

APPENDIX H. AIR QUALITY ANALYSIS

H.1 CONFORMITY DETERMINATION

Clean Air Act Requirements

Section 176(c)(1) of the Clean Air Act requires that federal actions conform to applicable state implementation plans for achieving and maintaining the National Ambient Air Quality Standards for criteria air pollutants (criteria air pollutants are sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter). In 1993, the U.S. Environmental Protection Agency (EPA) promulgated a rule entitled “Determining Conformity of General Federal Actions to State or Federal Implementation Plans” (58 Fed. Reg. 63214 (1993)), codified at 40 CFR Parts 6, 51, and 93. The rule is intended to ensure that criteria air pollutant emissions and their precursors (precursors are volatile organic compounds and nitrogen oxide) are specifically identified and accounted for in the attainment or maintenance demonstration contained in a state implementation plan. For there to be a conformity, a federal action must not contribute to new violations of air quality standards, increase the frequency or severity of existing violations, or delay timely attainment of standards in the area of concern.

The conformity rule applies to proposed federal actions that would cause emissions of criteria air pollutants above certain levels to occur in locations designated as nonattainment or maintenance areas for the emitted pollutants. Under the rule, an agency must engage in a conformity review process and, depending on the outcome of that review, conduct a conformity determination.

In a conformity review, the federal agency must (1) determine whether the proposed action would cause emissions of criteria pollutants or their precursors, (2) determine whether the emissions would occur in a nonattainment or maintenance area, (3) determine whether the proposed action is exempt from the conformity requirements, and (4) estimate the total emissions of the pollutants of concern from the proposed action and compare the estimates to the threshold emission rates and to the nonattainment or maintenance area’s emissions inventory for each pollutant of concern.

Table H-1 lists the emission threshold emission rates. It should be noted that the Energy Technology Engineering Center (ETEC) is located in Ventura County, which is a severe nonattainment area for ozone. Los Angeles County, which is adjacent to Ventura County, is an extreme nonattainment area for ozone and a serious nonattainment area for carbon monoxide and particulate matter.

H.2 AIR POLLUTANT EMISSIONS

DOE analyzed the volume of air pollutants that could be released as a result of soil excavation and waste transportation activities under Alternatives 1 and 2.

Soil Excavation

Table H-2 summarizes the types, numbers, operating hours, and total horsepower hours (hp-hr) for heavy equipment expected to be used in ETEC soil excavation and demolition activities under Alternatives 1 and 2 (a horsepower-hour is 1 horsepower produced continuously for 1 hour). A comparative estimate of exhaust air pollution from this equipment was made using emission factors reported in the EPA report titled *Exhaust Emission Factors for Nonroad Engine Modeling- Compression Ignition* (EPA 1998). This report describes and documents exhaust emission factors used for compression ignition engines in the EPA NONROAD emission inventory model and covers factors for all diesel-fueled engines.

Table H-1. Consolidated List of Emission Rates

Criteria Pollutants and Air Quality Classifications	Threshold Emission Rates (tons/yr)
O₃ Precursors (VOCs, NOx)	
Serious nonattainment	50
Severe nonattainment	25
Extreme nonattainment	10
Other O ₃ nonattainment areas outside an O ₃ transport region	100
Marginal and moderate nonattainment areas inside an O ₃ transport region	50 (VOCs) 100 (NOx)
CO, SO₂, or NO₂	
Nonattainment or maintenance	100
PM₁₀	
Moderate nonattainment	100
Serious nonattainment	70
Maintenance	100
Lead	
Nonattainment or maintenance	25

Table H-2. Estimated Equipment Types, Numbers, Operating Duration, and Total Horsepower-Hours for Soil Excavating and Demolition Equipment Under Alternatives 1 and 2

	Equipment Type	Estimated Number of Units To Be Used	Estimated Operating Hours/Unit/Yr	Estimated Total Operating Hours	Estimated Total Horsepower Hours
Alt. 1 (5 Years)	Grove 671 40-Ton Truck Crane 220 hp	1	298 (15% of Time)	1,488	327,360
	Komatsu Front-end Loader 120 hp, 2.5 cu yard	1	1,984 (Full Time)	9,920	1,190,400
	Komatsu Back Hoe Loader 98 hp, 1.25 cu. yard	1	1,984 (Full Time)	9,920	972,160
	Komatsu Excavator 107 hp, 1.12 cu yard	1	1,984 (Full Time)	9,920	1,061,440
Alt. 2 (8 years)	Grove 671 40-Ton Truck Crane 220 hp	1	198 (10% of time)	1,587	349,140
	Komatsu Front-end Loader 120 hp, 2.5 cu yard	3	1,984 (Full Time)	47,616	5,713,920
	Komatsu Back Hoe Loader 98 hp, 1.25 cu. yard	4	1,984 (Full Time)	63,488	6,221,824
	Komatsu Excavator 107 hp, 1.12 cu yard	2	1,984 (Full Time)	31,744	3,396,608
	Komatsu Dump truck 488 hp, 31.4 cu yard	4	1,984 (Full Time)	63,488	30,982,144
	Caterpillar 615 Series II Earth Mover (Scrapper) 265 hp	2	1,984 (Full Time)	31,744	8,412,160

The emission factors are estimates of the amount of pollution emitted by particular types of equipment during a unit of use, typically grams of pollutant per hp-hr. The report describes emission factors under regulations that establish three tiers of emission standards. The off-road engine regulations are structured as a three-tiered progression. Each tier involves a phase in (by horsepower rating) over several years. Tier 1 standards are phasing in from 1996 to 2000. A more stringent Tier 2 standard for all engine sizes is in effect from 2001 to 2006, and yet more stringent Tier 3 standards for engines rated over 37 kilowatts (50 hp) will phase in from 2006 to 2008 (DieselNet 2001). The Tier 3 standards are expected to lead to implementation of emission control technologies similar to those that will be used by manufacturers of highway heavy-duty engines (that is, trucks and buses) to comply with the 2004 highway engine standards. Further details on this tiered approach are available on the internet (<http://www.dieselnets.com/standards/us/offroad.html>) (DieselNet 2001).

The equipment projected to be used in the 5-year (Alternative 1) or 8-year (Alternative 2) soil excavation on Area IV may include equipment engines operating under any of the three tiers depending on the year of equipment purchase and replacement. For comparison purposes, it is conservatively assumed (that is, impacts would be overstated) that all equipment would be operating under the least stringent (that is, Tier 1) standards.

Table 1 of *Exhaust Emission Factors for Nonroad Engine Modeling-Compression Ignition* (EPA 1998) provides steady-state emission factors in grams per horsepower-hour (g/hp-hr) for hydrocarbons, carbon monoxide, nitrogen dioxide, and particulate matter for various horsepower engines, for various model year engines, and for the three emission standard tiers discussed above. Table H-3 is excerpted from Table 1 of EPA 1998; it summarizes the emission factor data for Tier 1 engines within the engine horsepower ranges of equipment expected to be used for Area IV soil excavation/demolition under Alternatives 1 and 2. Applying the exhaust emission factors to the total estimated operating hours in each of the engine horsepower ranges anticipated provides an estimate in grams and tons of each of the four air pollutants. These values are reported in Table H-4 for Alternative 1 and Table H-5 for Alternative 2.

For Alternative 1, the annual emissions listed in Table H-4 do not exceed the threshold emission rates listed in Table H-1. For Alternative 2, the annual emissions of nitrogen dioxide listed in Table H-5 exceed the threshold emission rate listed in Table H-1 for a severe nonattainment area.

H.3 TRANSPORTATION ACTIVITIES

To assess air pollution emission, route characteristics were determined for shipments from ETEC to the Nevada Test Site (NTS) for low-level waste (LLW) and to Envirocare in Clive, Utah, for mixed low-level waste (MLLW). Representative highway routes were analyzed using the routing computer code WebTRAGIS (Johnson and Michelhaugh 2000). The routes were calculated using current routing practices and applicable routing regulations and guidelines.

The WebTRAGIS computer code predicts highway routes for transporting radioactive materials within the United States. The WebTRAGIS database is a computerized road atlas that currently describes approximately 386,000 kilometers (240,000 miles) of roads. Complete descriptions of the interstate highway system, U.S. highways, most of the principal state highways, and a number of local and community highways are identified in the database. The WebTRAGIS computer code calculates routes that maximize the use of interstate highways. This feature allows the user to determine routes for shipment of radioactive materials that conform to U.S. Department of Transportation regulations (as specified in 49 CFR Part 397). The calculated routes conform to applicable guidelines and regulations and therefore represent routes that could be used. However, they may not be the actual routes used in the future. The code is updated periodically to reflect current road conditions, and it has been benchmarked against reported mileages and observations of commercial truck firms.

Table H-3. Steady State Emission Factors for Selected Compression Ignition Engines in the EPA NONROAD Model

Engine Horsepower Range	Emission Factors (g/hp-hr)			
	Hydrocarbons	Carbon Monoxide	Nitrogen Dioxide	Particulate Matter
>50-100	0.7	1.0	6.9	0.72
>100-175	0.4	1.0	6.9	0.4
>175-300	0.4	1.0	6.9	0.4
>300-600	0.3	1.0	6.9	0.4

Source: EPA 1998, Table 1.

Table H-4. Estimated Exhaust Emission Totals in grams (tons) – Alternative 1

Engine Horsepower Range	Pollutant			
	Hydrocarbons	Carbon Monoxide	Nitrogen Dioxide	Particulate Matter
>50-100	680,512 (0.8)	972,160 (1.0)	6,707,904 (7.4)	699,955 (0.8)
>100-175	900,736 (1.0)	2,251,840 (2.5)	15,537,696 (17.1)	900,736 (1.0)
>175-300	130,944 (0.1)	327,360 (0.4)	2,258,784 (2.5)	130,944 (0.1)
>300-600	-	-	-	-
Total	1,712,192 (1.9)	3,551,360 (3.9)	24,504,384 (27)	1,731,635 (1.9)
Annual Total	0.38 tons/yr	0.78 tons/yr	5.4 tons/yr	0.38 tons/yr

Table H-5. Estimated Exhaust Emission Totals in grams (tons) – Alternative 2

Engine Horsepower Range	Pollutant			
	Hydrocarbons	Carbon Monoxide	Nitrogen Dioxide	Particulate Matter
>50-100	4,355,277 (4.8)	6,221,824 (6.9)	42,930,586 (47.3)	4,479,713 (4.9)
>100-175	3,644,211 (4.0)	9,110,528 (10.0)	62,862,643 (69.3)	3,644,211 (4.0)
>175-300	3,504,520 (3.9)	8,761,300 (9.7)	60,452,970 (66.6)	3,504,520 (3.9)
>300-600	9,294,643 (10.3)	30,982,144 (34.2)	213,776,794 (235.6)	12,392,858 (13.7)
Total	20,798,651 (22.9)	55,075,796 (60.7)	380,022,993 (418.8)	24,021,302 (26.5)
Annual Total	2.9 tons/yr	7.6 tons/yr	52.3 tons/yr	3.3 tons/yr

DOE also estimated mileage from ETEC to authorized locations for the disposal of hazardous waste and nonhazardous debris waste, and for uncontaminated soil as backfill.

Emission factors for nitrogen dioxide, hydrocarbons, and carbon monoxide for heavy truck diesel engines were obtained from Appendix H of AP-42, *Compilation of Air Pollutant Emission Factors* (EPA 2000). The emission factors for hydrocarbons, carbon monoxide, and nitrogen dioxide were 2.1 grams per mile, 10.3 grams per mile, and 6.5 grams per mile, respectively. The emission factor for diesel particulate matter (0.22 gram per mile) was obtained from the *Motor Vehicle-Related Air Toxics Study* (EPA 1993).

Table H-6 shows the parameters used for determining the potential air emissions that would occur as a result of the implementation of Alternative 1 or Alternative 2. All miles traveled offsite are assumed to be on paved roads. Table H-7 shows the total estimated exhaust emission totals in grams and tons for Alternative 1 and Alternative 2. These totals do not include the fraction of travel in nonattainment or maintenance areas.

H.4 RESULTS

For Alternative 1, the annual emissions listed in Table H-7 are below the thresholds listed in Table H-1. For Alternative 2, the annual emissions listed in Table H-7 are below the thresholds listed in Table H-1 for all pollutants except for nitrogen dioxide, which slightly exceeds the threshold for an extreme nonattainment area for ozone. However, not all travel will be in extreme ozone nonattainment areas, so it is unlikely that the annual emissions will exceed the thresholds listed in Table H-1.

H.5 REFERENCES

- DieselNet, 2001. *Emission Standards, USA, Off-Road Diesel Engines*, available at [<http://www.dieselnet.com/standards/us/offroad.html>].
- EPA (U.S. Environmental Protection Agency), 2000. *Compilation of Air Pollutant Emission Factors, Volume II: Mobile Sources, AP-42*, Office of Transportation and Air Quality, November 24, 2000, fifth edition pending, Appendix H available at [<http://www.epa.gov/otaq/ap42.htm>].
- EPA (U.S. Environmental Protection Agency), 1998. *Exhaust Emission Factors for Nonroad Engine Modeling- Compression Ignition*, Report No. NR-009A, revised June 15, 1998, available at [<http://www.epa.gov/otaq/models/nonrdmdl/nr-009a.pdf>].
- EPA (U.S. Environmental Protection Agency), 1993. *Motor Vehicle-Related Air Toxics Study*, EPA 420-R-93-005, Office of Transportation and Air Quality, April 1993.
- Michelhaugh, R.D., and P.E. Johnson, 2000. *Transportation Routing Analysis Geographic Information System (WebTRAGIS) User's Manual*, Oak Ridge National Laboratory, ORNL/TM-2000/86.

Table H-6. Parameters for Air Quality Impacts from Transportation

	Alternative 1	Alternative 2
Low-Level Waste		
Waste volume	7,500 cubic meters	406,850 cubic meters
Number of one-way shipments (volume/13.6 cubic meters per shipment)	553 shipments	30,000 shipments
Miles traveled (one-way), NTS	377 miles	377 miles
Total one-way miles traveled	208,481 miles	11.3 million miles
Vehicle type	17.5 ton diesel-powered truck	17.5 ton diesel-powered truck
Mixed Low-Level Waste		
Waste volume	20 cubic meters	20 cubic meters
Number of one-way shipments (volume/13.6 cubic meters per shipment)	20 shipments	20 shipments
Miles traveled (one-way), Envirocare	803 miles	803 miles
Total one-way miles traveled	16,060 miles	16,060 miles
Vehicle type	17.5 ton diesel-powered truck	17.5 ton diesel-powered truck
Hazardous Waste		
Waste volume	5 cubic meters	5 cubic meters
Number of one-way shipments (volume/13.6 cubic meters per shipment)	5 shipments	5 shipments
Miles traveled (one-way)	469.4 (weighted average)	469.4 (weighted average)
Total one-way miles traveled	2,347	2,347
Vehicle type	17.5 ton diesel-powered truck	17.5 ton diesel-powered truck
Nonhazardous Debris Waste		
Waste volume	25,300 cubic meters	25,300 cubic meters
Number of one-way shipments (volume/13.6 cubic meters per shipment)	1,860 shipments	1,860 shipments
Miles traveled (one-way), Bradley Landfill	50 miles one-way	50 miles one-way
Total one-way miles traveled	93,000 miles	93,000 miles
Vehicle type	17.5 ton diesel-powered truck	17.5 ton diesel-powered truck
Uncontaminated Soil		
Volume	5,500 cubic meters	354,390 cubic meters
Number of one-way shipments (volume/13.6 cubic meters per shipment)	400 shipments	26,000 shipments
Miles traveled (one-way)	On SSFL; 1 mile (unpaved)	PW Gillibrand borrow site; 25 miles
Total one-way miles traveled	400 miles	650,000 miles
Vehicle type	17.5 ton diesel-powered truck	17.5 ton diesel-powered truck

Total miles traveled, Alternative 1: 330,000 miles

Total miles traveled, Alternative 2: 12,000,000 miles

Table H-7. Estimated Exhaust Emission Totals in grams (tons) for Alternative 1 and Alternative 2

	Pollutant			
	Hydrocarbons	Carbon Monoxide	Nitrogen Dioxide	Particulate Matter
Alternative 1				
LLW	4.38E+05 (0.48)	2.15E+06 (2.4)	1.35E+06 (1.5)	4.63E+04 (0.051)
MLLW	3.37E+04 (0.037)	1.66E+05 (0.18)	1.04E+05 (0.11)	3.57E+03 (0.0039)
Hazardous waste	4.93E+03 (0.0054)	2.42E+04 (0.027)	1.52E+04 (0.017)	5.21E+02 (0.00057)
Nonhazardous debris waste	1.95E+05 (0.22)	9.60E+05 (1.1)	6.04E+05 (0.67)	2.06E+04 (0.023)
Uncontaminated soil	2.10E+04 (0.023)	1.03E+05 (0.11)	6.49E+04 (0.072)	2.22E+03 (0.0024)
Total – Alternative 1	6.93E+05 (0.76)	3.40E+06 (3.8)	2.14E+06 (2.4)	7.32E+04 (0.081)
Tons/yr – Alternative 1	1.5E-01	7.5E-01	4.7E-01	1.6E-02
Alternative 2				
LLW	2.38E+07 (26)	1.17E+08 (130)	7.34E+07 (81)	2.51E+06 (2.8)
MLLW	3.37E+04 (0.037)	1.66E+05 (0.18)	1.04E+05 (0.11)	3.57E+03 (0.0039)
Hazardous waste	4.93E+03 (0.0054)	2.42E+04 (0.027)	1.52E+04 (0.017)	5.21E+02 (0.00057)
Nonhazardous debris waste	1.95E+05 (0.22)	9.60E+05 (1.1)	6.04E+05 (0.67)	2.06E+04 (0.023)
Uncontaminated soil	1.37E+06 (1.5)	6.71E+06 (7.4)	4.22E+06 (4.7)	1.44E+05 (0.16)
Total – Alternative 2	2.53E+07 (28)	1.25E+08 (140)	7.83E+07 (86)	2.68E+06 (3.0)
Tons/yr – Alternative 2	3.5	17	11	0.37

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