APPENDIX C

DETAILED CUMULATIVE IMPACTS ASSESSMENT

Methodology

The 11-step cumulative effects assessment methodology published by the Council on Environmental Quality is used as the framework for addressing cumulative effects (Council on Environmental Quality, 1997). The steps, in an expanded format, are as follows:

- Step 1: Identify the significant cumulative effects issues associated with the proposed action and define the assessment goals. This step is focused on the incremental impacts of the construction and operation of the proposed Idaho Spent Fuel Facility. Accordingly, these impacts have been summarized based on the information in Sections 4.1–4.13. Further, where the incremental impacts were deemed to be small and insignificant, no analyses of cumulative effects were conducted. Therefore, the assessment goal is to assess the direct, indirect, and contributed impacts of the proposed Idaho Spent Fuel Facility on nearby resources, ecosystems, and human communities that may have been, or would be, subject to cumulative effects. Step 1 results are described in Section 4. [Resources considered herein include geology and soils (Section 4.3), water (4.4), air quality (4.6), noise (4.7), and waste management (4.13); ecosystems include land use (4.1) and ecology (4.5); and human communities include transportation (4.2), historical and cultural (4.8), visual/scenic (4.9), socioeconomical (4.10), environmental justice (4.11), and public and occupational health and safety (4.12).]

- Step 2: Establish the geographic scope for the analysis (Council on Environmental Quality, 1997). The geographic scope is dependent on the affected resources, ecosystems, and human communities. Because of more site-specific and localized concerns, the Idaho National Engineering and Environmental Laboratory (INEEL) boundaries were used to define the impact area for geology and soils, water, air quality, noise, waste management, land use, ecology, and historical and cultural resources. INEEL and its surrounding region were used to establish impacts to transportation, visual/scenic, socioeconomical, environmental justice, and public and occupational health and safety resources.

- Step 3: Establish the timeframe for the analysis (Council on Environmental Quality, 1997). The timeframe for the analysis includes the past, present, and future. The historical (past) boundary was assumed to be prior to the establishment of the U.S. Department of Energy (DOE) and precursor activities at INEEL (established in 1949). Accordingly, the boundary selected was the 1940s. Past activities also include the facilities and programs at INEEL to year 2003. The future time boundary would extend to 2039 to encompass the construction period for the proposed Idaho Spent Fuel Facility (2–4 years), meet the terms of the 1995 Settlement Agreement, and a 2- to 4-year decommissioning period. The recent Idaho High-Level Waste (HLW) and facilities disposition environmental impact statement (EIS) incorporated a timeframe for analysis from 2000 to 2095 (DOE, 2002, Section 5.4). The 2000–2095 period was the timeframe established for completion of activities evaluated in that EIS and the assumed period of institutional control, although DOE has no plans to relinquish institutional control of INEEL facilities or lands.

- Step 4: Identify other actions affecting the resources, ecosystems, and human communities of concern (Council on Environmental Quality, 1997). This step was accomplished by reviewing the identified actions in the DOE Spent Nuclear Fuel Programmatic EIS, the DOE Idaho HLW and Facilities Disposition EIS (DOE, 2002), and the EIS on the independent spent fuel storage installation for Three-Mile Island Unit 2 Spent Fuel (U.S. Nuclear Regulatory Commission, 1998). Actions within INEEL, as well as off-site, were identified. Information on these past, present, and reasonably foreseeable future actions is summarized in Section 4.14.2. Contributions to cumulative effects are summarized in Section 4.14.3.

- Steps 5 and 6: Characterize the resources, ecosystems, and human communities identified in Steps 1–4 for response to change and capacity to withstand stresses. Further, characterize the stresses affecting these resources, ecosystems, and human communities and their relations to regulatory thresholds (Council on Environmental Quality, 1997). Considerable information on the conditions of these environmental categories, their current stresses, and their relations to regulatory thresholds and requirements is in Section 3 of the EIS. A summary table and discussion is included in Section 4.14.

- Step 7: Define a baseline condition for the resources, ecosystems, and human communities (Council on Environmental Quality, 1997). The words baseline condition can be used in three ways in an impact study: (i) to define the conditions of pertinent resources, ecosystems, and human communities at an historical reference date and as reflected by trends to the current date; (ii) to define the current conditions (such as in Section 3 of the EIS, with the current conditions reflective of historical cumulative effects); and (iii) to define the future without the proposed action conditions based on forecasting changes for the future time period within the analysis. Descriptive information will be included on conditions reflective of an historical reference date and trends. Steps 5 and 6 previously discussed relate to current conditions, with summary information included. The future without the proposed action conditions is summarized in conjunction with Step 9.

- Step 8: Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities (Council on Environmental Quality, 1997). These relationships will be addressed by identifying and describing common pathways or connections between the construction and operation of the proposed Idaho Spent Fuel Facility; related past, present, and reasonably foreseeable future actions; and the affected resources, ecosystems, and human communities. This step is related to Steps 1 and 4 previously discussed and will be addressed in Section 4.14 of the EIS.

- Step 9: Determine the magnitude and significance of cumulative effects (Council on Environmental Quality, 1997). The magnitude of the cumulative effects will be determined based on information from selected tables in DOE (2002), as well as impact information from Sections 4.1–4.13 of this report. The significance of the cumulative effects was determined considering historical, current, and forecasted conditions for the affected resources, ecosystems, and human communities, along with professional judgment. Information related to this step is in Section 4.14 of the EIS.

- Step 10: Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects (Council on Environmental Quality, 1997). Because there are no significant incremental impacts from the proposed Idaho Spent Fuel Facility and no significant cumulative effects associated therewith, it would not be necessary to develop alternatives to avoid, minimize, or mitigate significant cumulative effects. The proposed facility already includes a number of design, construction, and operational measures that are focused on avoiding, minimizing, or mitigating direct, indirect, and cumulative effects. These measures are mentioned in various locations in Sections 2 and 4. In addition, they are addressed in a summary fashion in Section 5 of the EIS.

- Step 11: Monitor the cumulative effects of the selected alternative and adapt management (Council on Environmental Quality, 1997). Extensive monitoring of the physical-chemical and biological environment is already conducted at INEEL, including specific components that are related to Idaho Nuclear Technology and Engineering Center (INTEC) and its environs (including the site for the proposed Idaho Spent Fuel Facility). Because there are no significant incremental impacts from the proposed Idaho Spent Fuel Facility and no significant cumulative effects associated therewith, it would not be necessary to develop and implement a special cumulative effects monitoring program with related adaptive management strategies. Specific monitoring of selected parameters is planned for the proposed Idaho Spent Fuel Facility. For example, process and effluent radiation monitoring would include criticality monitoring, area radiation monitoring, radiation signature monitoring, continuous air monitoring, and exhaust gas stack sampling. This monitoring program is presented in Section 6 of the EIS.

Cumulative Impacts of Past Actions

This summary is of the affected environment in accordance with 13 topical areas classified as resources, ecosystems, or human communities. The information is abstracted from Sections 3.1–3.14. Detailed information and data can be found in these sections, along with information on pertinent regulatory thresholds and environmental management policies and requirements. The approach used is to describe current conditions, which are reflective of the cumulative effects from past actions at INEEL, along with actions from the 1940s, or earlier, which predate the DOE operations.

- Land Use (Sections 3.1 and 3.2)—Ecosystem: INEEL covers 230,850 ha [570,000 acres] in southeast Idaho, with about 2 percent {4,600 ha [11,400 acres]} developed to support DOE. One of nine developed areas is INTEC, located in the south-central part of INEEL. INTEC includes 150 buildings located on 101 ha [250 acres]. The proposed Idaho Spent Fuel Facility would be constructed on 3.2 ha [8 acres] adjacent to the southeast boundary of INTEC; construction laydown activities would also occur on an adjoining 4.1-ha [10-acre] area. Additional land uses at INEEL include 340,000 acres leased for cattle and sheep grazing. Future industrial development at INEEL is expected to occur in the central portion within existing major facility areas. A designated Sagebrush Steppe Ecosystem Reserve {29,672 ha [73,263 acres]} is located at INEEL; its southern boundary is 17.6 km [11 mi] north of INTEC. Approximately 75 percent of the land adjacent to INEEL is administered by the Bureau of Land Management for wildlife habitat, mineral and energy production, grazing, and recreation. Approximately 1 percent of the adjacent land is owned by the State of Idaho and is used for purposes similar to that of the federal government. The remaining

24 percent of the land adjacent to INEEL is privately owned and primarily used for grazing and crop production (DOE, 2002). Historical use of a portion of the INEEL land in the 1940s was as a bombing range; agricultural and grazing operations existed on a periodic basis prior to and during the 1940s.

- Transportation and Infrastructure (Section 3.3)—Human Community: Two interstate highways (86 and 15), three U.S. highways (91, 20, and 26), and one state highway (33) serve the regional area and provide access to INEEL. Approximately 140 km [87 mi] of paved roads are located within INEEL. One DOE-owned spur line provides railway access to INEEL. Historical trails and roads existed in the INEEL area and region prior to and during the 1940s.

- Geology and Soils (Section 3.4)—Resources: INEEL is located on the Eastern Snake River Plain, which is a broad northeast-trending basin that began filling with volcanic deposits approximately 6 million years ago. Overlying and interlacing the volcanic lavas are thin, discontinuous deposits of wind-blown sand and loess, floodplain, riverbed and lake sediments, and landslope debris. Surficial sediments at the proposed Idaho Spent Fuel Facility site consist mostly of gravel, gravelly sands, and sands. The proposed site has been previously disturbed, and its vegetation covers approximately 5 percent of the 3.2 ha [8 acres]. Site soils are below thresholds for radiological and nonradiological contaminants. No mineral resources are associated with the 3.2-ha [8-acre] site. Finally, there is a low rate of seismicity in the Eastern Snake River Plain, and the annual probability of nearby volcanic eruptions is also low. Historical agricultural and grazing activities on current INEEL lands may have caused some losses of soil caused by erosion. Radiological contamination of soils in the vicinity of INTEC would have occurred in more recent decades.

- Water Resources–Surface Water (Section 3.5.1)—Resources: Three main streams are associated with INEEL—the Big and Little Lost Rivers and Birch Creek. INTEC is located 61 m [200 ft] from the Big Lost River channel; however, INTEC is surrounded by a storm water drainage ditch system for controlling storm water runoff. Several studies of a probable maximum flood near INTEC have been conducted. Based on conservative assumptions, small areas of the northern portion of INTEC could flood at the estimated 100- and 500-year flows, but the southeast corner of INTEC, where the proposed Idaho Spent Fuel Facility would be located, is not within the estimated 100- and 500-year flood plains. Additional work is ongoing at INEEL by the U.S. Geological Survey and the Bureau of Reclamation to further refine flow frequency estimates for the Big Lost River in the vicinity of INTEC. Finally, it should be noted that no surface water is used as a water supply at INEEL.

  Water quality in the Big Lost River has remained fairly constant for the period of record. Applicable drinking water quality standards for measured physical, chemical, and radioactive parameters have not been exceeded (DOE, 1995). INEEL activities do not directly affect the quality of surface water because discharges are to artificial seepage and evaporation basins or storm water injection wells. Effluents are not discharged to natural surface waters. Water from the Big Lost River, however, as well as seepage from evaporation basins and storm water injection wells, does infiltrate the Snake River Plain Aquifer.

- Water Resources–Groundwater (Section 3.5.2)—Resources: The Snake River Plain Aquifer is the largest groundwater system in Idaho. As the major source of drinking water for southeast Idaho, it has been designated a sole-source aquifer by the U.S. Environmental Protection Agency. Aquifer recharge is primarily from the infiltration of irrigation water and by valley underflow from the mountains to the north and northeast of the plain. The vadose zone extends down from the ground surface to the top of the Snake River Plain Aquifer; at INTEC, the zone extends from the ground surface to 140–146 m [460–480 ft] below the ground surface. Three zones of perched groundwater occur at INTEC ranging approximately 9–98 m [30–322 ft] below the ground surface.

  Monitoring of groundwater quality at INEEL has been conducted within four categories—drinking water monitoring, compliance monitoring (source oriented), surveillance monitoring (of the groundwater), and special studies. INTEC drinking water wells are hydrologically upgradient of the INTEC facility; they would be used to supply water to the proposed Idaho Spent Fuel Facility. In 2000, the most recent year with published data, all drinking water samples collected at INTEC had concentrations below the maximum contaminant levels specified in federal and state drinking water regulations. Surveillance monitoring of perched and aquifer water underneath and downgradient from INTEC established that concentrations of several inorganics and radionuclides exceed the Safe Drinking Water Act maximum contaminant levels and secondary maximum contaminant levels. An indepth study of soil and groundwater contaminations at INTEC was conducted in 1995. The study indicated that both soil and groundwater contaminations existed relative to several inorganics and radionuclides (details are in Section 3.5.2.4).

  The two primary uses of water withdrawn from the Eastern Snake River Plain Aquifer are for agricultural irrigation and for INEEL operations. Nearly 1.77 trillion L [0.47 trillion gal] of water is withdrawn for agricultural purposes within the region. Annual water withdrawals by INEEL range from 6.4 to 7.2 billion L [1.7 to 1.9 billion gal]; the water is used for drinking purposes, as process water, and for noncontact cooling. Finally, DOE holds a Federal Reserved Water Right for INEEL, which permits a maximum water consumption of 43.2 billion L [11.4 billion gal] per year.

- Ecological Resources (Section 3.6)—Ecosystem: Ecological resources at INEEL include flora; fauna (terrestrial and aquatic); threatened, endangered, and sensitive species; and wetlands. Vegetation at INEEL is primarily of the shrub-steppe type; the 15 vegetation associations range from primarily shadescale-steppe vegetation at lower altitudes through sagebrush- and grass-dominated communities to juniper woodlands along the foothills of the nearby mountains and buttes. Facility and human-disturbed (grazing not included) areas include about 2 percent of INEEL, with introduced annuals, including Russian thistle and cheatgrass, frequently dominating disturbed areas. These species usually are less desirable to wildlife as food and cover and compete with more desirable perennial native species. Disturbances to vegetative cover from large wildfires have been a concern at INEEL in recent years. Previous studies at INEEL indicated that more than 270 vertebrate species occur, including 46 mammal, 204 bird, 10 reptile, 2 amphibian, and 9 fish. The monitoring of radionuclide levels outside the boundaries of the various INEEL facilities, and off INEEL, has detected radionuclide concentrations above background levels in individual plants and animals; however, these limited data do not suggest that populations of exposed animals (e.g., mice and rabbits) or animals that feed on these exposed animals (e.g., eagles and hawks) are at risk.

Seven bird species, six mammals, one reptile, and six plant species is listed as threatened or endangered, or species of concern, or other unique species. Details are contained in Section 3.6. None of these species has been identified at the site for the proposed Idaho Spent Fuel Facility; moreover, no critical habitat has been designated at the proposed site. Finally, the U.S. Fish and Wildlife Service National Wetlands Inventory identified more than 130 areas inside the boundaries of the INEEL that might possess some wetlands characteristics. Surveys conducted in the fall of 1992 indicated that these possible wetlands cover about 1.3 percent {3,323 ha [8,206 acres]} of INEEL. There are, however, no wetland-like areas within the INTEC boundary, including the site for the proposed Idaho Spent Fuel Facility.

- Air Quality (Section 3.7)—Resources: Monitoring and assessment of radiological air quality at INEEL and in the surrounding region have demonstrated that exposures resulting from airborne radionuclide emissions are well within applicable standards and are a small fraction of the dose from background sources. The National Emission Standards for Hazardous Air Pollutants includes an annual radiation dose limit of 0.1 mSv [10 mrem] to the hypothetical maximally exposed individual (MEI). The calculated off-site dose to the MEI from INEEL radiation sources is about 0.00031 mSv [0.031 mrem]; this dose is well below the National Emissions Standard for Hazardous Air Pollutants of 0.1 mSv [10 mrem] and the annual background dose of 3.6 mSv [360 mrem]. In summary, radioactivity and radiation levels resulting from INEEL site emissions are low, well within applicable standards, and negligible when compared with doses received from natural background sources. These summary remarks apply to on-site conditions to which INEEL workers or visitors may be exposed and to off-site locations where the general public population resides.

  Nonradiological air quality includes criteria pollutants regulated by the National and State of Idaho Ambient Air Quality Standards and other types of pollutants with potentially toxic properties called toxic or hazardous air pollutants. Criteria pollutants are nitrogen dioxide, sulfur dioxide, carbon monoxide, lead, ozone, and respirable particulate matter less than or equal to 2.5 μm [9.8×10^{-9} in] in diameter. Twenty-six toxic air pollutants are emitted from INEEL facilities. Monitoring and assessment of the nonradiological air quality on and around INEEL indicate the air quality is good and within applicable standards and guidelines. The area around INEEL is either in attainment or unclassified for all National Ambient Air Quality Standards. Portions of Bannock and Power Counties in Idaho, near the region of influence, are in a nonattainment area for particulate matter. For toxic emissions, all INEEL boundary and public road levels have been found to be well below reference levels appropriate for comparison. Similarly, all toxic pollutant levels at on-site locations at INEEL are below occupational limits established for the protection of workers. Detailed information on comparisons to standards is found in Section 3.7.

- Noise (Section 3.8)—Resources: The environmental noise levels at INEEL and the associated facilities are typical of industrial operations. No cumulative effects concerns have been identified for noise levels on and around INEEL.

- Historical, Cultural, and Paleontological (Section 3.9), Human Communities—Prehistoric settlement and use of the area now known as INEEL date back 12,000 years. Numerous archeological surveys have been conducted in recent years, and no known sites have been identified on the 3.2-ha [8-acre] proposed project site nor on the adjoining 4.1-ha [10-acre] construction laydown area. Within INTEC, there are 38 buildings and structures that are of historical significance and potentially eligible for listing on the National Register of Historic Places. Special concerns exist relative to early cultures and lifestyles of the Shoshone–Bannock Tribes, and their inability to maintain and revitalize their traditional cultures because of continuing restricted access to aboriginal lands, including some areas on INEEL. Finally, several types of paleontological resources have been identified within INEEL boundaries.

- Visual/Scenic (Section 3.10)—Human Community: Lands within and adjacent to INEEL are subject to the Bureau of Land Management Visual Resource Management Guidelines. Adjacent lands are designated as a visual resource Class II area, which allows for moderate industrial growth while preserving and retaining the existing character of the landscape. Lands within the boundaries of INEEL are designated as either Class III or Class IV areas, allowing for partial retention of existing character and major modifications, respectively. The INTEC area is a Class IV area. No major issues exist relative to these classifications and incompatibilities with current land uses within INEEL.

- Socioeconomical (Section 3.11)—Human Community: The total population in 2000 in the seven-county region of influence was 250,365. Population growth in the region of influence paralleled statewide growth from 1960 to 1990, with approximate average annual rates of 1.3 and 1.4 percent. From 1990 to 2000, however, state population growth accelerated to 2.9 percent a year, compared with the region of influence growth of 1.4 percent. Nevertheless, with these trends, the region of influence population would reach almost 269,000 by 2005 and 339,700 by 2025. In the 1990s, employment in the region of influence grew at an average annual rate of nearly 2.6 percent. In 2000, the region of influence experienced the lowest unemployment rate in a decade—4.0 percent. This rate was lower than the 4.9 percent for the state, though rates varied widely in the region of influence from 2.5 percent in Madison County to 5.0 percent in Bannock County. The INEEL influence on the regional economy is apparent from the fact that in fiscal year 2001, INEEL accounted for 8,100 jobs, or 6 percent of the total workforce in the region of influence. Finally, housing and key community services such as education, law enforcement, fire protection, and medical services do not appear to be overstressed in the region of influence.

- Environmental Justice (Section 3.12)—Human Community: The environmental justice study area was chosen to encompass an 80-km [50-mi] radius around INTEC. This area includes portions of the seven counties that compose the region of influence for socioeconomics. Census data from 2002 were used to identify minority populations. The 2000 population within the 80-km [50-mi] radius was 203,165, including a minority population of 21,898 (11 percent). The low-income population was based on 1990 data becasue the 2000 data were not available. The 1990 population was 170,989, including 20,110 within the definition of low income (12 percent).

- Public and Occupational Health and Safety (Section 3.13)—Human Community: The annual exposure to airborne releases of radioactivity vary from 0.0027 mSv [0.27 mrem] for an on-site worker, to a range of 0.00008–0.00031 mSv [0.008–0.031 mrem] for the hypothetical MEI. These doses are well below the 0.1 mSv/yr [10 mrem/yr] National Emissions Standard for Hazardous Air Pollutants limit in 40 CFR Part 61. Further, the annual doses to individuals are well below the natural background level of 3.6 mSv/yr [360 mrem/yr]. The number of latent cancer fatalities estimated in the surrounding population for the next 70 years is less than 1. Lifetime health effects from groundwater pathway exposures were estimated to be 1 in 170 million. Health risks to the public from nonradiological airborne emissions and groundwater consumption are less than 1 in 1 million, and in some cases, the risks are 0. Radiation workers at INEEL can be exposed to radiation internally from inhalation and ingestion and externally from direct exposure. The largest fraction of occupational dose received by INEEL workers is external radiation from direct exposure. The average annual occupational dose at INEEL between 1997 and 2000 was 0.84 mSv [84 mrem]. This value is well below the annual occupational dose limit of 50 mSv [5,000 mrem] in 10 CFR Part 20.

- Waste Management (Section 3.14)—Resource: A variety of radioactive wastes are stored, generated, or both at INEEL. The current stored inventory includes 2,100 m^3 [2,750 yd^3] of mixed low-level waste; 980 m^3 [1,280 yd^3] of low-level waste; 65,000 m^3 [85,000 yd^3] of transuranic waste; 4,400 m^3 [5,750 yd^3] of HLW; and 3,785,000 L [1 million gal] of mixed transuranic waste/sodium-bearing waste. The annual generation of wastes includes 43,000 m^3 [56,250 yd^3] of industrial solid waste; 120 m^3 [150 yd^3] of hazardous waste; 160 m^3 [210 yd^3] of mixed low-level waste; and 2,900 m^3 [3,800 yd^3] of low-level waste. Industrial and commercial solid waste is disposed of at the INEEL Landfill Complex in the Central Facilities Area. Hazardous waste is minimized and managed via private sector treatment and disposal. The annual generation of mixed low-level and low-level radioactive waste is stored at the Radioactive Waste Management Complex.

Table 4-13 provides a synopsis of the effects and concerns and the basis for their classification.

References

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