DOE/EIS-0380-SA-01

Supplement Analysis
Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory

Proposed Transport of Low Level Radioactive Waste by Truck and Rail from Los Alamos National Laboratory (LANL) for Disposal at EnergySolutions at Clive, Utah

October 2009

Department of Energy
National Nuclear Security Administration
Los Alamos Site Office

Introduction

This analysis is prepared to determine if the Final Site-Wide Environmental Impact Statement (2008 SWEIS) for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico, (DOE/EIS 0380) adequately bounds off-site transportation of Low Specific Activity (LSA) and Low Level Waste (LLW) by a combination of truck and rail to EnergySolutions in Clive, Utah.

Background

The 2008 SWEIS includes an analysis of actions necessary to comply with the March 1, 2005, Compliance Order on Consent (Consent Order). The Consent Order is an agreement between the New Mexico Environment Department (NMED), Department of Energy (DOE), the University of California (UC)/Los Alamos National Security, LLC (LANS), which requires investigation and remediation of environmental contamination by 2015. Remediation of Consent Order sites and on and off-site transportation of wastes was analyzed in the 2008 SWEIS and addressed in the September 2008 and June 2009 Records of Decision.

The transportation human health risk assessment in the 2008 SWEIS analyzed the potential radiological and nonradiological impacts of transportation of waste for the three NEPA alternatives considered (No Action, Reduced, and Expanded).

The 2008 SWEIS considered truck transport in the accident analysis in Table K-8 in Appendix K. Rail transport has been analyzed in Environmental Impact Statements (EISs) and Environmental Assessments (EAs) from other sites in the DOE Complex including the following sites - West Valley, New York; Paducah, Kentucky; Yucca Mountain, Nevada; Argonne National Laboratory, Illinois; and the Programmatic Waste Management EIS for the DOE Complex.

Proposed Action

DOE proposes to ship an estimated 15,000 cubic yards of LSA and LLW from the North Ancho Canyon Aggregate Area to EnergySolutions in Clive, Utah (referred to as EnergySolutions or the Clive Facility throughout), by truck and rail. Specifically, the waste is from Material Disposal Area Y [MDA Y also known as Solid Waste Management Unit (SWMU) 39-001 (b)], SWMU 39-001(a), and Los Alamos Site Monitoring Area 2 (LA-SMA-2).

- MDA Y is a 0.2 acre area located in TA-39 and consists of three pits that, beginning in the late 1960s, received debris from a firing range, empty chemical containers, and office waste.
- SWMU 39-001(a) is an inactive landfill consisting of two disposal pits located at Technical Area (TA)-39, east and north of the light gas-gun facility (Building 39-69). According to long-time site workers, this landfill [SWMU 39-001(a)] operated between 1953 and 1979. Materials disposed of in the pits include debris from firing site experiments, empty chemical containers, and office waste. After 1976, hazardous and radioactive materials were separated from other waste and were disposed of off-site.

- LA-SMA-2 was a septic tank that served two TA-01 research buildings. The outfall from this tank discharged into Los Alamos Canyon.

In the 2008 SWEIS, DOE proposed to ship LSA/LLW from Consent Order activities to an off-site commercial facility, specifically EnergySolutions (previously named Envirocare) in Clive, Utah. EnergySolutions is a Nuclear Regulatory Commission (NRC) permitted site (NUREG-1476). Shipment of Consent Order LLW from remediation of MDAY, SWMU 39-001(a), and LA-SMA-2 is anticipated to consist of 400 to 500 truck shipments over approximately 63 working days to the Clive Facility.

The waste from these three locations would be packaged in accordance with Department of Transportation (DOT) requirements in compliance with 49 CFR 173.410 and 411 (e.g., DOT compliant Industrial Package-1 (IP-1) and intermodals). Specifically, the waste would be transported in *supersack* containers made of double-lined, woven coated polypropylene fabric material (Figure 1). In addition to the use of IP-1 supersacks, some waste would be containerized in DOT compliant intermodal, metal containers.

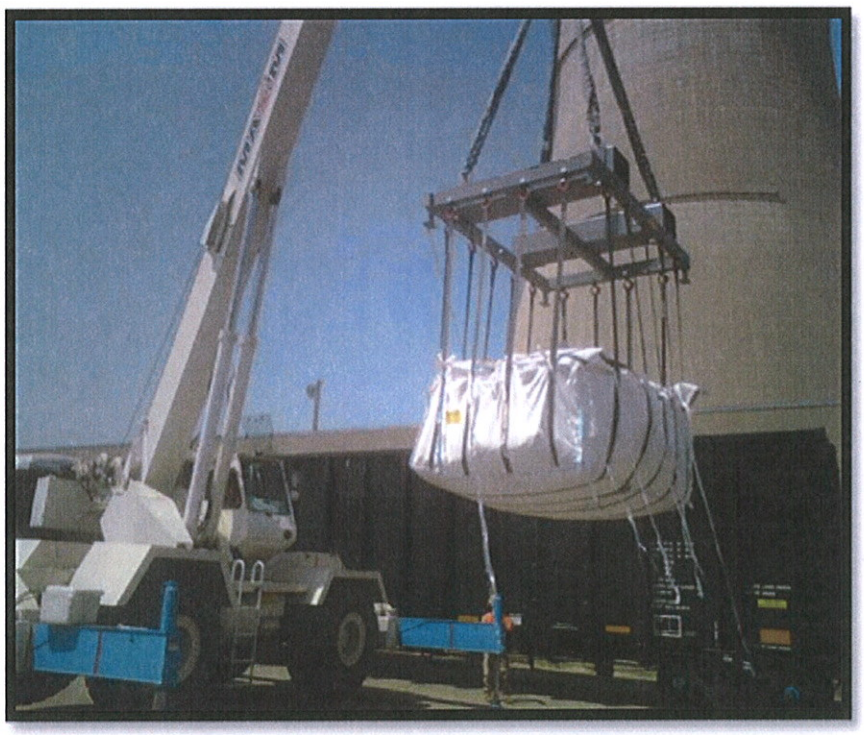

Figure 1. Supersack being loaded.

The waste would be carried by truck from LANL to Pojoaque to the U.S. Highway 84/285 diversion and from there to EnergySolutions industrial transload facility in Antonito, Colorado. From Antonito, transportation would be by rail to the EnergySolution facility in Clive, Utah (Figure 2). In Figure 2, Segments A to D represent the LANL to Antonito, Colorado truck route and Segments D to H represent the rail route to the Clive Facility.

Figure 2. Routes from LANL to Clive, Utah.

In Antonito, EnergySolutions has leased 300 feet of dedicated rail track within a locked security fence. The transload facility is approximately one-half mile from the nearest residence and one mile from the center of Antonito. The filled IP-1 bags from LANL would be lifted by crane or extended boom forklift into and onto IP-1 Supergondolas providing secondary containment (Figure 1). EnergySolutions estimates no more than 48 supersacks per rail shipment; however, some waste is inappropriate for supersack containment and would be shipped by truck in intermodals and transferred in Antonito onto rail cars using a crane. EnergySolutions has estimated eight intermodals per rail car and normal shipments to consist of no more than three railcars (e.g., Supergondolas) per train (Figure 3). During all phases of loading and offloading, EnergySolutions will follow all applicable DOT, American Association of Railroad (AAR), Code of Federal Regulations (CFR), and safety guidance, as required in their Emergency Response Plan. If waste is staged over a weekend, EnergySolutions will ensure that appropriate security measures are in place to prevent access to the containers during temporary storage.

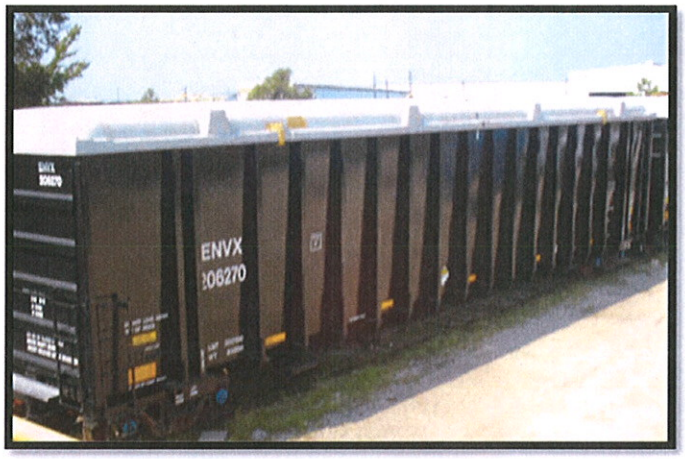

Figure 3. Supergondola with lid attached.

For transport of waste from Antonito to Clive, the San Luis and Rio Grande (SLRG) Railroad, owned and operated by Permian Basin Railways (a unit of Iowa Pacific Holdings, LLC) provides standard five day per week service along the line between Antonito and Walsenburg, Colorado, with weekend service as needed. The projected increase of three railcars a day will not require additional service or locomotives to meet the demands for this project. SLRG has the current capacity to move about 40 railcars per day with existing trains and are currently operating at about 50 percent of that capacity. Additionally, peak demands do not approach locomotive and track capacity constraints.

Potential Consequences of Proposed Action

The potential environmental effects from implementing the proposed action are summarized in Table 1. The majority of resource impacts would not change if a combination of rail and truck transport of waste was implemented; the impacts of off-site transportation of waste to Clive, Utah were analyzed in the 2008 SWEIS.

Table 1. Changes from 2008 SWEIS for the Proposed Action

Resource Area	Changes from 2008 SWEIS
Land Use	No changes projected
Visual Resources	No changes projected
Noise	No changes projected
Geology	No changes projected
Soils	No changes projected
Surface Water Quality	No changes projected
Ground Water Quality	No changes projected
Air Quality/Radioactive Air Emissions	**Reduced vehicle emissions**[1]
Public Health-Radiological	**Negligible Increase**
Environmental Justice	No changes projected
Cultural Resources	No changes projected
Biological Resources	No changes projected
Transportation	**Off-site transportation by truck and rail**
Nonradiological Safety (traffic fatalities)	**Reduced by about 90 percent**

[1] Trucks emissions are more substantial then trains – not quantified.

DOE's Office of Environmental Management (EM) recommended a shift to rail transport in late 2004 for efficiency and safety reasons. Statistics on railroad accidents in the United States are gathered and maintained by the Federal Railroad Administration (FRA), an agency of the DOT. The FRA currently maintains an online database of reported

railroad accidents/incidents from 1975 to the present. According to FRA reports, 2008 was the safest year ever for American railroads. From 1980 to 2008, the train accident rate fell 73 percent, the rail employee injury rate fell 82 percent, and the grade crossing collision rate fell 79 percent (Association of American Railroads, October 15, 2009 http://www.aar.org/Safety/Safety.aspx). Railroads have lower employee injury rates than most other major industries, including trucks, barges, airlines, agriculture, mining, manufacturing, and construction.

Transportation Analysis: Assumptions, Methodology, and Results.

The calculations for affected population and population dose used in this analysis are conservative. Population estimates are calculated using average densities that likely over-estimate total affected population. Shielding provided by rail containers was not considered in the dose assessment. Dose assessments were based on the 2008 SWEIS calculation for LSA waste. The wastes to be shipped in this proposed action are of significantly lower concentrations of activity; therefore, the analysis would be bounding. In the following sections, Table 2 summarizes the route characteristics, Table 3 provides the radiological risk of the proposed action, and Table 4 compares the truck only option with the truck and rail option.

Table 2. Offsite Transportation Truck and Rail Route Characteristics.

Origin	Destination	Nominal Distance (km)	Distance Traveled in Zones (km)			Population Density in Zone (number per square km)			Number of Affected Persons
			Rural	Suburban	Urban	Rural	Suburban	Urban	
LANL	Pojoaque	31	27	3.8	0.2	5.8	362.6	2,408.5	3,227
Pojoaque	U.S. 285/84	27.5	22.7	0	4.8	8.3	0	2,280.2	17,813.4
U.S. 284/85	Antonito, CO	124	116.7	7.3	0	8.3	331.9	0	5,426.4
Antonito, CO	Clive, UT	1,424	1,227	47	150	8.3	331.9	2,280.2	588,501

Radiological Risk

Radiological risks are a function of the number of kilometers (km) traveled, affected populations, individual dose calculation, and number of shipments/trips. The total dose is a sum of the impacts from both the truck and rail transport of waste. The following steps were performed to calculate radiological risks associated with the proposed action:

1. The proposed action was divided into a truck segment and a rail segment and route distances for each segment were calculated;
2. The 2008 SWEIS defines the affected population as the population within 0.5 miles of either side of the route, which represents 1 mile or a 1.6 km wide corridor. Each linear km of a 1.6 km wide corridor represents 1.6 square km;
3. Population densities vary by route, so this analysis calculated average population densities for rural, suburban, and urban segments using Table K-1 (2008 SWEIS);
4. The affected populations for the truck segment (LANL to Antonito) and the rail segment (Antonito to Clive) were calculated by multiplying estimated population densities by rural, suburban, and urban square km along the route;
5. The individual dose was calculated by dividing the population dose for one truck trip by the affected population. The population dose (0.000234 person-rem) came from the 2008 SWEIS Table K-3 for one LSA truck shipment to Clive. The

affected population (183,804 people) is in Table K-1 of the 2008 SWEIS;

6. **Total Truck Population Dose = (Individual Dose) X (Affected Population) X (Number of Shipments).** Total population dose along the truck segment was calculated by multiplying the individual dose (1.27×10^{-9}) by the affected population (26,500), by 500 truck shipments;
7. **Total Rail Population Dose = (Individual Dose) X (Affected Population) X (Number of Shipments) X (48 truck equivalents).** Population dose along the rail segment was calculated by multiplying the individual dose (1.27×10^{-9}) (Table K-3, 2008 SWEIS), by the affected population along the route by the number of rail shipments. To ship 500 truck shipments requires 10.4 rail shipments, each consisting of 48 truckloads;
8. To derive population risk, expressed as Latent Cancer Fatalities (LCF), the methodology described in 2008 SWEIS was used, where one person-rem equals 0.0006 LCF. In this assessment, population risk is 0.39 person-rem X 0.0006 LCF, which equals 0.00023 LCF (see Table 3);

Table 3. Incident-Free Radiological Risks for Transport of LSA by Truck and Rail.

Transport route segment	Individual dose	Affected population	Number of one-way shipments	km traveled	Population dose (person-rem)	Radiological risk (LCF) [1]
LANL to Pojoaque	1.27×10^{-9}	3,227	500	31	0.002049	0.0000012
Pojoaque to U.S. 84/285	1.27×10^{-9}	17,813	500	27	0.01131	0.0000067
U.S. 84/285 to Antonito, Colorado	1.27×10^{-9}	5,426	500	125	0.003445	0.000002
Antonito, Colorado to Clive, Utah [2]	1.27×10^{-9}	588,501	10.4	1,424	0.37401	0.000224
Total		614,967	500 truckloads or 10.4 rail shipments	1,608	0.390814	0.0002339

(1) Person-rem to LCF conversion factor is 1 person-rem of exposure equals 0.0006 LCF (2008 SWEIS, Appendix K, p. K-22).
(2) Forty-eight truck shipments are transported on one rail shipment (three cars); 500 truck shipments equal 10.4 rail shipments.

The potential risk from exposure to the worker at the transload facility in Antonito is negligible. In Appendix I of the 2008 SWEIS, worker radiation doses for waste processing were assumed based on LANL worker radiation experience for 2004 and 2005. Person-hours for loading containers onto trucks were based on a review of other analyses and radiation doses were assessed using RADTRAN, version 5 computer code. This analysis assumed container surface radiation rates were compatible with assumptions for waste transportation; loading would be accomplished assuming using crews of 3 to 5 people having average distances ranging from 3.3 to 16 ft from waste packages (SWEIS I-181). Worker risks were calculated assuming a latent cancer fatality rate of 0.0006 per person-rem of exposure. The radiological risks and nonradiological traffic accidents were estimated in the same risk assessment in Appendix I of the 2008 SWEIS in Tables I-66 and I-96 (pps. I-180 and I-271). If railcars are staged over a weekend before transport to the Clive Facility, the security gates would be locked (EnergySolutions, personal communication, 2009).

Nonradiological Risk (Traffic Fatalities)

The purpose of the 2008 SWEIS transportation analysis was to assess the radiological and nonradiological impacts from shipping waste for the three alternatives. The conclusion of the analysis is that the greatest human health risk associated with shipping

waste results not from a radiological accident, but from a nonradiological traffic accident fatality. Therefore, even with a longer route (1,076 km by truck vs. 1,608 by truck/rail), shipping by rail provides a marked increase in public safety as a result of the reduction in traffic fatalities. Table 4 includes calculations for nonradiological risk, expressed in traffic fatalities. These results demonstrate that shipping by rail is safer than shipping by the truck only at an approximate ratio of 10:1, because the total number of km traveled is lower as trains make fewer trips carrying larger loads.

Table 4. Comparison of risks for all waste shipments (LANL to Clive) by truck and by truck and rail.

Transport	Incident-Free			Accidents	
	Individual Dose (rem)	Population Dose (person-rem)	Population Risk (LCF)	Radiological Risk (LCF)	Nonradiological Risk (traffic fatalities)
Truck from LANL to Clive	0.0000006365[a]	0.117	0.0000702	0.000004815[c]	0.0211[b]
Truck from LANL to Antonito	0.0000006365	0.0168	0.00001009	0.000004815	0.00187
Rail from Antonito to Clive	0.0000006355	0.37401	0.0002244	0.0000001	0.000258[d]

(a) Background dose to the individual residents.
(b) Per table SWEIS Table K-3, 0.0000211 X 1000 trips = 0.0211.
(c) Table K-3, LSA for commercial shipment dose risk of 9.63×10^{-9} per shipment multiplied by 500 shipments.
(d) Combined Truck and Rail = 0.002128 nonradiological risk (traffic fatalities).

Other Relevant DOE Documents and Analyses

The Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (DOE/EIS-0250) was issued in February 2002. The Yucca EIS included an in-depth analysis (Chapter 6 and Appendix J) regarding the relative safety of transporting spent nuclear fuel and high-level radioactive waste by truck and by rail. This analysis concluded that incident-free transportation is the expected norm for transportation of spent nuclear fuel and high-level radioactive waste to the Yucca Mountain site whether by truck or by rail.

The Yucca analysis also concluded that over the 24 years of the Proposed Action, an estimated 2.5 latent cancer fatalities could occur in the general population along transportation routes from radiation exposure under the mostly legal-weight truck scenario and an estimated one latent cancer fatality could occur under the mostly rail scenario. Moreover, over the 24 years of the Proposed Action there would be no or very small impacts to workers or members of the public expected from postulated loading accidents; and DOE further identified there would be no national environmental justice concerns or air quality impacts for incident-free transportation - whether by truck or rail. The 2007 Supplemental EIS for Yucca had no additional analyses, but shipment by a combination of track and rail is the preferred alternative (DOE/EIS-0250F-S1D).

DOE has previously analyzed transportation from LANL to other facilities using rail in the *Final Waste Management Programmatic Environmental Impact Statement* (DOE/EIS/200-F). This EIS compared rail and truck transportation and concluded that nonradiological accident risks are substantially lower when low-level waste is transported

by rail when compared to truck transport (p. 7-61). In fact, this EIS combined radiological and nonradiological fatalities for rail and estimated 1 to 5 fatalities per 10-year period, compared to the much higher 1 to 38 nonradiological fatalities and 1 to 16 radiological fatalities estimated for truck transport.

Nonradiological impacts for rail were stated as lower than truck on page K-14 (K-5.2). Other NEPA analyses have considered transport of radioactive waste by rail. In the *Environmental Assessment Proposed Decontamination and Demolition of Building 301 at Argonne National Laboratory* U. S. Department of Energy Argonne Site Office Argonne, Illinois March 26, 2007 (DOE/EA-1585) it states in a footnote:

> Argonne has no on-site rail access. It is possible that waste could be loaded into containers and transported by truck to a local railway point and, from there, to appropriate disposal sites. For purposes of analysis, however, DOE assumed that all waste would be transported by truck to its final destination. In general, potential impacts are greater for transportation by truck than transportation by rail because fewer numbers of trips are required for transportation by rail, and impacts are primarily a factor of the number of trips. For this reason, DOE believes that the truck transportation analysis bounds the potential impacts of transporting waste by rail.

In addition, the Paducah EA and Finding of no Significant Impact (FONSI) state that off-site shipment by rail was equivalent to truck transportation. The West Valley Waste Management EIS also analyzed truck versus rail shipments from western New York to the Clive Facility and found similar impacts to workers and the public.

The Rocky Flats Closure Project, one of the largest environmental cleanup projects in the world, shipped radioactive and hazardous waste from Rocky Flats to waste disposal sites, including EnergySolutions. More than 600,000 cubic meters of LLW was shipped by rail.

Finding

This supplement analysis was prepared in accordance with the provisions of the DOE NEPA Implementing Procedures, 10 CFR Part 1021. DOE is required to prepare a supplemental EIS if there are substantial changes to the proposal or significant new circumstances or information relevant to environmental concern presented in an EIS (10 CFR Part 1021.314). A supplement analysis is prepared when it is unclear whether or not the changes to the proposal are significant or whether the impacts from the changes are within the binding thresholds analyzed in the original EIS. This analysis provides information to support the conclusion that shipment of waste to in the Clive Facility by truck and rail from LANL for these proposed waste shipments is bounded by the 2008 SWEIS transportation analysis. Numerous federal environmental reviews have concluded that rail shipments have a substantially lower risk and fewer consequences when compared with truck transport. This conclusion is supported by this supplement analysis. With more precise calculation tools (e.g., RADTRAN, TRAGIS) the estimated population risk would likely be reduced substantially.

Determination:

Based on my review of information conveyed to me in this supplement analysis concerning the proposed action, as Head of Field Organization (as authorized under DOE Order 451.1A), I have determined that no further documentation is required.

10/22/09

Don Winchell
Manager, Los Alamos Site Office

Date

In accordance with DOE Order 451.1A, this action is concurred with by the site NEPA Compliance Officer and the site General Council.

George Rael
NEPA Compliance Officer, Los Alamos Site Office

Silas DeRoma
General Council, Los Alamos Site Office

References

Bureau of Transportation Statistics, National Transportation Statistics 2007, Table 2-17: Motor Vehicle Safety Data, Table 2-35: Railroad and Grade-Crossing Fatalities by Victim Class, and Table 2-39: Railroad System Safety and Property Damage Data (www.bts.gov/publications/national_transportation_statistics).

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