
DIESEL	99		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	7676.86
DIESEL	489		8	15		8	60		8	150	1	8	240		8	60		8	150		8	120		8	240		8	180	31599.18
DIESEL	74		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	7651.01
DIESEL	74		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	9563.76
DIESEL	74		8	15		8	60		8	150	2	8	240		8	60		8	150		8	120		8	240		8	180	9563.76
DIESEL	161		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	12484.58
DIESEL	157		8	15		8	60		8	150	2	8	240		8	60		8	150		8	120		8	240		8	180	36523.22
DIESEL	157		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	0.00
DIESEL	22		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	0.00
DIESEL	20		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	0.00
DIESEL	200		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	0.00
DIESEL	4		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	413.57
DIESEL	489	1	8	15		8	60		8	150	1	8	240		8	60		8	150		8	120		8	240		8	180	173795.49
DIESEL	22		8	15		8	60		8	150	1	8	240		8	60		8	150		8	120		8	240		8	180	5402.23
DIESEL	161		8	15		8	60		8	150		8	240		8	60		8	150		8	120		8	240		8	180	0.00

1361156 gallons

Table A-7
Heavy Construction Equipment Diesel Usage Estimates
Moosa 100,000 AF Alternative

Energy Use Factor, gallons/hp-hr		0.05385		60		Mobilization		Clearing		Excavation		Building		Tanks		Pumps		Electrical Systems		Pipeline Installation		Demobilization		Diesel Use				
FUEL	HP	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	Diesel Use gallons		
Pump Station and Water Line for VCMWD South																												
DIESEL	161		8	15	1	8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	8323.06
DIESEL	33		8	15		8	60		8	120		8	150		8	60		8	90		8	90	1	8	60	8	150	2132.46
DIESEL	489		8	15		8	60		8	120		8	150		8	60		8	90		8	90	1	8	60	8	150	31599.18
DIESEL	489		8	15		8	60		8	120		8	150		8	60		8	90		8	90	1	8	60	8	150	31599.18
DIESEL	161		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	0.00
DIESEL	100		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	0.00
DIESEL	161		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	0.00
DIESEL	161		8	15	1	8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	4161.53
DIESEL	240		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	0.00
DIESEL	76		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	0.00
DIESEL	20		8	15		8	60		8	120	1	8	150		8	60		8	90		8	90	1	8	60	8	150	2843.28
DIESEL	153		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	0.00
DIESEL	173		8	15		8	60		8	120	1	8	150		8	60		8	90		8	90		8	60	8	150	0.00
DIESEL	37		8	15		8	60		8	120	1	8	150		8	60		8	90		8	90		8	60	8	150	3825.50
DIESEL	23		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	0.00
DIESEL	489		8	15		8	60		8	120		8	150	1	8	60		8	90		8	90		8	60	8	150	44238.85
DIESEL	365		8	15		8	60		8	120	1	8	150		8	60		8	90		8	90	1	8	60	8	150	66041.64
DIESEL	378		8	15		8	60		8	120		8	150	1	8	60		8	90		8	90		8	60	8	150	14655.82
DIESEL	130		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	0.00
DIESEL	177	1	8	15		8	60		8	120	1	8	150		8	60		8	90		8	90		8	60	8	150	30881.90
DIESEL	518		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	160671.17
DIESEL	518		8	15		8	60		8	120	2	8	150		8	60		8	90		8	90		8	60	8	150	0.00
DIESEL	518		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	0.00
DIESEL	518		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	0.00
DIESEL	518		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	0.00
DIESEL	100		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	0.00
DIESEL	489	1	8	15		8	60		8	120		8	150	1	8	60		8	90		8	90		8	60	8	150	47398.77
DIESEL	238	1	8	15		8	60		8	120		8	150	1	8	60		8	90		8	90		8	60	8	150	41524.81
DIESEL	238		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	0.00
DIESEL	489	1	8	15		8	60		8	120	1	8	150		8	60		8	90		8	90	1	8	60	8	150	85317.79
DIESEL	23		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	0.00
DIESEL	100		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	0.00
DIESEL	238		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	0.00
DIESEL	318		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	46138.68
DIESEL	475		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	0.00
DIESEL	194		8	15		8	60		8	120		8	150		8	60		8	90		8	90	1	8	60	8	150	5014.51
DIESEL	180	1	8	15		8	60		8	120	1	8	150		8	60		8	90		8	90	1	8	60	8	150	26752.68
DIESEL	161		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	0.00
DIESEL	99		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	6397.38
DIESEL	489		8	15		8	60		8	120	1	8	150		8	60		8	90		8	90		8	60	8	150	25279.34
DIESEL	74		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	1912.75
DIESEL	74		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	7651.01
DIESEL	74		8	15		8	60		8	120	2	8	150		8	60		8	90		8	90		8	60	8	150	7651.01
DIESEL	161		8	15		8	60		8	120	2	8	150		8	60		8	90		8	90		8	60	8	150	10403.82
DIESEL	157		8	15		8	60		8	120	2	8	150		8	60		8	90		8	90	1	8	60	8	150	20290.68
DIESEL	157		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	0.00
DIESEL	22		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	0.00
DIESEL	20		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	0.00
DIESEL	200		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	0.00
DIESEL	4		8	15		8	60		8	120		8	150		8	60		8	90		8	90	1	8	60	8	150	10339
DIESEL	489	1	8	15		8	60		8	120	1	8	150		8	60		8	90		8	90		8	60	8	150	135876.47
DIESEL	22		8	15		8	60		8	120	1	8	150		8	60		8	90		8	90		8	60	8	150	3696.26
DIESEL	161		8	15		8	60		8	120		8	150		8	60		8	90		8	90		8	60	8	150	0.00

872383 gallons

Table A-7
Heavy Construction Equipment Diesel Usage Estimates
Moosa 100,000 AF Alternative

Energy Use Factor, gallons/hp-hr		0.05385		60		Mobilization		Clearing		Remove Old Lines		Install electric Lines		Excavation		Demobilization		No of Equipment		Hrs Per Day		Days In Service		Diesel Use gallons			
FUEL	HP	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	Diesel Use gallons	
Relocated Public Roads and Electrical Systems																											
DIESEL	161		8	30		8	30		8	30		8	240	1	8	75		8	8		8	60				5201.91	
DIESEL	33		8	30		8	30		8	30		8	240		8	75		8	8		8	60				852.98	
DIESEL	489		8	30		8	30		8	30		8	240		8	75		8	8		8	60				12639.67	
DIESEL	489		8	30		8	30		8	30		8	240		8	75		8	8		8	60				12639.67	
DIESEL	161		8	30		8	30		8	30		8	240		8	75		8	8		8	60				16646.11	
DIESEL	100		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	161		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	161		8	30		8	30	2	8	30		8	240		8	75		8	8		8	60				4161.53	
DIESEL	240		8	30		8	30		8	30		8	240	1	8	75		8	8		8	60				13957.92	
DIESEL	76		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	20		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	153		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	173		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	37		8	30		8	30		8	30		8	240	1	8	75		8	8		8	60				1195.47	
DIESEL	23		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	489		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	365		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	378		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	130		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	177		8	30		8	30	2	8	30	1	8	240	1	8	75		8	8		8	60				37744.54	
DIESEL	518		8	30		8	30	2	8	30		8	240		8	75		8	8		8	60				13389.26	
DIESEL	518		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	518		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	518		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	518		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	100		8	30		8	30		8	30		8	240		8	75		8	8		8	60				66946.32	
DIESEL	489		8	30		8	30		8	30	1	8	240		8	75		8	8		8	60				0.00	
DIESEL	238		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	238		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	489		8	30		8	30		8	30		8	240	1	8	75		8	8		8	60				22119.43	
DIESEL	23		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	100		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	238		8	30		8	30		8	30		8	240	1	8	75		8	8		8	60				13841.60	
DIESEL	318		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	475		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	194		8	30		8	30		8	30	1	8	240		8	75		8	8		8	60				22565.30	
DIESEL	180		8	30		8	30		8	30		8	240	1	8	75		8	8		8	60				12794.76	
DIESEL	161		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	99		8	30		8	30		8	30		8	240		8	75		8	8		8	60				2558.95	
DIESEL	489		8	30		8	30		8	30		8	240	1	8	75		8	8		8	60				15799.59	
DIESEL	74		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	74		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	74		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	161		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	157		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	157		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	22		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	20		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	200		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	4		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	489		8	30		8	30		8	30	2	8	240	1	8	75		8	8		8	60				135876.47	
DIESEL	22		8	30		8	30		8	30		8	240		8	75		8	8		8	60				0.00	
DIESEL	161		8	30		8	30		8	30	2	8	240		8	75		8	8		8	60				4161.53	

430809 gallons
23019924 gallons

Table A-8
Heavy Construction Equipment Diesel Usage Estimates
Moosa 100,000 AF Alternative

2010 Construction Worker Estimates and Emission Calculations

Construction Phase	Vehicle Class	No. of Workers Per Construction Phase	Speed (mph)	VMT (mi/vehicle-day)	Miles per gallon	Fuel usage, gallons/day	Days	Fuel usage, gallons/year
2.1 Moosa Dam								
Mobilization	Light-duty truck, catalyst	9	27	14	24.044	141.49	30	4244.72
Earthwork	Light-duty truck, catalyst	13	27	14	24.044	204.38	210	42918.82
Clearing/Grubbing	Light-duty truck, catalyst	21	27	14	24.044	330.14	780	257512.89
Foundation Treatment	Light-duty truck, catalyst	70	27	14	24.044	1100.48	825	907898.02
Outlet Works	Light-duty truck, catalyst	18	27	14	24.044	282.98	180	50936.62
Spillway	Light-duty truck, catalyst	19	27	14	24.044	298.70	714	213273.50
Quarry	Light-duty truck, catalyst	60	27	14	24.044	943.27	210	198086.84
Embankment	Light-duty truck, catalyst	36	27	14	24.044	565.96	720	407492.93
Demobilization	Light-duty truck, catalyst	13	27	14	24.044	204.38	60	12262.52
Supervision/Inspection	Light-duty truck, catalyst	15	27	14	24.044	235.82	365	86073.45
2.2 Drain/Fill Pipeline from Moosa Dam to 2nd Aqueduct								
Mobilization	Light-duty truck, catalyst	10	27	14	24.044	157.21	45	7074.53
Clearing	Light-duty truck, catalyst	27	27	14	24.044	424.47	75	31835.39
Excavation	Light-duty truck, catalyst	14	27	14	24.044	220.10	630	138660.79
Pipe Install (trench)	Light-duty truck, catalyst	50	27	14	24.044	786.06	750	589544.17
Access Roads	Light-duty truck, catalyst	5	27	14	24.044	78.61	15	1179.09
Demobilization	Light-duty truck, catalyst	7	27	14	24.044	110.05	75	8253.62
Supervision/Inspection	Light-duty truck, catalyst	14	27	14	24.044	220.10	365	80335.22
2.3 Pump Station at Moosa Creek								
Mobilization	Light-duty truck, catalyst	10	27	14	24.044	157.21	15	2358.18
Excavation	Light-duty truck, catalyst	18	27	14	24.044	282.98	210	59426.05
Building	Light-duty truck, catalyst	18	27	14	24.044	282.98	720	203746.46
Pumps	Light-duty truck, catalyst	41	27	14	24.044	644.57	270	174033.44
Electric Systems	Light-duty truck, catalyst	6	27	14	24.044	94.33	240	22638.50
Electric Power	Light-duty truck, catalyst	10	27	14	24.044	157.21	60	9432.71
Demobilization	Light-duty truck, catalyst	8	27	14	24.044	125.77	210	26411.58
Supervision/Inspection	Light-duty truck, catalyst	9	27	14	24.044	141.49	365	51644.07
2.4 Interconnection between Moosa Pipeline and Second Aqueduct								
Mobilization	Light-duty truck, catalyst	10	27	14	24.044	157.21	15	2358.18
Excavation	Light-duty truck, catalyst	8	27	14	24.044	125.77	30	3773.08
Vault Construction	Light-duty truck, catalyst	12	27	14	24.044	188.65	60	11319.25
Install Valves/Pipes	Light-duty truck, catalyst	11	27	14	24.044	172.93	90	15563.97
Demobilization	Light-duty truck, catalyst	10	27	14	24.044	157.21	60	9432.71
Supervision/Inspection	Light-duty truck, catalyst	4	27	14	24.044	62.88	90	5659.62
2.5 Relocate 1st Aqueduct								
Mobilization	Light-duty truck, catalyst	10	27	14	24.044	157.21	45	7074.53
Clearing	Light-duty truck, catalyst	27	27	14	24.044	424.47	15	6367.08
Excavation	Light-duty truck, catalyst	13	27	14	24.044	204.38	135	27590.67

Table A-8
Heavy Construction Equipment Diesel Usage Estimates
Moosa 100,000 AF Alternative

Construction Phase	Vehicle Class	No. of Workers Per Construction Phase	Speed (mph)	VMT (mi/vehicle-day)	Miles per gallon	Fuel usage, gallons/day	Days	Fuel usage, gallons/year
Pipe Install (trench)	Light-duty truck, catalyst	49	27	14	24.044	770.34	120	92440.53
Pipe Install (tunnel)	Light-duty truck, catalyst	22	27	14	24.044	345.87	105	36315.92
Tunneling	Light-duty truck, catalyst	20	27	14	24.044	314.42	441	138660.79
Access Roads	Light-duty truck, catalyst	20	27	14	24.044	314.42	45	14149.06
Demobilization	Light-duty truck, catalyst	7	27	14	24.044	110.05	15	1650.72
Supervision/Inspection	Light-duty truck, catalyst	14	27	14	24.044	220.10	135	29713.03
2.6 Pump Station and Water Line VCMD (North)								
Mobilization	Light-duty truck, catalyst	10	27	14	24.044	157.21	15	2358.18
Clearing	Light-duty truck, catalyst	10	27	14	24.044	157.21	60	9432.71
Excavation	Light-duty truck, catalyst	20	27	14	24.044	314.42	150	47163.53
Building	Light-duty truck, catalyst	14	27	14	24.044	220.10	240	52823.16
Tanks	Light-duty truck, catalyst	6	27	14	24.044	94.33	60	5659.62
Pumps	Light-duty truck, catalyst	41	27	14	24.044	644.57	150	96685.24
Electric Systems	Light-duty truck, catalyst	8	27	14	24.044	125.77	120	15092.33
Install Pipeline	Light-duty truck, catalyst	34	27	14	24.044	534.52	240	128284.81
Demobilization	Light-duty truck, catalyst	9	27	14	24.044	141.49	180	25468.31
Supervision/Inspection	Light-duty truck, catalyst	10	27	14	24.044	157.21	240	37730.83
2.7 Pump Station and Water Line VCMD (South)								
Mobilization	Light-duty truck, catalyst	10	27	14	24.044	157.21	15	2358.18
Clearing	Light-duty truck, catalyst	17	27	14	24.044	267.26	60	16035.60
Excavation	Light-duty truck, catalyst	14	27	14	24.044	220.10	120	26411.58
Building	Light-duty truck, catalyst	15	27	14	24.044	0.00	150	0.00
Tanks	Light-duty truck, catalyst	6	27	14	24.044	94.33	60	5659.62
Pumps	Light-duty truck, catalyst	41	27	14	24.044	644.57	90	58011.15
Electric Systems	Light-duty truck, catalyst	8	27	14	24.044	125.77	90	11319.25
Install Pipeline	Light-duty truck, catalyst	15	27	14	24.044	235.82	60	14149.06
Demobilization	Light-duty truck, catalyst	7	27	14	24.044	110.05	150	16507.24
Supervision/Inspection	Light-duty truck, catalyst	10	27	14	24.044	157.21	150	23581.77
2.8 Relocated Public Rds and Electrical Systems								
Mobilization	Light-duty truck, catalyst	9	27	14	24.044	141.49	30	4244.72
Clearing	Light-duty truck, catalyst	11	27	14	24.044	172.93	30	5187.99
Remove Existing Electric Lines	Light-duty truck, catalyst	9	27	14	24.044	141.49	30	4244.72
Install Electric Lines	Light-duty truck, catalyst	16	27	14	24.044	251.54	240	60369.32
Excavation	Light-duty truck, catalyst	20	27	14	24.044	314.42	75	23581.77
Demobilization	Light-duty truck, catalyst	13	27	14	24.044	204.38	60	12262.52
Supervision/Inspection	Light-duty truck, catalyst	10	27	14	24.044	157.21	240	37730.83
								4731697

Assuming workers would travel from Escondido area to Moosa Dam, average mileage is 7 miles each way.
Assume startup after 8 hours
Assume 45 minutes run time total

2010 Emission Factors from EMFAC2002, average temp 55F

Table A-9
Heavy Construction Equipment Diesel Usage Estimates
Moosa 100,000 AF Alternative

Construction Phase	Vehicle Class	No. of Trucks Per Construction Phase	Speed (mph)	VMT (mi/vehicle-day)	Miles per gallon	Fuel usage, gallons/day	Days	Fuel usage, gallons/yr
2.1 Moosa Dam								
Mobilization	Heavy-duty truck	1	27	10	4.646	58.11	30	1743.44
Earthwork	Heavy-duty truck	0	27	10	4.646	0.00	210	0.00
Cleaning/Grubbing	Heavy-duty truck	9	27	10	4.646	523.03	780	407963.84
Foundation Treatment	Heavy-duty truck	2	27	10	4.646	116.23	825	95888.94
Outlet Works	Heavy-duty truck	3.5	27	10	4.646	203.40	180	36612.14
Spillway	Heavy-duty truck	2.5	27	10	4.646	145.29	714	103734.40
Quarry	Heavy-duty truck	0.5	27	10	4.646	29.06	210	6102.02
Embankment	Heavy-duty truck	103	27	10	4.646	5985.79	720	430971.85
Demobilization	Heavy-duty truck	1	27	10	4.646	58.11	60	3486.87
Supervision/Inspection	Heavy-duty truck	0	27	10	4.646	0.00	365	0.00
2.2 Drain/Fill Pipeline from Moosa Dam to 2nd Aqueduct								
Mobilization	Heavy-duty truck	1	27	10	4.646	58.11	45	2615.15
Clearing	Heavy-duty truck	1	27	10	4.646	58.11	75	4358.59
Excavation	Heavy-duty truck	0	27	10	4.646	0.00	630	0.00
Pipe Install (trench)	Heavy-duty truck	10	27	10	4.646	581.15	750	435858.80
Access Roads	Heavy-duty truck	0	27	10	4.646	0.00	15	0.00
Demobilization	Heavy-duty truck	1	27	10	4.646	58.11	75	4358.59
Supervision/Inspection	Heavy-duty truck	0	27	10	4.646	0.00	365	0.00
2.3 Pump Station at Moosa Creek								
Mobilization	Heavy-duty truck	0.5	27	10	4.646	29.06	15	435.86
Excavation	Heavy-duty truck	1	27	10	4.646	58.11	210	12204.05
Building	Heavy-duty truck	3	27	10	4.646	174.34	720	125527.34
Pumps	Heavy-duty truck	1	27	10	4.646	58.11	270	15690.92
Electric Systems	Heavy-duty truck	1	27	10	4.646	58.11	240	13947.48
Electric Power	Heavy-duty truck	0	27	10	4.646	0.00	60	0.00
Demobilization	Heavy-duty truck	1	27	10	4.646	58.11	210	12204.05
Supervision/Inspection	Heavy-duty truck	0	27	10	4.646	0.00	365	0.00
2.4 Interconnection between Moosa Pipeline and Second Aqueduct								
Mobilization	Heavy-duty truck	0.5	27	10	4.646	29.06	15	435.86
Excavation	Heavy-duty truck	1	27	10	4.646	58.11	30	1743.44
Vault Construction	Heavy-duty truck	0	27	10	4.646	0.00	60	0.00
Install Valves/Pipes	Heavy-duty truck	0.25	27	10	4.646	14.53	90	1307.58
Demobilization	Heavy-duty truck	0.5	27	10	4.646	29.06	60	1743.44
Supervision/Inspection	Heavy-duty truck	0	27	10	4.646	0.00	90	0.00
2.5 Relocate 1st Aqueduct								
Mobilization	Heavy-duty truck	1	27	10	4.646	58.11	45	2615.15
Clearing	Heavy-duty truck	0	27	10	4.646	0.00	15	0.00
Excavation	Heavy-duty truck	1	27	10	4.646	58.11	135	7845.46

Table A-9
Heavy Construction Equipment Diesel Usage Estimates
Moosa 100,000 AF Alternative

Construction Phase	Vehicle Class	No. of Trucks Per Construction Phase	Speed (mph)	VMT (mi/vehicle-day)	Miles per gallon	Fuel usage, gallons/day	Days	Fuel usage, gallons/yr
Pipe Install (trench)	Heavy-duty truck	10	27	10	4.646	581.15	120	69737.41
Pipe Install (tunnel)	Heavy-duty truck	10	27	10	4.646	581.15	105	61020.23
Tunneling	Heavy-duty truck	0	27	10	4.646	0.00	441	0.00
Access Roads	Heavy-duty truck	0	27	10	4.646	0.00	45	0.00
Demobilization	Heavy-duty truck	0	27	10	4.646	0.00	15	0.00
Supervision/Inspection	Heavy-duty truck	0	27	10	4.646	0.00	135	0.00
2.6 Pump Station and Water Line VCMD (North)								
Mobilization	Heavy-duty truck	0.5	27	10	4.646	29.06	15	435.86
Clearing	Heavy-duty truck	0	27	10	4.646	0.00	60	0.00
Excavation	Heavy-duty truck	0	27	10	4.646	0.00	150	0.00
Building	Heavy-duty truck	2	27	10	4.646	116.23	240	27894.96
Tanks	Heavy-duty truck	1	27	10	4.646	58.11	60	3486.87
Pumps	Heavy-duty truck	1	27	10	4.646	58.11	150	8717.18
Electric Systems	Heavy-duty truck	1	27	10	4.646	58.11	120	6973.74
Install Pipeline	Heavy-duty truck	0	27	10	4.646	0.00	240	0.00
Demobilization	Heavy-duty truck	1	27	10	4.646	58.11	180	10460.61
Supervision/Inspection	Heavy-duty truck	0	27	10	4.646	0.00	240	0.00
2.7 Pump Station and Water Line VCMD (South)								
Mobilization	Heavy-duty truck	0.5	27	10	4.646	0.00	15	0.00
Clearing	Heavy-duty truck	0	27	10	4.646	0.00	60	0.00
Excavation	Heavy-duty truck	0	27	10	4.646	0.00	120	0.00
Building	Heavy-duty truck	2	27	10	4.646	116.23	150	17434.35
Tanks	Heavy-duty truck	1	27	10	4.646	58.11	60	3486.87
Pumps	Heavy-duty truck	1	27	10	4.646	58.11	90	5230.31
Electric Systems	Heavy-duty truck	1	27	10	4.646	58.11	90	5230.31
Install Pipeline	Heavy-duty truck	0	27	10	4.646	0.00	60	0.00
Demobilization	Heavy-duty truck	1	27	10	4.646	58.11	150	8717.18
Supervision/Inspection	Heavy-duty truck	0	27	10	4.646	0.00	150	0.00
2.8 Relocated Public Rds and Electrical Systems								
Mobilization	Heavy-duty truck	0.5	27	10	4.646	29.06	30	871.72
Clearing	Heavy-duty truck	1	27	10	4.646	58.11	30	1743.44
Remove Existing Electric Lines	Heavy-duty truck	0	27	10	4.646	0.00	30	0.00
Install Electric Lines	Heavy-duty truck	0.5	27	10	4.646	29.06	240	6973.74
Excavation	Heavy-duty truck	1	27	10	4.646	58.11	75	4358.59
Demobilization	Heavy-duty truck	5	27	10	4.646	290.57	60	17434.35
Supervision/Inspection	Heavy-duty truck	0	27	10	4.646	0.00	240	0.00
								5868403

Assuming trucks would travel up to 5 miles one way for aggregate and RCC materials, assuming materials provided
Emission factors from 2010 EMFAC2002, 27 mph, Heavy Duty Diesel truck (HDD)

Table A-10
Heavy Construction Equipment Diesel Usage Estimates
Moosa 50,000 AF Alternative

Energy Use Factor, gallons/hp-hr

0.05385

60

Equipment	FUEL	Mobilization			Cleaning			Excavation			Pipe Installation			Access roads			Demobilization			Diesel Use gallons			
		No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service				
Drain/Fill Pipeline from Moosa Dam to Second Aqueduct																							
Air Track Drill Rig	DIESEL	161	8	45		8	8	480	2	8	8	570	8	8	15	8	8	75	1	8	8	75	66584.45
Asphalt Broom	DIESEL	33	8	45		8	8	480		8	8	570	8	8	15	8	8	75	3	8	8	75	1066.23
Asphalt Mix Truck	DIESEL	489	8	45		8	8	480		8	8	570	8	8	15	8	8	75	1	8	8	75	47398.77
Asphalt Prime Truck	DIESEL	489	8	45		8	8	480		8	8	570	8	8	15	8	8	75	1	8	8	75	15799.59
Auger Drill	DIESEL	161	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	0.00
Barge	DIESEL	100.1	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	0.00
Cement Grout Mixer	DIESEL	161	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	39534.52
Chipper	DIESEL	161	8	45	1	8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	5201.91
Compactor 815 Cat	DIESEL	240	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	0.00
Compactor Pneumatic	DIESEL	76	8	45		8	8	480		8	8	570	8	8	15	8	8	75	1	8	8	75	2455.56
Compactor Sheepfoot	DIESEL	20	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	129.24
Compactor Smooth Drum	DIESEL	153	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	0.00
Compactor Vibratory	DIESEL	173	8	45		8	8	480	2	8	8	570	8	8	15	8	8	75		8	8	75	42481.19
Compressor	DIESEL	37	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	42558.73
Concrete Pump	DIESEL	23	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	0.00
Concrete Pump Truck	DIESEL	489	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	0.00
Crane 35 ton	DIESEL	365	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	358511.76
Crane 75 ton	DIESEL	378	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	0.00
Dozer D5 Cat	DIESEL	130	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	0.00
Dozer D8 Cat	DIESEL	177	8	45	1	8	8	480	1	8	8	570	8	8	15	8	8	75		8	8	75	90358.15
Dump Truck 10 CY	DIESEL	518	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	0.00
Dump Truck 12 CY	DIESEL	518	8	45		8	8	480	2	8	8	570	8	8	15	8	8	75	2	8	8	75	568780.30
Dump Truck 20 CY	DIESEL	518	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	0.00
Dump Truck 25 CY	DIESEL	518	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	0.00
Dump Truck 35 CY	DIESEL	518	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	0.00
Dump Truck 50 ton	DIESEL	518	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	0.00
Electric Locomotive	DIESEL	100.1	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	0.00
Flatbed Truck	DIESEL	489	8	45	1	8	8	480	1	8	8	570	8	8	15	8	8	75		8	8	75	230674.01
Fork Loader	DIESEL	238	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	0.00
Fork Loader 966 Cat	DIESEL	238	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	0.00
Fuel Truck	DIESEL	489	8	45		8	8	480	1	8	8	570	8	8	15	8	8	75		8	8	75	382350.08
GROUT Pump	DIESEL	23	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	0.00
Jumbo	DIESEL	100.1	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	0.00
Loader 966 Cat	DIESEL	238	8	45	1	8	8	480	2	8	8	570	8	8	15	8	8	75		8	8	75	0.00
Loader 980 Cat	DIESEL	318	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	0.00
Loader 988 Cat	DIESEL	475	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	0.00
Mobile Crane	DIESEL	194	8	45	1	8	8	480	1	8	8	570	8	8	15	8	8	75		8	8	75	51398.75
Motor Grader	DIESEL	180	8	45	1	8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	59321.16
Mucker	DIESEL	161	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	0.00
Paver	DIESEL	99	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	3198.69
Powder Truck	DIESEL	489	8	45		8	8	480	1	8	8	570	8	8	15	8	8	75		8	8	75	101117.38
Pressure Testing Pump	DIESEL	74	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	18171.14
Pump Portable & Gen Set	DIESEL	74	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	0.00
Pump Submersible	DIESEL	74	8	45		8	8	480	1	8	8	570	8	8	15	8	8	75		8	8	75	48775.18
Seeder	DIESEL	161	8	45		8	8	480	2	8	8	570	8	8	15	8	8	75		8	8	75	5201.91
Track Backhoe	DIESEL	157	8	45		8	8	480	2	8	8	570	8	8	15	8	8	75	1	8	8	75	103482.47
Tractor Logger	DIESEL	157	8	45	1	8	8	480	1	8	8	570	8	8	15	8	8	75		8	8	75	5072.67
Tunnel Boring Machine	DIESEL	22	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	0.00
Ventilation Fan 20 HP	DIESEL	20	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	9822.24
Ventilation Fan 200 HP	DIESEL	200	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	0.00
Vibratory Pneumatic Tamper	DIESEL	4	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	1964.45
Water Truck	DIESEL	489	8	45	1	8	8	480	1	8	8	570	8	8	15	8	8	75		8	8	75	524546.39
Welder & Gen Set	DIESEL	22	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	10804.46
Winch	DIESEL	161	8	45		8	8	480		8	8	570	8	8	15	8	8	75		8	8	75	0.00
																							3096758

Table A-10
Heavy Construction Equipment Diesel Usage Estimates
Moosa 50,000 AF Alternative

Energy Use Factor, gallons/hp-hr

0.05385

60

Equipment	FUEL	HP	Mobilization			Excavation			Building			Pumps			Electrical Systems			Electric Power			Demobilization			Diesel Use gallons
			No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	
Pump Station at Moosa Creek																								
Air Track Drill Rig	DIESEL	161		8	15	1	8	8	8	270		8	8	8	240		8	8	8	60	8	8	210	14565.35
Asphalt Broom	DIESEL	33		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Asphalt Mix Truck	DIESEL	489		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Asphalt Prime Truck	DIESEL	489		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Auger Drill	DIESEL	161		8	15		8	8	8	270		8	8	240	1	8	8	8	60	8	8	210	4161.53	
Barge	DIESEL	100.1		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Cement Grout Mixer	DIESEL	161		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Chipper	DIESEL	161		8	15	1	8	8	8	270		8	8	240		8	8	8	60	8	8	210	14565.35	
Compactor 815 Cat	DIESEL	240		8	15	1	8	8	8	270		8	8	240		8	8	8	60	8	8	210	43424.64	
Compactor Pneumatic	DIESEL	76		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Compactor Sheepfoot	DIESEL	20		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Compactor Smooth Drum	DIESEL	153		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Compactor Vibratory	DIESEL	173		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Compressor	DIESEL	37		8	15	1	8	8	8	270		8	8	240		8	8	8	60	8	8	210	3347.32	
Concrete Pump	DIESEL	23		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Concrete Pump Truck	DIESEL	489		8	15		8	8	8	270	1	8	8	240		8	8	8	60	8	8	210	94797.54	
Crane 35 ton	DIESEL	365		8	15		8	8	8	270	1	8	8	240	1	8	8	8	60	8	8	210	117931.50	
Crane 75 ton	DIESEL	378		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	43967.45	
Dozer D5 Cat	DIESEL	130		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Dozer D8 Cat	DIESEL	177	1	8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	33169.45	
Dump Truck 10 CY	DIESEL	518		8	15	1	8	8	8	270		8	8	240		8	8	8	60	8	8	210	140587.27	
Dump Truck 12 CY	DIESEL	518		8	15	1	8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Dump Truck 20 CY	DIESEL	518		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Dump Truck 25 CY	DIESEL	518		8	15	2	8	8	8	270		8	8	240		8	8	8	60	8	8	210	93724.85	
Dump Truck 35 CY	DIESEL	518		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Dump Truck 50 ton	DIESEL	518		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Electric Locomotive	DIESEL	100.1		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Flatbed Truck	DIESEL	489	1	8	15		8	8	8	270	1	8	8	240		8	8	8	60	8	8	210	199074.83	
Fork Loader	DIESEL	238	1	8	15		8	8	8	270	1	8	8	240		8	8	8	60	8	8	210	96891.23	
Fork Loader 966 Cat	DIESEL	489	1	8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Fuel Truck	DIESEL	489	1	8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	91637.62	
Grount Pump	DIESEL	23		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Jumbo	DIESEL	100.1		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Loader 966 Cat	DIESEL	238		8	15	2	8	8	8	270		8	8	240		8	8	8	60	8	8	210	64594.15	
Loader 980 Cat	DIESEL	318		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Loader 988 Cat	DIESEL	475		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Mobile Crane	DIESEL	194		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Motor Grader	DIESEL	180	1	8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	33731.64	
Mucker	DIESEL	161		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Paver	DIESEL	99		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Powder Truck	DIESEL	489		8	15	1	8	8	8	270		8	8	240		8	8	8	60	8	8	210	44238.85	
Pressure Testing Pump	DIESEL	74		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Pump Portable & Gen Set	DIESEL	74		8	15	2	8	8	8	270		8	8	240		8	8	8	60	8	8	210	13389.26	
Pump Submersible	DIESEL	74		8	15	4	8	8	8	270		8	8	240		8	8	8	60	8	8	210	26778.53	
Seeder	DIESEL	161		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	14565.35	
Track Backhoe	DIESEL	157		8	15	1	8	8	8	270		8	8	240		8	8	8	60	8	8	210	14203.48	
Tunnel Boring Machine	DIESEL	22		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Ventilation Fan 20 HP	DIESEL	20		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Ventilation Fan 200 HP	DIESEL	200		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Vibratory Pneumatic Tamper	DIESEL	4		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
Water Truck	DIESEL	489	1	8	15	1	8	8	8	270	1	8	8	240		8	8	8	60	8	8	210	186435.16	
Welder & Gen Set	DIESEL	22		8	15		8	8	8	270	1	8	8	240		8	8	8	60	8	8	210	6823.87	
Winch	DIESEL	161		8	15		8	8	8	270		8	8	240		8	8	8	60	8	8	210	0.00	
																							1396606	

Table A-10
Heavy Construction Equipment Diesel Usage Estimates
Moosa 50,000 AF Alternative

Energy Use Factor, gallons/hp-hr

0.05385 60

Equipment	FUEL HP	Mobilization			Excavation			Vault construction			Install Valves and Pipes			Demobilization			Diesel Use gallons
		No. of Equipment	Hrs Per Day	Days In Service	No. of Equipment	Hrs Per Day	Days In Service	No. of Equipment	Hrs Per Day	Days In Service	No. of Equipment	Hrs Per Day	Days In Service	No. of Equipment	Hrs Per Day	Days In Service	
Interconnection Between Moose Pipeline and Second Aqueduct																	
Air Track Drill Rig	161		8	15	8	8	30										0.00
Asphalt Broom	33		8	15	8	8	30										0.00
Asphalt Mix Truck	489		8	15	8	8	30										0.00
Asphalt Prime Truck	489		8	15	8	8	30										0.00
Auger Drill	161		8	15	8	8	30										0.00
Barge	100.1		8	15	8	8	30										0.00
Cement Grout Mixer	161		8	15	8	8	30										0.00
Chipper	161		8	15	8	8	30										2080.76
Compactor 815 Cat	240		8	15	8	8	30										0.00
Compactor Pneumatic	76		8	15	8	8	30										0.00
Compactor Sheepfoot	20		8	15	8	8	30	1									775.44
Compactor Smooth Drum	153		8	15	8	8	30										0.00
Compactor Vibratory	173		8	15	8	8	30										0.00
Compressor	37		8	15	8	8	30										956.38
Concrete Pump	23		8	15	8	8	30										0.00
Concrete Pump Truck	489		8	15	8	8	30	1									12639.67
Crane 35 ton	365		8	15	8	8	30	1									23586.30
Crane 75 ton	378		8	15	8	8	30										0.00
Dozer D5 Cat	130		8	15	8	8	30										0.00
Dozer D8 Cat	177		8	15	8	8	30										8006.42
Dump Truck 10 CY	518		8	15	8	8	30										40167.79
Dump Truck 12 CY	518		8	15	8	8	30										0.00
Dump Truck 20 CY	518		8	15	8	8	30										0.00
Dump Truck 25 CY	518		8	15	8	8	30										0.00
Dump Truck 35 CY	518		8	15	8	8	30										0.00
Dump Truck 50 ton	518		8	15	8	8	30										0.00
Electric Locomotive	100.1		8	15	8	8	30										0.00
Flatbed Truck	489		8	15	8	8	30										47398.77
Fork Loader	238		8	15	8	8	30										0.00
Fork Loader 966 Cat	238		8	15	8	8	30	1									23069.34
Fuel Truck	489		8	15	8	8	30										0.00
GROUT Pump	23		8	15	8	8	30										0.00
Jumbo	100.1		8	15	8	8	30										0.00
Loader 966 Cat	238		8	15	8	8	30										0.00
Loader 980 Cat	318		8	15	8	8	30										0.00
Loader 988 Cat	475		8	15	8	8	30										0.00
Mobile Crane	194		8	15	8	8	30										0.00
Motor Grader	180		8	15	8	8	30										0.00
Mucker	161		8	15	8	8	30										3489.48
Paver	99		8	15	8	8	30										0.00
Powder Truck	489		8	15	8	8	30										0.00
Pressure Testing Pump	74		8	15	8	8	30										0.00
Pump Portable & Gen Set	74		8	15	8	8	30										0.00
Pump Submersible	74		8	15	8	8	30										0.00
Seeder	161		8	15	8	8	30										0.00
Track Backhoe	157		8	15	8	8	30										2029.07
Tractor Logger	157		8	15	8	8	30										0.00
Tunnel Boring Machine	22		8	15	8	8	30										0.00
Ventilation Fan 20 HP	20		8	15	8	8	30										0.00
Ventilation Fan 200 HP	200		8	15	8	8	30										0.00
Vibratory Pneumatic Tamper	4		8	15	8	8	30										0.00
Water Truck	489		8	15	8	8	30										22119.43
Welder & Gen Set	22		8	15	8	8	30	1									1421.64
Winch	161		8	15	8	8	30										0.00
																	200044

Table A-10
Heavy Construction Equipment Diesel Usage Estimates
Moosa 50,000 AF Alternative

Energy Use Factor, gallons/hp-hr

0.05385

60

Equipment	FUEL	Mobilization			Cleaning			Excavation			Pipeline - Trenching			Pipeline - Tunneling			Tunneling			Access roads			Demobilization			Diesel Use gallons
		No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	
Relocate First Aqueduct																										
Air Track Drill Rig	DIESEL	161	8	0	8	480	2	8	135	8	120	8	105	8	105	8	8	8	105	2	8	45	1	8	15	24969.17
Asphalt Broom	DIESEL	33	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45	1	8	15	213.25
Asphalt Mix Truck	DIESEL	489	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45	3	8	15	9479.75
Asphalt Prime Truck	DIESEL	489	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45	1	8	15	3159.92
Auger Drill	DIESEL	161	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	0.00
Barge	DIESEL	100.1	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	0.00
Cement Grout Mixer	DIESEL	161	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	15605.73
Chipper	DIESEL	161	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45	1	8	15	36413.37
Compactor 815 Cat	DIESEL	240	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	0.00
Compactor Pneumatic	DIESEL	76	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	0.00
Compactor Sheepsfoot	DIESEL	20	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45	1	8	15	1292.40
Compactor Smooth Drum	DIESEL	153	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	0.00
Compactor Vibratory	DIESEL	173	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45	2	8	15	8943.41
Compressor	DIESEL	37	8	0	8	480	2	8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	11476.51
Concrete Pump	DIESEL	23	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	0.00
Concrete Pump Truck	DIESEL	489	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	0.00
Crane 35 ton	DIESEL	365	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	89627.94
Crane 75 ton	DIESEL	378	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	0.00
Dozer D5 Cat	DIESEL	130	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	0.00
Dozer D8 Cat	DIESEL	177	8	0	8	480	1	8	135	8	120	8	105	8	105	8	8	8	105		8	45	3	8	15	74345.31
Dump Truck 10 CY	DIESEL	518	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	0.00
Dump Truck 12 CY	DIESEL	518	8	0	8	480	4	8	135	8	120	8	105	8	105	8	8	8	105		8	45	3	8	15	719672.94
Dump Truck 20 CY	DIESEL	518	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	46862.42
Dump Truck 25 CY	DIESEL	518	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	0.00
Dump Truck 35 CY	DIESEL	518	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	0.00
Dump Truck 50 ton	DIESEL	518	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	0.00
Electric Locomotive	DIESEL	100.1	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45	1	8	15	13583.77
Flatbed Truck	DIESEL	489	8	0	8	480	1	8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	63198.36
Fork Loader	DIESEL	238	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	0.00
Fork Loader 966 Cat	DIESEL	238	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	0.00
Fuel Truck	DIESEL	489	8	0	8	480	1	8	135	8	120	8	105	8	105	8	8	8	105		8	45	1	8	15	214874.42
Grou Pump	DIESEL	23	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	0.00
Jumbo	DIESEL	100.1	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	0.00
Loader 966 Cat	DIESEL	238	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	0.00
Loader 980 Cat	DIESEL	318	8	0	8	480	2	8	135	8	120	8	105	8	105	8	8	8	105		8	45	3	8	15	187630.63
Loader 988 Cat	DIESEL	475	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	0.00
Mobile Crane	DIESEL	194	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	0.00
Motor Grader	DIESEL	180	8	0	8	480	1	8	135	8	120	8	105	8	105	8	8	8	105		8	45	1	8	15	10029.02
Mucker	DIESEL	161	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	52342.20
Paver	DIESEL	99	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	43696.04
Powder Truck	DIESEL	489	8	0	8	480	1	8	135	8	120	8	105	8	105	8	8	8	105		8	45	1	8	15	639.74
Pressure Testing Pump	DIESEL	74	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	37919.02
Pump Portable & Gen Set	DIESEL	74	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	7172.82
Pump Submersible	DIESEL	74	8	0	8	480	2	8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	0.00
Seeder	DIESEL	161	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	12432.89
Track Backhoe	DIESEL	157	8	0	8	480	1	8	135	8	120	8	105	8	105	8	8	8	105		8	45	1	8	15	1040.38
Tractor Logger	DIESEL	157	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	17247.08
Tunnel Boring Machine	DIESEL	22	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	32465.09
Ventilation Fan 20 HP	DIESEL	20	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	995.15
Ventilation Fan 200 HP	DIESEL	200	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	2972.52
Vibratory Pneumatic Tamper	DIESEL	4	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	27140.40
Water Truck	DIESEL	489	8	0	8	480	1	8	135	8	120	8	105	8	105	8	8	8	105		8	45	1	8	15	413.57
Welder & Gen Set	DIESEL	22	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8	15	236993.85
Winch	DIESEL	161	8	0	8	480		8	135	8	120	8	105	8	105	8	8	8	105		8	45		8		

Table A-10
Heavy Construction Equipment Diesel Usage Estimates
Moosa 50,000 AF Alternative

Energy Use Factor, gallons/hp-hr

0.05385

60

Equipment	FUEL	Mobilization			Clearing			Excavation			Building			Tanks			Pumps			Electrical Systems			Pipeline Installation			Demobilization			Diesel Use gallons
		No. of Equipment	Hrs Per Day	Days In Service	No. of Equipment	Hrs Per Day	Days In Service	No. of Equipment	Hrs Per Day	Days In Service	No. of Equipment	Hrs Per Day	Days In Service	No. of Equipment	Hrs Per Day	Days In Service	No. of Equipment	Hrs Per Day	Days In Service	No. of Equipment	Hrs Per Day	Days In Service	No. of Equipment	Hrs Per Day	Days In Service	No. of Equipment	Hrs Per Day	Days In Service	
Pump Station and Water Line for VCMWD North																													
Air Track Drill Rig	DIESEL	161	8	30		8	8	60	1	8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	10403.82
Asphalt Broom	DIESEL	33	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	2558.95
Asphalt Mix Truck	DIESEL	489	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	37919.02
Asphalt Prime Truck	DIESEL	489	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	37919.02
Auger Drill	DIESEL	161	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	0.00
Barge	DIESEL	100.1	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	0.00
Cement Grout Mixer	DIESEL	161	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	0.00
Chipper	DIESEL	161	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	4161.53
Compactor 815 Cat	DIESEL	240	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	0.00
Compactor Pneumatic	DIESEL	76	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	0.00
Compactor Sheepsfoot	DIESEL	20	8	30		8	8	60	1	8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	4911.12
Compactor Smooth Drum	DIESEL	153	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	0.00
Compactor Vibratory	DIESEL	173	8	30		8	8	60	1	8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	0.00
Compressor	DIESEL	37	8	30		8	8	60	1	8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	10041.95
Concrete Pump	DIESEL	23	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	0.00
Concrete Pump Truck	DIESEL	489	8	30		8	8	60		8	150	8	240	1	8	60	8	150	8	8	120	8	240	8	240	8	180	8	63198.36
Crane 35 ton	DIESEL	365	8	30		8	8	60		8	150	8	240	1	8	60	8	150	8	8	120	8	240	8	240	8	180	8	141517.80
Crane 75 ton	DIESEL	378	8	30		8	8	60		8	150	8	240	1	8	60	8	150	8	8	120	8	240	8	240	8	180	8	24426.36
Dozer D5 Cat	DIESEL	130	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	0.00
Dozer D8 Cat	DIESEL	177	8	30	1	8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	50326.06
Dump Truck 10 CY	DIESEL	518	8	30	5	8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	294563.81
Dump Truck 12 CY	DIESEL	518	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	0.00
Dump Truck 20 CY	DIESEL	518	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	0.00
Dump Truck 25 CY	DIESEL	518	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	0.00
Dump Truck 35 CY	DIESEL	518	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	0.00
Dump Truck 50 ton	DIESEL	100.1	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	0.00
Electric Locomotive	DIESEL	489	8	30		8	8	60		8	150	8	240	1	8	60	8	150	8	8	120	8	240	8	240	8	180	8	69518.20
Flatbed Truck	DIESEL	489	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	61518.24
Fork Loader	DIESEL	238	8	30	1	8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	0.00
Fork Loader 966 Cat	DIESEL	238	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	139036.39
Fuel Truck	DIESEL	489	8	30	1	8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	0.00
GROUT Pump	DIESEL	23	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	0.00
Jumbo	DIESEL	100.1	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	0.00
Loader 966 Cat	DIESEL	238	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	55366.42
Loader 980 Cat	DIESEL	318	8	30		8	8	60	2	8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	0.00
Loader 988 Cat	DIESEL	475	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	0.00
Mobile Crane	DIESEL	194	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	22565.30
Motor Grader	DIESEL	180	8	30	1	8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	32568.48
Mucker	DIESEL	161	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	0.00
Paver	DIESEL	99	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	7676.86
Powder Truck	DIESEL	489	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	31599.18
Pressure Testing Pump	DIESEL	74	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	7651.01
Pump Portable & Gen Set	DIESEL	74	8	30		8	8	60	2	8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	9563.76
Pump Submersible	DIESEL	74	8	30		8	8	60	2	8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	9563.76
Seeder	DIESEL	161	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	12484.58
Track Backhoe	DIESEL	157	8	30		8	8	60	2	8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	36523.22
Tractor Logger	DIESEL	157	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	0.00
Tunnel Boring Machine	DIESEL	22	8	30		8	8	60		8	150	8	240		8	60	8	150	8	8	120	8	240	8	240	8	180	8	0.00
Ventilation Fan 20 HP	DIESEL	20	8	30		8	8	60		8																			

Table A-10
Heavy Construction Equipment Diesel Usage Estimates
Moosa 50,000 AF Alternative

Equipment	FUEL HP	Mobilization			Clearing			Remove Old Lines			Install electric Lines			Excavation			Demobilization			Diesel Use gallons
		No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	
Relocated Public Roads and Electrical Systems																				
Air Track Drill Rig	161		8	30		8	30		8	30		8	240		1	8	75	8	60	5201.91
Asphalt Broom	33		8	30		8	30		8	30		8	240			8	75	8	60	852.98
Asphalt Mix Truck	489		8	30		8	30		8	30		8	240			8	75	8	60	12639.67
Asphalt Prime Truck	489		8	30		8	30		8	30		8	240			8	75	8	60	12639.67
Auger Drill	161		8	30		8	30		8	30	1	8	240			8	75	8	60	16646.11
Barge	100.1		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Cement Grout Mixer	161		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Chipper	161		8	30		8	30	2	8	30		8	240			8	75	8	60	4161.53
Compactor 815 Cat	240		8	30		8	30		8	30	1	8	240			8	75	8	60	13957.92
Compactor Pneumatic	76		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Compactor Sheepfoot	20		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Compactor Smooth Drum	153		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Compactor Vibratory	173		8	30		8	30		8	30	1	8	240			8	75	8	60	0.00
Compressor	37		8	30		8	30		8	30		8	240			8	75	8	60	1195.47
Concrete Pump	23		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Concrete Pump Truck	489		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Crane 35 ton	365		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Crane 75 ton	378		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Dozer D5 Cat	130		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Dozer D8 Cat	177		1	30		8	30		8	30	1	8	240			8	75	8	60	0.00
Dump Truck 10 CY	518		8	30		8	30		8	30		8	240			8	75	8	60	37744.54
Dump Truck 12 CY	518		8	30		8	30		8	30		8	240			8	75	8	60	13389.26
Dump Truck 20 CY	518		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Dump Truck 25 CY	518		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Dump Truck 35 CY	518		8	30		8	30		8	30	4	8	240			8	75	8	60	0.00
Dump Truck 50 ton	518		8	30		8	30		8	30		8	240			8	75	8	60	66946.32
Electric Locomotive	100.1		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Flatbed Truck	489		8	30		8	30		8	30	1	8	240			8	75	8	60	0.00
Fork Loader	238		8	30		8	30		8	30		8	240			8	75	8	60	12639.67
Fork Loader 966 Cat	238		1	30		8	30		8	30		8	240			8	75	8	60	3075.91
Fuel Truck	489		8	30		8	30		8	30		8	240		1	8	75	8	60	0.00
Grout Pump	23		8	30		8	30		8	30		8	240			8	75	8	60	22119.43
Jumbo	100.1		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Loader 966 Cat	238		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Loader 980 Cat	318		8	30		8	30		8	30	1	8	240			8	75	8	60	13841.60
Loader 988 Cat	475		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Mobile Crane	194		8	30		8	30		8	30		8	240			8	75	8	60	22565.30
Motor Grader	180		8	30		8	30		8	30	1	8	240			8	75	8	60	12794.76
Mucker	161		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Paver	99		8	30		8	30		8	30		8	240			8	75	8	60	2558.95
Powder Truck	489		8	30		8	30		8	30		8	240		1	8	75	8	60	15799.59
Pressure Testing Pump	74		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Pump Portable & Gen Set	74		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Pump Submersible	74		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Seeder	161		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Track Backhoe	157		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Tractor Logger	157		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Tunnel Boring Machine	22		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Ventilation Fan 20 HP	20		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Ventilation Fan 200 HP	200		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Vibratory Pneumatic Tamper	4		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Water Truck	489		1	30		8	30		8	30		8	240		1	8	75	8	60	135876.47
Welder & Gen Set	22		8	30		8	30		8	30		8	240			8	75	8	60	0.00
Winch	161		8	30		8	30		8	30	2	8	240			8	75	8	60	4161.53
																				430809
																				20579015

Energy Use Factor, gallons/hp-hr
0.05385 60

Table A-11
Moosa 50,000 AF Alternative
Worker Fuel Usage

2010 Construction Worker Estimates and Emission Calculations

Construction Phase	Vehicle Class	No. of Workers Per Construction Phase	Speed (mph)	VMT (mi/vehicle-day)	Miles per gallon	Fuel usage, gallons/day	Days	Fuel usage, gallons/year
2.1 Moosa Dam								
Mobilization	Light-duty truck, catalyst	9	27	14	24.044	141.49	30	4244.72
Earthwork	Light-duty truck, catalyst	13	27	14	24.044	204.38	150	30656.30
Clearing/Grubbing	Light-duty truck, catalyst	21	27	14	24.044	330.14	480	158469.47
Foundation Treatment	Light-duty truck, catalyst	70	27	14	24.044	1100.48	675	742825.65
Outlet Works	Light-duty truck, catalyst	18	27	14	24.044	282.98	150	42447.18
Spillway	Light-duty truck, catalyst	19	27	14	24.044	298.70	789	235676.18
Quarry	Light-duty truck, catalyst	53	27	14	24.044	833.22	210	174976.71
Embankment	Light-duty truck, catalyst	29	27	14	24.044	455.91	720	328258.19
Demobilization	Light-duty truck, catalyst	13	27	14	24.044	204.38	60	12262.52
Supervision/Inspection	Light-duty truck, catalyst	15	27	14	24.044	235.82	365	86073.45
2.2 Drain/Fill Pipeline from Moosa Dam to 2nd Aqueduct								
Mobilization	Light-duty truck, catalyst	10	27	14	24.044	157.21	45	7074.53
Clearing	Light-duty truck, catalyst	27	27	14	24.044	424.47	75	31835.39
Excavation	Light-duty truck, catalyst	14	27	14	24.044	220.10	480	105646.32
Pipe Install (trench)	Light-duty truck, catalyst	50	27	14	24.044	786.06	570	448053.57
Access Roads	Light-duty truck, catalyst	5	27	14	24.044	78.61	15	1179.09
Demobilization	Light-duty truck, catalyst	7	27	14	24.044	110.05	75	8253.62
Supervision/Inspection	Light-duty truck, catalyst	14	27	14	24.044	220.10	365	80335.22
2.3 Pump Station at Moosa Creek								
Mobilization	Light-duty truck, catalyst	10	27	14	24.044	157.21	15	2358.18
Excavation	Light-duty truck, catalyst	18	27	14	24.044	282.98	210	59426.05
Building	Light-duty truck, catalyst	18	27	14	24.044	282.98	450	127341.54
Pumps	Light-duty truck, catalyst	41	27	14	24.044	644.57	270	174033.44
Electric Systems	Light-duty truck, catalyst	6	27	14	24.044	94.33	240	22638.50
Electric Power	Light-duty truck, catalyst	10	27	14	24.044	157.21	60	9432.71
Demobilization	Light-duty truck, catalyst	8	27	14	24.044	125.77	210	26411.58
Supervision/Inspection	Light-duty truck, catalyst	9	27	14	24.044	141.49	365	51644.07
2.4 Interconnection between Moosa Pipeline and Second Aqueduct								
Mobilization	Light-duty truck, catalyst	10	27	14	24.044	157.21	15	2358.18
Excavation	Light-duty truck, catalyst	8	27	14	24.044	125.77	30	3773.08
Vault Construction	Light-duty truck, catalyst	12	27	14	24.044	188.65	60	11319.25
Install Valves/Pipes	Light-duty truck, catalyst	11	27	14	24.044	172.93	90	15563.97
Demobilization	Light-duty truck, catalyst	10	27	14	24.044	157.21	60	9432.71
Supervision/Inspection	Light-duty truck, catalyst	4	27	14	24.044	62.88	90	5659.62
2.5 Relocate 1st Aqueduct								
Mobilization	Light-duty truck, catalyst	10	27	14	24.044	157.21	45	7074.53
Clearing	Light-duty truck, catalyst	27	27	14	24.044	424.47	15	6367.08
Excavation	Light-duty truck, catalyst	13	27	14	24.044	204.38	135	27590.67
Pipe Install (trench)	Light-duty truck, catalyst	49	27	14	24.044	770.34	120	92440.53
Pipe Install (tunnel)	Light-duty truck, catalyst	22	27	14	24.044	345.87	105	36315.92
Tunneling	Light-duty truck, catalyst	20	27	14	24.044	314.42	441	138660.79

Table A-11
Moosa 50,000 AF Alternative
Worker Fuel Usage

Construction Phase	Vehicle Class	No. of Workers Per Construction Phase	Speed (mph)	VMT (mi/vehicle-day)	Miles per gallon	Fuel usage, gallons/day	Days	Fuel usage, gallons/year
Access Roads	Light-duty truck, catalyst	20	27	14	24.044	314.42	45	14149.06
Demobilization	Light-duty truck, catalyst	7	27	14	24.044	110.05	15	1650.72
Supervision/Inspection	Light-duty truck, catalyst	14	27	14	24.044	220.10	135	29713.03
2.6 Pump Station and Water Line VCMD (North)								
Mobilization	Light-duty truck, catalyst	10	27	14	24.044	157.21	15	2358.18
Clearing	Light-duty truck, catalyst	10	27	14	24.044	157.21	60	9432.71
Excavation	Light-duty truck, catalyst	20	27	14	24.044	314.42	150	47163.53
Building	Light-duty truck, catalyst	14	27	14	24.044	220.10	240	52823.16
Tanks	Light-duty truck, catalyst	6	27	14	24.044	94.33	60	5659.62
Pumps	Light-duty truck, catalyst	41	27	14	24.044	644.57	150	96685.24
Electric Systems	Light-duty truck, catalyst	8	27	14	24.044	125.77	120	15092.33
Install Pipeline	Light-duty truck, catalyst	34	27	14	24.044	534.52	240	128284.81
Demobilization	Light-duty truck, catalyst	9	27	14	24.044	141.49	180	25468.31
Supervision/Inspection	Light-duty truck, catalyst	10	27	14	24.044	157.21	240	37730.83
2.7 Pump Station and Water Line VCMD (South)								
Mobilization	Light-duty truck, catalyst	10	27	14	24.044	157.21	15	2358.18
Clearing	Light-duty truck, catalyst	17	27	14	24.044	267.26	60	16035.60
Excavation	Light-duty truck, catalyst	14	27	14	24.044	220.10	120	26411.58
Building	Light-duty truck, catalyst	15	27	14	24.044	235.82	150	35372.65
Tanks	Light-duty truck, catalyst	6	27	14	24.044	94.33	60	5659.62
Pumps	Light-duty truck, catalyst	41	27	14	24.044	644.57	90	58011.15
Electric Systems	Light-duty truck, catalyst	8	27	14	24.044	125.77	90	11319.25
Install Pipeline	Light-duty truck, catalyst	15	27	14	24.044	235.82	60	14149.06
Demobilization	Light-duty truck, catalyst	7	27	14	24.044	110.05	150	16507.24
Supervision/Inspection	Light-duty truck, catalyst	10	27	14	24.044	157.21	150	23581.77
2.8 Relocated Public Rds and Electrical Systems								
Mobilization	Light-duty truck, catalyst	9	27	14	24.044	141.49	30	4244.72
Clearing	Light-duty truck, catalyst	11	27	14	24.044	172.93	30	5187.99
Remove Existing Electric Lines	Light-duty truck, catalyst	9	27	14	24.044	141.49	30	4244.72
Install Electric Lines	Light-duty truck, catalyst	16	27	14	24.044	251.54	240	60369.32
Excavation	Light-duty truck, catalyst	20	27	14	24.044	314.42	75	23581.77
Demobilization	Light-duty truck, catalyst	13	27	14	24.044	204.38	60	12262.52
Supervision/Inspection	Light-duty truck, catalyst	10	27	14	24.044	157.21	240	37730.83
								4151350

Assuming workers would travel from Escondido area to Moosa Dam, average mileage is 7 miles each way.

Assume startup after 8 hours

Assume 45 minutes run time total

2010 Emission Factors from EMFAC2002, average temp 55F

Table A-12
Moosa 50,000 AF Alternative
Construction Truck Fuel Usage

Construction Phase	Vehicle Class	No. of Trucks Per Construction Phase	Speed (mph)	VMT (mi/vehicle-day)	Miles per gallon	Fuel usage, gallons/day	Days	Fuel usage, gallons/yr
2.1 Moosa Dam								
Mobilization	Heavy-duty truck	1	27	10	4.646	58.11	30	1743.44
Earthwork	Heavy-duty truck	0	27	10	4.646	0.00	150	0.00
Clearing/Grubbing	Heavy-duty truck	9	27	10	4.646	523.03	480	251054.67
Foundation Treatment	Heavy-duty truck	2	27	10	4.646	116.23	675	78454.58
Outlet Works	Heavy-duty truck	3.5	27	10	4.646	203.40	150	30510.12
Spillway	Heavy-duty truck	2.5	27	10	4.646	145.29	789	114630.87
Quarry	Heavy-duty truck	0.5	27	10	4.646	29.06	210	6102.02
Embankment	Heavy-duty truck	103	27	10	4.646	5985.79	720	4309771.85
Demobilization	Heavy-duty truck	1	27	10	4.646	58.11	60	3486.87
Supervision/Inspection	Heavy-duty truck	0	27	10	4.646	0.00	365	0.00
2.2 Drain/Fill Pipeline from Moosa Dam to 2nd Aqueduct								
Mobilization	Heavy-duty truck	1	27	10	4.646	58.11	45	2615.15
Clearing	Heavy-duty truck	1	27	10	4.646	58.11	75	4358.59
Excavation	Heavy-duty truck	0	27	10	4.646	0.00	480	0.00
Pipe Install (trench)	Heavy-duty truck	10	27	10	4.646	581.15	570	331252.69
Access Roads	Heavy-duty truck	0	27	10	4.646	0.00	15	0.00
Demobilization	Heavy-duty truck	1	27	10	4.646	58.11	75	4358.59
Supervision/Inspection	Heavy-duty truck	0	27	10	4.646	0.00	365	0.00
2.3 Pump Station at Moosa Creek								
Mobilization	Heavy-duty truck	0.5	27	10	4.646	29.06	15	435.86
Excavation	Heavy-duty truck	1	27	10	4.646	58.11	210	12204.05
Building	Heavy-duty truck	3	27	10	4.646	174.34	450	78454.58
Pumps	Heavy-duty truck	1	27	10	4.646	58.11	270	15690.92
Electric Systems	Heavy-duty truck	1	27	10	4.646	58.11	240	13947.48
Electric Power	Heavy-duty truck	0	27	10	4.646	0.00	60	0.00
Demobilization	Heavy-duty truck	1	27	10	4.646	58.11	210	12204.05
Supervision/Inspection	Heavy-duty truck	0	27	10	4.646	0.00	365	0.00
2.4 Interconnection between Moosa Pipeline and Second								
Mobilization	Heavy-duty truck	0.5	27	10	4.646	29.06	15	435.86
Excavation	Heavy-duty truck	1	27	10	4.646	58.11	30	1743.44
Vault Construction	Heavy-duty truck	0	27	10	4.646	0.00	60	0.00
Install Valves/Pipes	Heavy-duty truck	0.25	27	10	4.646	14.53	90	1307.58
Demobilization	Heavy-duty truck	0.5	27	10	4.646	29.06	60	1743.44
Supervision/Inspection	Heavy-duty truck	0	27	10	4.646	0.00	90	0.00

Table A-12
Moosa 50,000 AF Alternative
Construction Truck Fuel Usage

Construction Phase	Vehicle Class	No. of Trucks Per Construction Phase	Speed (mph)	VMT (mi/vehicle-day)	Miles per gallon	Fuel usage, gallons/day	Days	Fuel usage, gallons/yr
2.5 Relocate 1st Aqueduct								
Mobilization	Heavy-duty truck	1	27	10	4.646	58.11	45	2615.15
Clearing	Heavy-duty truck	0	27	10	4.646	0.00	15	0.00
Excavation	Heavy-duty truck	1	27	10	4.646	58.11	135	7845.46
Pipe Install (trench)	Heavy-duty truck	10	27	10	4.646	581.15	120	69737.41
Pipe Install (tunnel)	Heavy-duty truck	10	27	10	4.646	581.15	105	61020.23
Tunneling	Heavy-duty truck	0	27	10	4.646	0.00	441	0.00
Access Roads	Heavy-duty truck	0	27	10	4.646	0.00	45	0.00
Demobilization	Heavy-duty truck	0	27	10	4.646	0.00	15	0.00
Supervision/Inspection	Heavy-duty truck	0	27	10	4.646	0.00	135	0.00
2.6 Pump Station and Water Line VCMD (North)								
Mobilization	Heavy-duty truck	0.5	27	10	4.646	29.06	15	435.86
Clearing	Heavy-duty truck	0	27	10	4.646	0.00	60	0.00
Excavation	Heavy-duty truck	0	27	10	4.646	0.00	150	0.00
Building	Heavy-duty truck	2	27	10	4.646	116.23	240	27894.96
Tanks	Heavy-duty truck	1	27	10	4.646	58.11	60	3486.87
Pumps	Heavy-duty truck	1	27	10	4.646	58.11	150	8717.18
Electric Systems	Heavy-duty truck	1	27	10	4.646	58.11	120	6973.74
Install Pipeline	Heavy-duty truck	0	27	10	4.646	0.00	240	0.00
Demobilization	Heavy-duty truck	1	27	10	4.646	58.11	180	10460.61
Supervision/Inspection	Heavy-duty truck	0	27	10	4.646	0.00	240	0.00
2.7 Pump Station and Water Line VCMD (South)								
Mobilization	Heavy-duty truck	0.5	27	10	4.646	29.06	15	435.86
Clearing	Heavy-duty truck	0	27	10	4.646	0.00	60	0.00
Excavation	Heavy-duty truck	0	27	10	4.646	0.00	120	0.00
Building	Heavy-duty truck	2	27	10	4.646	116.23	150	17434.35
Tanks	Heavy-duty truck	1	27	10	4.646	58.11	60	3486.87
Pumps	Heavy-duty truck	1	27	10	4.646	58.11	90	5230.31
Electric Systems	Heavy-duty truck	1	27	10	4.646	58.11	90	5230.31
Install Pipeline	Heavy-duty truck	0	27	10	4.646	0.00	60	0.00
Demobilization	Heavy-duty truck	1	27	10	4.646	58.11	150	8717.18
Supervision/Inspection	Heavy-duty truck	0	27	10	4.646	0.00	150	0.00
2.8 Relocated Public Rds and Electrical Systems								
Mobilization	Heavy-duty truck	0.5	27	10	4.646	29.06	30	871.72
Clearing	Heavy-duty truck	1	27	10	4.646	58.11	30	1743.44
Remove Existing Electric Lines	Heavy-duty truck	0	27	10	4.646	0.00	30	0.00
Install Electric Lines	Heavy-duty truck	0.5	27	10	4.646	29.06	240	6973.74
Excavation	Heavy-duty truck	1	27	10	4.646	58.11	75	4358.59
Demobilization	Heavy-duty truck	5	27	10	4.646	290.57	60	17434.35
Supervision/Inspection	Heavy-duty truck	0	27	10	4.646	0.00	240	0.00
								5547611

Assuming trucks would travel up to 5 miles one way for aggregate and RCC materials, assuming materials provided from Emission factors from 2010 EMFAC2002, 27 mph, Heavy Duty Diesel truck (HDD)

Table A-13
Heavy Construction Equipment Diesel Usage Estimates
San Vicente 50,000 AF Alternative
Onsite Quarry

Equipment	FUEL HP	Load Factor	Mobilization			RCC Test Section			Foundation Treatment			Dam Crest Demo			Agg. Supply			RCC Placement			Dam Seepage Control			Outlet Facilities			Bypass Pipeline			Clearing-Grubbing			Demobilization					
			No of Equip	Hrs Per Day	Days In Service	No of Equip	Hrs Per Day	Days In Service	No of Equip	Hrs Per Day	Days In Service	No of Equip	Hrs Per Day	Days In Service	No of Equip	Hrs Per Day	Days In Service	No of Equip	Hrs Per Day	Days In Service	No of Equip	Hrs Per Day	Days In Service	No of Equip	Hrs Per Day	Days In Service	No of Equip	Hrs Per Day	Days In Service	No of Equip	Hrs Per Day	Days In Service	No of Equip	Hrs Per Day	Days In Service	Diesel Use gallons		
Cranes																																						
100 T Truck Crane	DIESEL	194	43	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	154196.24		
Grove Crane 15T	DIESEL	194	43	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	115333.78		
Plant Erection Cranes	DIESEL	194	43	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	162971.64		
Tower Crane	DIESEL	194	43	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	55159.63		
Bull Dozers/Wheel Loaders																																						
966G Wheel Loaders	DIESEL	238	46.5	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	282983.90		
988G Wheel Loaders	DIESEL	475	46.5	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	208722.60		
D7G Dozers(Track type)	DIESEL	200	59	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	277866.00		
D4 Dozer	DIESEL	105	59	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	146558.16		
Compactors																																						
CS-683E Vib Compactors	DIESEL	173	43	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	34655.71		
Double Drum Roller 224D	DIESEL	31	57.5	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	13221.25		
Double Drum Roller 434C	DIESEL	66	57.5	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	28148.47		
Smooth Drum Roller 583C	DIESEL	153	57.5	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	65253.28		
Graders/Scrapers/Excavators																																						
Backhoe w/Breaker Attachment	DIESEL	79	46.5	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	90868.64		
Backhoe w/GEVR Attachment	DIESEL	79	46.5	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	33692.87		
Backhoe w/Compactor Attachment	DIESEL	79	46.5	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	33692.87		
Backhoe w/Joint Machine Atch.	DIESEL	79	46.5	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	33692.87		
Excavator Cat 312	DIESEL	84	58	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	107475.98		
Motor Grader 163H Global	DIESEL	180	57.5	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	63973.80		
Various Trucks																																						
769D Dump Trucks	DIESEL	518	41	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	1194991.81
Blasting Powder Truck	DIESEL	489	41	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	214874.42
Cat IT28G w/Broom Attachment	DIESEL	125	41	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	64620.00
Concrete pump	DIESEL	23	74	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	17240.62
End Dump Trucks	DIESEL	489	41	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	284392.62
Flat Bed	DIESEL	489	41	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	571945.16
Groat Truck	DIESEL	489	41	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	199074.83
Mixer Truck	DIESEL	489	41	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	821578.88
Pressure Washer Truck	DIESEL	489	41	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	549825.73
Vacuum Truck	DIESEL	489	41	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	180115.33
Plant/Conveyor Equipment																																						
Aggregate Crushing Plant	DIESEL	161	62	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	0.00
Groat Mixing Plant	DIESEL	161	62	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	24969.17
Conventional Concrete Plant	DIESEL	161	62	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	18726.88
Ice Plant	DIESEL	161	62	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	107159.35
RCC Batch Plant	DIESEL	161	62	8	60	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	210	8	60	32251.84
Var Conveyors type /size	DIESEL	161	62	8	60																																	

Table A-14
 Heavy Construction Equipment Diesel Usage Estimates
 San Vicente 50,000 AF Alternative
 Onsite Quarry

2010 Construction Worker Estimates
 and Emission Calculations

Construction Phase	No. of Trucks Per Construction Phase	Speed (mph)	VMT (mi/vehicle-day)	Miles per gallon	Fuel usage, gallons/day	Months	Fuel usage, gallons/yr
Mobilization	12	27	14	24.044	188.65	60	11319.25
RCC Test Section	46	27	14	24.044	723.17	60	43390.45
Foundation Treatment	29	27	14	24.044	455.91	270	123096.82
Dam Crest Demo Surface Prep	26	27	14	24.044	408.75	210	85837.63
Aggregate Supply	40	27	14	24.044	628.85	360	226384.96
RCC Placement Craft	158	27	14	24.044	2483.95	465	1155034.94
RCC Placement Mechanic	2	27	14	24.044	31.44	465	14620.70
RCC Placement Batch Plant & Setup	12	27	14	24.044	188.65	465	87724.17
Spillway and Weir Crew	20	27	14	24.044	314.42	120	37730.83
Outlet Facilities Front End	20	27	14	24.044	314.42	660	207519.55
Outlet Facilities Craft	21	27	14	24.044	330.14	660	217895.52
Outlet Facilities Tunnel Men 60"	16	27	14	24.044	251.54	660	166015.64
Outlet Facilities Tunnel Men 120"	16	27	14	24.044	251.54	660	166015.64
Remove Rock Dam	15	27	14	24.044	235.82	120	28298.12
Dam Seepage Control	17	27	14	24.044	267.26	120	32071.20
Bypass Pipeline Diversion Structure	34	27	14	24.044	534.52	360	192427.22
Clearing/Grubbing	21	27	14	24.044	330.14	150	49521.71
Demobilization/Reclamation	12	27	14	24.044	188.65	60	11319.25
Supervision/Inspection	27	27	14	24.044	424.47	365	154932.21

Assuming workers would travel from EI

Assume startup after 8 hours

Assume 45 minutes run time total

2010 Emission Factors from

8552.32

3011156

Table A-16
Heavy Construction Equipment Diesel Usage Estimates
San Vicente 50,000 AF Alternative
Offsite Trucked

CECOR Construction Emissions
Calculation: Off-Road equipment
YEAR: 2010

Equipment	FUEL	HP	Load Factor	Mobilization		RCC Test Section		Foundation Treatment		Dam Crest Demo Surface		Agg. Supply		RCC Placement		Dam Seepage Control		Outlet Facilities		Bypass Pipeline		Clearing-Grubbing		Demobilization		Diesel Use gallons
				No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	Hrs Per Day	Days In Service	No of Equipment	
Cranes																										
100 T Truck Crane	DIESEL	194	43	8	60	8	210	8	210	8	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	154196.24
Grove Crane 15T	DIESEL	194	43	8	60	8	210	8	210	8	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	115333.78
Plant Erection Cranes	DIESEL	194	43	8	60	8	210	8	210	8	210	1	270	8	465	8	120	8	660	8	360	8	150	8	60	155449.87
Tower Crane	DIESEL	194	43	8	60	8	210	8	210	8	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	55159.63
Bull Dozers/Wheel Loaders																										
966G Wheel Loaders	DIESEL	238	46.5	8	60	8	210	8	210	2	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	264528.43
988G Wheel Loaders	DIESEL	475	46.5	8	60	8	210	8	210	1	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	190305.90
D7G Dozers(Track type)	DIESEL	200	59	8	60	8	210	8	210	2	210	2	270	8	465	8	120	8	660	8	360	8	150	8	60	262357.20
D4 Dozer	DIESEL	105	59	8	60	8	210	8	210	1	210	1	270	8	465	8	120	8	660	8	360	8	150	8	60	142487.10
Compactors																										
CS-683E Vib Compactors	DIESEL	173	43	8	60	8	210	8	210	8	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	34655.71
Double Drum Roller 224D	DIESEL	31	57.5	8	60	8	210	8	210	2	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	13221.25
Double Drum Roller 434C	DIESEL	66	57.5	8	60	8	210	8	210	2	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	28148.47
Smooth Drum Roller 583C	DIESEL	153	57.5	8	60	8	210	8	210	2	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	65253.28
Graders/Scrapers/Excavators																										
Backhoe w/Breaker Attachment	DIESEL	79	46.5	8	60	8	210	8	210	3	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	0.00
Backhoe w/GEVR Attachment	DIESEL	79	46.5	8	60	8	210	8	210	8	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	90868.64
	DIESEL	79	46.5	8	60	8	210	8	210	2	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	33692.87
Backhoe w/Compactor Attachment	DIESEL	79	46.5	8	60	8	210	8	210	2	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	33692.87
Backhoe w/Joint Machine Atch.	DIESEL	79	46.5	8	60	8	210	8	210	2	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	33692.87
Excavator Cat 312	DIESEL	84	58	8	60	8	210	8	210	2	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	107475.98
Motor Grader 163H Global	DIESEL	180	57.5	8	60	8	210	8	210	1	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	63973.80
Various Trucks																										
769D Dump Trucks	DIESEL	518	41	8	60	8	210	8	210	1	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	1194991.81
Blasting Powder Truck	DIESEL	489	41	8	60	8	210	8	210	8	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	214874.42
Cat IT28G w/Broom Attachment	DIESEL	125	41	8	60	8	210	8	210	1	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	64620.00
Concrete pump	DIESEL	23	74	8	60	8	210	8	210	8	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	17240.62
End Dump Trucks	DIESEL	489	41	8	60	8	210	8	210	5	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	284392.62
Flat Bed	DIESEL	489	41	8	60	8	210	8	210	1	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	552985.65
Grout Truck	DIESEL	489	41	8	60	8	210	8	210	2	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	199074.83
Mixer Truck	DIESEL	489	41	8	60	8	210	8	210	1	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	821578.68
Pressure Washer Truck	DIESEL	489	41	8	60	8	210	8	210	4	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	530866.22
Vacuum Truck	DIESEL	489	41	8	60	8	210	8	210	1	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	180115.33
Plant/Conveyor Equipment																										
Aggregate Crushing Plant	DIESEL	161	62	8	60	8	210	8	210	8	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	0.00
Grout Mixing Plant	DIESEL	161	62	8	60	8	210	8	210	8	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	0.00
RCC Batch Plant	DIESEL	161	62	8	60	8	210	8	210	1	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	18726.88
Conventional Concrete Plant	DIESEL	161	62	8	60	8	210	8	210	2	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	76988.27
Ice Plant	DIESEL	161	62	8	60	8	210	8	210	1	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	107159.35
RCC Batch Plant	DIESEL	161	62	8	60	8	210	8	210	2	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	32251.84
Var Conveyors type /size	DIESEL	161	62	8	60	8	210	8	210	6	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	76988.27
Miscellaneous Equipment																										
Brush Chipper	DIESEL	161	62	8	60	8	210	8	210	8	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	212237.93
Compressors	DIESEL	37	48	8	60	8	210	8	210	2	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	45776.81
Dewatering Pumps	DIESEL	23	74	8	60	8	210	8	210	2	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	64555.38
Drills Various sizes and types	DIESEL	161	62	8	60	8	210	8	210	3	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	13079.09
Grout Pump	DIESEL	23	74	8	60	8	210	8	210	2	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	472333.43
Misc Grouting Equipment	DIESEL	161	62	8	60	8	210	8	210	16	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	8768.93
Misc Mixing Equipment	DIESEL	161	62	8	60	8	210	8	210	2	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	68665.21
Power Jet w/Compressor	DIESEL	37	48	8	60	8	210	8	210	2	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	72826.74
Road Header	DIESEL	22	74	8	60	8	210	8	210	3	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	61447.16
Saw Cutting Machines	DIESEL	56	73	8	60	8	210	8	210	4	210	8	270	8	465	8	120	8	660	8	360	8	150	8	60	9667.15
Various Saws	DIESEL	56	73	8	60	8	210	8	210	8	210	8														

Table A-17
 Heavy Construction Equipment Diesel Usage Estimates
 San Vicente 50,000 AF Alternative
 Offsite Trucked

2010 Construction Worker Estimates and
 Emission Calculations

VMT	No. of Workers Per Construction Phase	Speed (mph)	VMT (mi/vehicle-day)
Mobilization	12	27	14
RCC Test Section	46	27	14
Foundation Treatment	29	27	14
Dam Crest Demo Surface Prep	26	27	14
Aggregate Supply	40	27	14
RCC Placement Craft	158	27	14
RCC Placement Mechanic	2	27	14
RCC Placement Batch Plant & Setup	12	27	14
Spillway and Weir Crew	20	27	14
Outlet Facilities Front End	20	27	14
Outlet Facilities Craft	21	27	14
Outlet Facilities Tunnel Men 60"	16	27	14
Outlet Facilities Tunnel Men 120"	16	27	14
Remove Rock Dam	15	27	14
Dam Seepage Control	17	27	14
Bypass Pipeline Diversion Structure	34	27	14
Clearing/Grubbing	21	27	14
Demobilization/Reclamation	12	27	14
Supervision/Inspection	27	27	14

Miles per gallon	Fuel usage, gallons/day	Months	Fuel usage, gallons/year
24,044	188.65	60	11319.25
24,044	723.17	60	43390.45
24,044	455.91	270	123096.82
24,044	408.75	210	85837.63
24,044	628.85	360	226384.96
24,044	2483.95	465	1155034.94
24,044	31.44	465	14620.70
24,044	188.65	465	87724.17
24,044	314.42	120	37730.83
24,044	314.42	660	207519.55
24,044	330.14	660	217895.52
24,044	251.54	660	166015.64
24,044	251.54	660	166015.64
24,044	235.82	120	28298.12
24,044	267.26	120	32071.20
24,044	534.52	360	192427.22
24,044	330.14	150	49521.71
24,044	188.65	60	11319.25
24,044	424.47	365	154932.21

Assuming workers would travel from El Cajon area to San Vicente Dam, average mileage is 7 miles each way.

Assume startup after 8 hours

Assume 45 minutes run time total

2010 Emission Factors from EMFAC2002, average temp 55F

8552.32

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