radiological accident impacts for rail shipments relative to truck shipments. However, a review of the impact estimates in Table H.10 indicates that radiological accident impacts are a small fraction of the radiological incident-free and non-radiological impacts. Therefore, the radiological accident impacts do not contribute substantially to the total impacts.

Although predicted impacts for rail shipments would likely be smaller than for truck shipments, a number of other variables must also be considered. First, general freight rail service is slower than truck shipping, resulting in longer travel times and possibly long stop times in rail yards waiting for train makeup. The longer shipping times for rail shipments may also lead to less efficient use of DOE shipping containers, depending on the waste types transported by rail and the truck/rail mix of the shipping campaigns. Second, not all generator sites, including Hanford, are provided with rail service. In order for these sites to use rail service, they would have to construct new rail lines, rebuild existing lines that have been discontinued, or implement truck/rail intermodal transportation (i.e., deliver truck shipments to a railyard where the shipping containers would be offloaded from the trucks and loaded onto a rail car for subsequent transport; the opposite operation would be required if the receiving site is also not provided with rail service). This could lead to increased costs as well as increased impacts due to the additional handling activities required to offload and reload the containers onto or off of the railcars. Third, if a rail accident involving a derailment were to occur, the rail line could be disabled for a lengthy period of time. Although truck accidents could also involve closure of a highway, there is a greater potential for a detour around a closed highway than around a closed rail line.

There are two types of rail service available for radioactive waste shipments; 1) general freight rail in which the railcars carrying the wastes would be added to an existing train and 2) dedicated rail service in which a train would be made up solely of railcars carrying radioactive wastes to/from Hanford plus locomotives and buffer cars as needed. According to DOE (2002), dedicated rail service offers advantages over general freight rail service in incident-free transport but could lead to higher accident impacts. It was concluded in DOE (2002) that available information does not indicate a clear advantage for the use of either general freight or dedicated train service.

A final point relative to rail shipping is that the HSW management facilities are not currently provided with rail service. Although restarting rail service to the Waste Treatment Plant is currently under consideration, new rail spurs and upgrades to existing rail lines would be needed to reach the HSW treatment facilities. At this time, it is too speculative to assume that rail access to solid waste management facilities on the Hanford Site would be available, and an analysis of rail transport does not appear warranted.

H.10 References

10 CFR 71. "Packaging and Shipping of Radioactive Materials." U.S. Code of Federal Regulations. Online at: http://www.access.gpo.gov/nara/cfr/waisidx_01/10cfr71_01.html.

65 FR 10061. "Record of Decision for the Department of Energy's Waste Management Program: Treatment and Disposal of Low-Level Waste and Mixed Low-Level Waste; Amendment of the Record of Decision for the Nevada Test Site." *Federal Register* (February 25, 2000).

Craig, D. K. 2001. *ERPGs and TEELs for Chemicals of Concern, Rev. 18*. WSMS-SAE-02-0001, Westinghouse Safety Management Systems, Aiken, South Carolina. Online at: http://tis.eh.doe.gov/web/chem_safety/teel.html.

DOE. 1995. *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement*. DOE/EIS-0203-F, U.S. DOE, Office of Environmental Management, Idaho Operations Office.

DOE. 1997a. *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste*, DOE/EIS-0200-F, Office of Environmental Management, Washington, D.C.

DOE. 1997b. *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement***.** DOE/EIS-0026-S2, Carlsbad Area Office, Carlsbad, New Mexico.

DOE. 1998. *Information Package on Pending Low-Level Waste and Mixed Low-Level Waste Disposal Decisions to be made under the Final Waste Management Programmatic Environmental Impact Statement*, online at: http://www.em.doe.gov/em30.

DOE. 2001. *Environmental Assessment for Transportation of Low-Level Radioactive Waste from the Oak Ridge Reservation to Off-site Treatment or Disposal Facilities*, DOE/EA-1315, Oak Ridge Operations Office, Oak Ridge, Tennessee.

DOE. 2002a. *Final Environmental Impact Statement for the Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada.* DOE/EIS-0250. Office of Civilian Radioactive Waste Management, Washington D.C.

DOE. 2002b. *Transuranic Waste Performance Management Plan*. U.S. Department of Energy, Carlsbad Field Office, Carlsbad, New Mexico, August 2002.

Fluor Hanford (FH). 2003. *Hanford Site Solid Waste Management Environmental Impact Statement Technical Information Document*. HNF-4755, Rev. 1, Fluor Hanford, Inc., Richland, Washington.

Green, J. R., B. D. Flanagan, and H. W. Harris. 1996. *Hanford Site Truck Accident Rate, 1990-1995*. WHC-SD-TP-RPT-021, Rev. 0, Westinghouse Hanford Co., Richland, Washington.

Grove Engineering. 1996. *Microshield Version 5 User's Manual*. Framatome Technologies, Inc., d.b.a. Grove Engineering, Rockville, Maryland.

ICRP. 1991. "1990 Recommendations of the International Commission on Radiological Protection." ICRP Publication 60. *Annals of the ICRP*, Vol. 21, No. 1-3., Pergamon Press, Oxford.

Johnson, P. E., D. S. Jay, D. B. Clarke, and J. M. Jacoby. 1993. *HIGHWAY 3.1 - An Enhanced Highway Routing Model: Program Description, Methodology, and User's Manual*. ORNL/TM-12124, REV 1. Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Luna, R. E., K. S. Neuhauser, and M. G. Vigil. 2000. *Projected Source Terms for Potential Sabotage Events Related to Spent Fuel Shipments*. SAND99-0963. Sandia National Laboratory, Albuquerque, New Mexico.

NIOSH. 1990. *NIOSH Pocket Guide to Chemical Hazards*. National Institute for Occupational Safety and Health (NIOSH). U.S. Department of Health and Human Services, Cincinnati, Ohio.

Neuhauser, K. S., and F. L. Kanipe. 1992. *RADTRAN 4, Volume 3: User Guide*. SAND89-2370, Sandia National Laboratories, Albuquerque, New Mexico.

NRC. 1977. *Final Environmental Impact Statement in the Transportation of Radioactive Material by Air and Other Modes*. NUREG-0170, Office of Standards Development, U.S. Nuclear Regulatory Commission, Washington, D.C.

NRC. 1982. *Atmospheric Dispersion Models for Potential Consequence Assessments at Nuclear Power Plants*. Regulatory Guide 1.145, Nuclear Regulatory Commission, Washington, D.C.

Rao, R. K., E. L. Wilmot, and R. E. Luna. 1982. *Non-Radiological Impacts of Transporting Radioactive Material*. SAND81-1703, TTC-0236, Sandia National Laboratories, Albuquerque, New Mexico.

Saricks, C. L., and M.M. Tompkins. 1999. *State-Level Accident Rates of Surface Freight Transportation: A Reexamination*. ANL/ESD/TM-150. Argonne National Laboratory, Argonne, Illinois. Online at: http://www.osti.gov.