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APPENDIX D ACRONYMS AND ABBREVIATIONS

ACRONYMS AND ABBREVIATIONS

A

A1W	Large Ship Reactor Prototype
AAC	acceptable air concentration
AACC	acceptable air concentration of carcinogens
AAQS	Idaho Ambient Air Quality Standards
ACGIH	American Conference of Government Industrial Hygienists
AE	architectural engineering
AEA	Atomic Energy Act of 1954
AIRFA	American Indian Religious Freedom Act
ALARA	as low as reasonably achievable
ANL-W	Argonne National Laboratory-West
ANSI	American National Standards Institute
APCE	air pollution control equipment
App.	Appendix
APS	atmospheric protection system
ARA	Auxiliary Reactor Area
ARAR	applicable or relevant appropriate requirement
ARMF	Advanced Reactivity Measurement Facility
ARN	Asbestos Removal Notification
ARPA	Archeological Resources Protection Act
ARVFS	Army Reentry Vehicle Entry Facility Site
ASB	Air Support Building
ASWS	air support weather shield
ATR	Advanced Test Reactor

B

BA	Bachelor of Arts Degree
BACT	best available control technology
BEIR V	Biologic Effects of ionizing Radiation (NAS-NRC committee)
BLEVE	boiling liquid-expanding vapor explosion
BLM	U.S. Bureau of Land Management
BORAX	Boiling Water Reactor Experiment
BS	Bachelor of Science Degree

C

CAA	Clean Air Act
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and

	Liability Act
CPA	Central Facilities Area
CFC	chlorofluorocarbons
CFR	Code of Federal Regulations
CPRMF	Coupled Fast Reactivity Measurement Facility
CH-TRU	contact-handled transuranic waste
CHP	certified health physicist
Ci	curies
cm	centimeters
COCA	Consent Order and Compliance Agreement
COE	Corps of Engineers
CPP	Chemical Processing Plant
CTF	Core Test Facility
CWA	Clean Water Act
	D
D&D	decontamination and decommissioning
dBA	decibel A-weighted
DBA	design basis accident
DCG	Derived Concentration Guide
DEIS	Draft Environmental Impact Statement
DEQ	Division of Environmental Quality (State of Idaho)
DOE	U.S. Department of Energy
DOE-CH	U.S. Department of Energy-Chicago Operations Office
DOE-Chicago	U.S. Department of Energy-Chicago Operations Office
DOE-ID	U.S. Department of Energy-Idaho Operations Office
DOI	U.s. Department of the Interior
DOT	U.S. Department of Transportation
DRCT	Dry Rod Consolidation Technology
DVF	Drum Venting Facility
	E
EA	environmental assessment
EBR-I	Experimental Breeder Reactor
EBR-II	Experimental Breeder Reactor II
ECF	Expended Core Facility
EDE	effective dose equivalent
EDF	Engineering Design File
EIS	Environmental Impact Statement
EM	Environmental Restoration and Waste Management (DOE Headquarters)
EMT	emergency medical technician
EO	Executive Order (U.S. president)
EP	environmental program
EPA	Environmental Protection Agency
ER&WM	Environmental Restoration and Waste Management
ERPG	Emergency Response Planning Guide

ERPG3	Emergency Response Planning Guide Level 3
ES	executive summary
ESF	engineered-safety features
exp.	exposure
	F
FAST	Fluorinel Dissolution Process and Fuel Storage
FDM	frequency division multiplex
FDM	Fugitive Dust Model
FDP	fluorinel dissolution process
FECF	Fuel Element Cutting Facility
FEIS	Final Environmental Impact Statement
FFA/CO	Federal Facility Agreement and Consent Order
FFC Act	Federal Facility Compliance Act
FMC	Food, Machinery, and Chemical Corporation
FONSI	finding of no significant impact
FPR	fuel processing restoration
FR	Federal Register
FSA	Fuel Storage Area
FSV	Fort St. Vrain
FTE	full-time employee
FWHA	Federal Highway Administration
FWS	U.S. Fish and Wildlife Service
FY	fiscal year
	GH
GPP	General Plant Project
GTCC	greater-than-Class-C (waste)
haz.	hazardous
HEPA	high-efficiency particulate air (filter)
HFEF	Hot Fuel Examination Facility
HLLW	high-level liquid waste
HLW	high-level waste
HPIL	Health Physics Instrument Laboratory
HTRE-3	Heat Transfer Reactor Experiment No. 3
HW	hazardous waste
HWMA	Hazardous Waste Management Act
HWSF	Hazardous Waste Storage Facility
	I
IAEA	International Atomic Energy Agency
IAG	Interagency Agreement
IAQB	Idaho Air Quality Bureau (now known as Division of Environmental Quality)
IBO	Idaho Branch Office (of Pittsburgh Naval Reactors)
IC	industrial/commercial waste
ICPP	Idaho Chemical Processing Plant
ICRP	International Commission on Radiation Protection
IDE	Idaho Department of Education
IDHW	Idaho Department of Health

	and Welfare
IDLH	immediate danger to life or health
IDO	Department of Energy-Idaho Operations Office reports
IDWR	Idaho Department of Water Resources
IET	Initial Engine Test
IFSF	Irradiated Fuel Storage Facility
ILTSF	Intermediate-Level Transuranic Storage Facility
ind.	industrial
INEL	Idaho National Engineering Laboratory
INPS	Idaho Natural Plant Society
IPC	Idaho Power Company
IRC	INEL Research Center
ISC2	Industrial Source Complex 2
ISDE	Idaho State Department of Employment
ISU	Idaho State University
IWPF	Idaho Waste Processing Facility
	JKL
JD	Juris Doctor (Doctor of Law)
K	one thousand
kl	kiloliters
km	kilometers
kV	kilovolt
l	liters
LDR	land disposal restrictions
LLW	low-level waste
	M
ug	micrograms
m	meters
m^3	cubic meters
MA	Master of Arts Degree
MACT	maximum achievable control technology
MCL	maximum containment level
MCW	maximally exposed co-located worker
MEI	maximally exposed individual
mil.	millions
MLLW	mixed low-level waste
MLLWTF	Mixed Low-Level Waste Treatment Facility
MPA	Master's Degree in Public Affairs
mrem	millirem
MRW	mixed radioactive waste
MS	Master of Science Degree
MTHM	metric tons of heavy metal
MTR	Materials Test Reactor
MW	mixed waste
MWh	megawatt hours
	N
NA, N/A	not applicable
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NAS	National Association of Science

NCR	notification of change report
NCRP	National Council on Radiation Protection
NDE/NDA	nondestructive examination/ nondestructive analysis
NEC	National Electrical Code/ Nuclear Energy Center
NEPA	National Environmental Policy Act of 1969
NESHAP	National Emission Standard for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NIOSH	National Institute for Occupational Safety and Health
NOA	notice of availability
NOAA	National Oceanic and Atmospheric Association
NODA	Naval Ordnance Disposal Area
NOI	Notice of Intent
NON	Notice of Noncompliance
NOO	Notice of Opportunity
NPDES	National Pollutant Discharge Elimination Systems
NPL	National Priority List
NPR	New Production Reactor
NPRD	New Production Reactor Department
NPS	National Park Service
NRC	U.S. Nuclear Regulatory Commission
NRF	Naval Reactors Facility
NSC	National Security Council
NTIS	National Technical Information Service
NUREG	Nuclear Regulatory Guide
NWCF	New Waste Calcining Facility
NWPA	Nuclear Waste Policy Act of 1982
NYSERDA	New York State Energy Research and Development Authority
	op
OCRWM	Office of Civilian Radioactive Waste Management
OIP	operating internal pressure
ops.	operations
ORR	Oak Ridge Reservation
OSHA	Occupational Safety and Health Administration
PBF	Power Burst Facility
PCB	polychlorinated biphenyl
pCi	picocuries
PEIS	programmatic environmental impact statement
PEW	process equipment waste
PhD	a doctoral degree
PMF	probable maximum flood
PNL	Pacific Northwest Laboratory
PREPP	Process Experimental Pilot Plant
PSAWT	private sector alpha low-level waste treatment
PSD	prevention of serious

	deterioration
PSD	plant safety document
PTC	permit to construct
PTI	Protection Technology Idaho
PTO	permit to operate
	QR
R&D	research and development
RCRA	Resource Conservation and Recovery Act
RESL	Radiological and Environmental Sciences Laboratory
RFP	Request for Proposal
RI/FS	Remedial Investigation/ Feasibility Study
RLWTF	Radioactive Liquid Waste Treatment Facility
RMWSF	Radioactive Mixed Waste Storage Facility
ROD	Record of Decision
ROI	region of influence
RSAC-5	Radiological Safety Analysis Computer Program
RSWF	Radioactive Scrap and Waste Facility
RW	radioactive waste
RWMC	Radioactive Waste Management Complex
RWMIS	Radioactive Waste Management Information System
	S
S1W	Submarine Thermal Reactor
S5G	Submarine Reactor
SAA	Satellite Accumulation Area (process waste)
SAIC	Science Applications International Corporation
SAR	Safety Assessment Report
SARA	Superfund Amendments and Reauthorization Act
scfm	standard cubic feet per minute
SDA	Subsurface Disposal Area
SDWA	Safe Drinking Water Act
SF	support facilities
SL-1	Stationary Low-Power Reactor No. 1
SMC	Specific Manufacturing Complex
SNF	spent nuclear fuel
SNF and INEL EIS	Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement
SPERT	Special Power Excursion Reactor Test
SPF	Sodium Process Facility
spp.	species

SSC	species of special concern (State of Idaho)
SWEPP	Solid Waste Examination Pilot Plant
SWMU	solid waste management unit
	T
TAN	Test Area North
TBD	to be determined
TCE	tetrachloroethylene
TCLP	toxicity characterization leeching procedure
TEDE	total effective dose equivalent
THEF	Thermal Hydraulic Experiment Facility
TLD	thermoluminescent dosimeters
TLV-TWA	threshold limit valve/time weighted average
TMI	Three-Mile Island
TPSP	TAN (Test Area North) Pool Stabilization Project
TRA	Test Reactor Area
TRANSAX	transportation accident exercise
TRD	Technical Resource Document
TRU	transuranic waste
TRUPACT	transuranic packaging container
TSA	Technical Support Annex
TSA	Transuranic Storage Area
TSCA	Toxic Substances Control Act
TSD	Treatment, Storage, or Disposal (Facility)
TSD	Technical Support Document
TSF	Technical Support Facility
	U
UCRL	University of California Research Laboratory
UCW	utility cooling water
USBC	U.S. Bureau of the Census
USC	United States Code
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
	VW
VOC	volatile organic compound
VVE	vapor vacuum extraction
WAG	Waste Area Group
WCC	Warning Communication Center
WCF	Waste Calcining Facility
WEC	Westinghouse Electric Corporation
WEDF	Waste Engineering Development Facility
WERF	Waste Experimental Reduction Facility
WHF	Waste Handling Facility
WIF	Waste Immobilization Facility
WINCO	Westinghouse Idaho Nuclear Company
WIPP	Waste Isolation Pilot Plant
WM	waste management
WMO	Waste Management Office
WMO	World Meteorological Organization
WNYNSC	Western New York Nuclear Service Center

WRRTF	Water Reactor Research Test Facility
WTD	waste technology development
WVDP	West Valley Demonstration Project
WWSB	Waste Experimental Reduction Facility Waste Storage Building
	XVZ
ZPPR	Zero Power Physics Reactor

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APPENDIX E

GLOSSARY

Terms in this glossary are defined based on the context in which they are used in t
100-year flood A flood event of such magnitude it occurs, on average, every 100 ye
a 1 percent probability of occurring in any given year).
500-year flood A flood event of such magnitude it occurs, on average, every 500 ye
a 0.2 percent probability of occurring in any given year).
absorbed dose The energy imparted by ionizing radiation per unit mass of irradiate
The unit of absorbed dose is the rad.
accelerator produced radioactive material Radioactive material that was produced i
particle accelerator.
acceptable ambient concentration for a carcinogen (AACC) Ambient air quality stand
based on the probability of developing excess cancers over a 70-year lifetime expos
microgram per cubic meter (1ug/m^3) of a given carcinogen and expressed in terms of
emission level or an acceptable ambient concentration for a carcinogenic toxic air
acceptable ambient concentration for a noncarcinogen (AAC) Ambient air quality sta
based on occupational exposure limits for airborne toxic chemicals expressed in ter
emission level or an acceptable ambient concentration for a noncarcinogenic toxic a
accident An unplanned sequence of events that results in undesirable consequences.
actinide Any of a series of chemically similar, mostly synthetic, radioactive elem
numbers ranging from actinium-89 through lawrencium-103.
acute exposure The absorption of a relatively large amount of hazardous material (
hazardous material) over a short period of time.
adsorption The attraction and adhesion of ions or molecules in a gaseous or aqueou
solid surface.
air pollutant Any substance including, but not limited to, dust, fumes, gas, mist,
vapor, pollen, soot, carbon, or particulate matter that is regulated.
air quality The specific measurement in the ambient air of a particular air pollut
time.
air quality criteria The varying amounts of pollution and lengths of exposure at w
adverse effects to health and welfare take place.
air quality standard The prescribed level of a pollutant in the outside air that c
during a specified time in a specified geographical area. Established by both Feder
governments.
alluvium Sedimentary material deposited by flowing water, as in a river bed or del
alpha-emitter A radioactive substance that decays by releasing an alpha particle.
alpha low-level waste Waste that was previously classified as transuranic waste bu
transuranic concentration lower than the currently established limit for transurani
level waste requires additional controls and special handling. This waste stream ca
for onsite disposal under the current waste acceptance criteria; therefore, it is s
alpha-particle A positively charged particle ejected spontaneously from the nuclei
radioactive elements. It is identical to a helium nucleus that has a mass number of
electrostatic charge of +2.
ambient air That portion of the atmosphere outside of buildings to which the genera
access.
applicable or relevant and appropriate requirements (ARARs) Requirements, includin
cleanup standards, standards of control, and other substantive environmental protec
and criteria for hazardous substances as specified under Federal and State law and
must be met when complying with the Comprehensive Environmental Response, Compensat
Liability Act of 1980 (CERCLA).
aquifer A body of rock or sediment sufficiently permeable to conduct groundwater a
significant quantities of water to wells and springs.
as low as reasonably achievable (ALARA) A process by which a graded approach is ap
maintaining dose levels to workers and the public and releases of radioactive mater
environment as low as reasonably achievable.
attainment area Any area which is designated, pursuant to 42 U.S.C. Section 7407(d
Clean Air Act, as having ambient concentrations equal to or less than national prim
ambient air quality standards for a particular air pollutant or air pollutants.

atomic number The number of positively charged protons in the nucleus of an atom an number of electrons on an electrically neutral atom.
background level The value assigned to the quantity of particulate or gaseous mate air which originates from natural sources uninfluenced by the activity of man.
background radiation Radiation from cosmic sources, naturally occurring radioactiv including radon (except as a decay product of source or special nuclear material), it exists in the environment from the testing of nuclear explosive devices.
basalt A general term for dark-colored, fine-grained igneous rock. Commonly extrus composed primarily of calcic plagioclase and pyroxene minerals.
baseline For purposes of this EIS, the conditions projected to exist in June 1995, date for the Record of Decision, against which the environmental consequences of th alternatives are evaluated.
below regulatory concern A definable amount of low-level waste that is sufficientl can be deregulated with minimal risk to the public.
best available control technology (BACT) An emission standard (including fuel clea treatment or innovative fuel combination techniques) for control of such contaminan be determined on a case-by-case basis, taking into account energy, environmental an impacts, and other costs, and shall be at least as stringent as any applicable Sect 60 and 40 CFR Part 61. If an emissions standard is infeasible, a design, equipment, operational standard, or combination thereof, may be prescribed as BACT.
beta-emitter A radioactive substance that decays by releasing a beta particle.
beta-particle A charged particle emitted from a nucleus during radioactive decay, equal to 1/1837 that of a proton. A negatively charged beta particle is identical t positively charged beta particle is called a positron.
beyond design basis accidents Accidents of the same type as a distinct design basi (fire, earthquake, and so forth) but defined by parameters that exceed in severity defined for the distinct design basis accident.
bound To estimate or describe an upper limit on a potential environmental conseque uncertainty exists.
bounding That which represents the maximum reasonably foreseeable event or impact. reasonably foreseeable events or impacts would have fewer and/or less severe enviro consequences.
breeder reactor A type of nuclear reactor that creates more fissionable fuel than i
buffer zone An area designed to separate. Specifically, the portion of a disposal controlled by the licensee and that lies under and between the disposal units and t site.
by-product material (a) Any radioactive material (except special nuclear material) made radioactive by, exposure to the radiation incident to the process of producing nuclear material, and (b)the tailings or wastes produced by the extraction or conce or thorium from any ore processed primarily for its source material content [Atomic 11(e)]. By-product material is exempt from regulation under the Resource Conservati Recovery Act.
calcination The process of converting high-level waste to unconsolidated granules called calcining).
calcine The materials produced by calcination.
canning The process of placing spent nuclear fuel in canisters to retard corrosion radioactive releases, or control geometry.
certification plan See waste certification plan.
certified waste Waste that has been confirmed to comply with the waste acceptance treatment, storage, or disposal facility for which it is intended under an approved program.
certifying authority or official An organization or person outside the waste gener organization who is responsible for certifying that the waste being sent to a treat disposal facility meets the requirements of the receiving facility's waste acceptan
characterization The determination of waste composition and properties, whether by process knowledge, nondestructive examination or assay, or sampling and analysis, g the purpose of determining appropriate storage, treatment, handling, transportation requirements.
chronic exposure The absorption of hazardous material (or intake of hazardous mater long period of time (for example, over a lifetime).
cladding The outer jacket of fuel elements and targets usually made of aluminum, s or zirconium-aluminum alloy, used to prevent fuel corrosion and retain fission prod operation, or to prevent releases into the environment during storage.
Class I area Under the Clean Air Act, any Federal land that is classified or recla

The designation applies to pristine areas, such as national parks and wilderness ar substantial growth is effectively precluded in order to avoid any degradation of th
clean waste Waste products that are neither radioactive nor hazardous but require disposal in a solid waste landfill.
closure Deactivation, stabilization, and surveillance of a waste management unit, facility. Closure often refers to the process under the Resource Conservation and R involving the preparation and signing of a Closure Plan.
cold nuclear fuel Nuclear reactor fuel which has not been exposed to a neutron flu reactor.
collective dose The sum of the individual doses received in a given period of time population from exposure to a specified source of radiation. The units of collectiv rem.
co-located workers Workers in a fixed population outside the day-to-day process sa management controls of a given facility area. In practice, this fixed population is workers at an independent facility area located some distance from the reference fa
commercial waste management facility A facility located off DOE-controlled property not managed by DOE to which DOE sends waste for treatment, storage, and/or disposal
committed dose equivalent (H50) The dose equivalent to organs or tissues of refere be received from an intake of radioactive material by an individual during the 50-y following the intake. The International Commission on Radiological Protection defin committed equivalent dose.
committed effective dose See committed effective dose equivalent.
committed effective dose equivalent (HE,50) The sum of the products of the weighti applicable to each of the body organs or tissues that are irradiated and the commit to these organs or tissues. The International Commission on Radiological Protection the committed effective dose.
Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) A Federal law (also known as "Superfund") that provides a comprehensive f to deal with past or abandoned hazardous materials. The Comprehensive Environmental Compensation, and Liability Act of 1980 (CERCLA) provides for liability, compensati and emergency response for hazardous substances released into the environment that public health, welfare, or the environment, as well as the cleanup of inactive haza sites. CERCLA has jurisdiction over any release or threatened release of any "hazar to the environment. Under CERCLA, the definition of "hazardous" is much broader tha Resource Conservation and Recovery Act, and the hazardous substance need not be a w meets the CERCLA requirements for designation, it is ranked along with other "Super listed on the National Priorities List. This ranking and listing is the U.S. Envir Agency's way of determining which sites have the highest priority for cleanup.
committed equivalent dose See committed dose equivalent.
confinement General control of contaminants through engineering design, such as he ventilation systems that use high-efficiency particulate air (HEPA) filters to remo before discharge to the atmosphere. Such systems may break down or experience a los power that would "lose confinement" temporarily. This may require evacuation of the would not lead to significant consequences to workers or a significant release.
Consent Order and Compliance Agreement (COCA) A legally binding agreement signed i 1987 between the U.S. Department of Energy Idaho Field Office (DOE-ID), U.S. Enviro Protection Agency Region 10 (EPA Region 10), and the U.S. Geological Survey (USGS). agreement addressed environmental restoration activities at the INEL. The COCA was the Federal Facilities Agreement/Consent Order, among DOE-ID, EPA Region 10, and th Idaho, signed in December 1991.
contact-handled waste Packaged waste whose external surface dose rate does not exce millirem per hour.
containerization The process of placing radioactive or other hazardous material in receptacle for storage or transport. For spent nuclear fuel, this is called canning
containment The provision of a gastight shell or other enclosure around a reactor t fission products that otherwise might be released into the atmosphere in the event
contamination The deposition of unwanted radioactive material on the surfaces of st areas, objects, or personnel.
contingency plan A document setting out an organized, planned, and coordinated cou to be followed in case of unanticipated events such as fire, explosion, or other ev toxic chemicals, hazardous wastes, or radioactive materials to threaten human healt environment. The goal of the contingency plan is the containment or mitigation of t resulting from the event.
continuity of operations Activities that include developing strategic and long-rang

management plans, surveillance and maintenance of facilities and equipment, waste c
proper training programs for personnel, and record/information administration.
control equipment Any method, process or equipment which removes, reduces, or rend
noxious, air pollutants discharged into the atmosphere.
coolant A gas or liquid circulated through a nuclear reactor to remove or transfer
core The central portion of a nuclear reactor containing the fuel elements, moderat
poisons, and support structures.
criteria air pollutant Under the Clean Air Act, and the State of Idaho air quality
air pollutant for which there is a State or national ambient air quality standard.
cumulative impact The impact on the environment which results from incremental impa
action when added to other past, present, and reasonably foreseeable future actions
agency (Federal or non-Federal) or person undertakes such other actions. Cumulative
result from individually minor but collectively significant actions taking place ov
curie (Ci) The basic unit used to describe the intensity of radioactivity in a sam
curie is equal to 37 billion disintegrations per second, which is approximately the
gram of radium. A curie is also a quantity of any radionuclide that decays at a rat
disintegrations per second.
decay, radioactive The decrease in the amount of any radioactive material with the
time, due to the spontaneous emission from the atomic nuclei of either alpha or bet
accompanied by gamma radiation. (See half-life; radioactive.)
decommissioning The process of removing a facility from operation, followed by
decontamination, entombment, dismantlement, or conversion to another use.
decontamination The actions taken to reduce or remove substances that pose a subst
or potential hazard to human health or the environment, such as radioactive contami
facilities, soil, or equipment by washing, chemical action, mechanical cleaning, or
defense waste Radioactive waste from any activity performed in whole or in part in
DOE atomic energy defense activities; excludes waste from DOE nondefense activities
the purview of the U. S. Nuclear Regulatory Commission or generated by the commerci
power industry.
delta E A parameter used to define color shift in visual impact modeling. It is th
for determining perceptibility of plume visual impact in screening analyses.
design basis accident (DBA) Accidents that are postulated for the purpose of estab
functional requirements for safety significant structures, systems, components, and
diffusion The process by which a pollutant plume is diluted by turbulent eddies.
discharge Under principles of hydrogeology, the amount of water passing through (o
given cross-sectional area in a given period of time. Under the Clean Water Act, di
pollutant, which includes any addition of any pollutant or combination of pollutant
United States from any point source. This definition includes additions of pollutan
the United States from: surfaced runoff which is collected or channeled by man; dis
pipes, sewers, or other conveyances owned by a State, municipality, or person which
treatment works; and discharges through pipes, sewers, or other conveyances, leadin
owned treatment works.
dispersion In air pollution, the process of transport and diffusion of airborne co
atmosphere.
disposal Emplacement of waste in a manner that ensures protection of human health
environment within prescribed limits for the foreseeable future with no intent of r
requires deliberate action to regain access to the waste.
disposal facility A facility or part of a facility at which hazardous waste is int
into or on any land or water and at which waste will remain after closure.
dissolution The ability of water to take a substance into solution.
DOE orders Requirements internal to the U.S. Department of Energy (DOE) that estab
policy and procedures, including those for compliance with applicable laws.
DOE site boundary A geographic boundary within which public access is controlled a
are governed by the U.S. Department of Energy (DOE) and its contractors, not by loc
Based on the definition of exclusion zone, a public road traversing a DOE site is c
within the DOE site boundary if DOE or the site contractor has the capability to co
any time necessary.
dose (or radiation dose) A generic tern that means absorbed dose, dose equivalent,
dose equivalent, committed dose equivalent, committed effective dose equivalent, or
dose equivalent, as defined elsewhere in this glossary.
dose conversion factor Any factor that is used to change an environmental measureme
in the units of concern. Frequently used as the factor that expresses the committed
equivalent to a person from the intake (inhalation or ingestion) of a unit activity
radionuclide.

dose equivalent The product of the absorbed dose in tissue, quality factor, and al
modifying factors at the location of interest. The unit of dose equivalent is the r
International Commission on Radiation Protection defines this as the equivalent dos
dose rate The radiation dose delivered per unit of time; measured, for example, in
dry storage Storage of spent nuclear fuel in environments where the fuel is not im
for purposes of cooling and/or shielding.
earthquake magnitude A measure of earthquake size, determined by taking the common
logarithm (base 10) of the largest ground motion recorded during the arrival of a s
and applying a standard correction for distance to the epicenter. Three common type
are Richter (or local) (ML), P body wave (mb), and surface wave (M8).
effective dose See effective dose equivalent.
effective dose equivalent (EDE) The sum of the products of the dose equivalent to
tissue and the weighting factors applicable to each of the body organs or tissues t
includes the dose from radiation sources internal and/or external to the body and i
of rem. The International Commission on Radiation Protection defines this as the ef
effluent The wastewater, treated or untreated, that flows out of a facility. Genera
discharged into surface waters.
emission Any controlled or uncontrolled release or discharge into the outdoor atmo
air pollutants or combination thereof. Emission also includes any release or discha
pollutant from a stack, vent, or other means into the outdoor atmosphere that origi
emission unit.
emission standard A permit or regulatory requirement established by the Idaho Depa
Health and Welfare, or a requirement contained in 40 CFR Part 60, 40 CFR Part 61, o
State Implementation Plan (SIP), which limits the quantity, rate, or concentration
continuous basis, including any requirements which limit opacity, prescribe equipme
specifications, or prescribe operation or maintenance procedures to assure continuo
control.
engineered barriers Manmade components of a waste management system or facility de
prevent or impede the release of radionuclides or other waste material into the bio
includes the waste form, radioactive waste containers, and other materials placed o
such containers, and physical features of the system or facility.
enriched uranium Uranium that has greater amounts of the fissionable isotope urani
occurs naturally. Naturally occurring uranium is 0.72 percent uranium-235.
environmental monitoring The process of sampling and analysis of environmental med
around a facility being monitored for the purpose of (a) confirming compliance with
objectives and (b) early detection of any contamination entering the environment to
remedial action.
environmental restoration Cleanup and restoration of sites and decontamination and
decommissioning of facilities contaminated with radioactive and/or hazardous substa
production, accidental releases, or disposal activities.
environmental restoration program A DOE subprogram concerned with all aspects of
assessment and cleanup of both contaminated facilities in use and of sites that are
active operations. Remedial actions, most often concerned with contaminated soil an
and decontamination and decommissioning are responsibilities of this program.
eolian Applied (a) to deposits arranged by the wind, (b)to the erosive action of t
deposits which are due to the transporting action of the wind.
equivalent dose See dose equivalent.
existing facilities Facilities that are projected to exist as of the Record of Dec
scheduled for June 1995.
exposure Being exposed to ionizing radiation or to hazardous material. Alternativel
of the ionization produced in air by X or gamma radiation; the unit of exposure in
external accident Accidents initiated by manmade energy sources not associated wit
a given facility. Examples include airplane crashes, induced fires, transportation
a facility, and so forth.
external dose That portion of the dose equivalent received from radiation sources
body.
facility (a) Any building, structure, installation, equipment, pipe or pipeline (i
into a sewer or publicly owned treatment works), well, pit. pond, lagoon, impoundme
landfill, storage container, motor vehicle, rolling stock, or aircraft; or (b) any
hazardous substance has been deposited, stored, disposed of, placed, or otherwise c
facility area The area within the DOE site boundary immediately surrounding a faci
facilities that functions under process safety management programs and a common eme
response plan. This definition covers any building within such an area regardless o
dedicated to production, waste handling, or administrative issues; for example, an

cafeteria, a production facility, a machine shop, and a waste handling facility all common boundary. If programs such as radiation protection, training, auditing, and integral part of safety management at each facility and emergency response plans co responses of individuals at all buildings, then the collection of buildings constit All personnel in the area are facility workers, not co-located workers.

facility area boundary The geographic boundary of an area controlled on a daily bas safety management and a common emergency response plan.

facility security plan In the context of waste management, a security plan is one measures required by law, regulation, or good judgment for prevention of unknowing entry into a treatment, storage, or disposal facility; or operation of facility equ access to waste material or spent nuclear fuel.

facility worker Any worker whose day-to-say activities are controlled by process s management programs and a common emergency response plan associated with a facility area. This definition includes any individual within a facility/facility area or it area. This definition can also include those transient individuals or small populat exclusion zone but inside the radius defined by the maximally exposed co-located wo efforts to account for such people have been made in the facility or facility area facility accident analyses, the facility worker is defined as an individual located downwind of the facility location where an accidental release occurs.

feasibility study (FS) A step in the environmental restoration process specified b Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERC objectives are to identify the alternatives for remediation and describe a remedial applicable or relevant appropriate requirements (ARRs) for mitigating confirmed env contamination. The FS presents a series of specific engineering or construction alt dealing up a site; for each alternative presented, there will be a detailed analysi engineering feasibility, and environmental impacts. The FS is based on information remedial investigation (RI). Successful completion of an FS should result in a deci Decision) selecting a remedial action alternative and the subsequent development of for implementation of the selected remedial action.

Federal Facility Compliance Act (FFCA) Federal law signed in October 1992 amending Resource Conservation and Recovery Act. The objective of the FFCA is to bring all F facilities into compliance with applicable Federal and State hazardous waste laws, sovereign immunity under those laws, and to allow the imposition of fines and penal also requires the U.S. Department of Energy to submit an inventory of all its mixed develop a treatment plan for mixed wastes.

Federal Facility Agreement and Consent Order (FFA/CO) A binding agreement, negotiat pursuant to Section 120 of CERCLA, signed by DOE, the Environmental Protection Agen 10, and the State of Idaho, to coordinate cleanup activities at the INEL. The FFAIC Plan outline the remedial action process that will encompass all investigation of h release sites. The FFA/CO superseded the Consent Order and Compliance Agreement (CO

Federal land manager The Secretary of the Federal department with authority over an lands in the United States.

field offices An administrative division of the DOE that operates facilities that jurisdiction.

fiscal year (FY) The time frame specified by any public or private entity to separa financial (fiscal) activities from the next year's. The 1994 Federal Fiscal Year (F October 1, 1993, and ended on September 31, 1994.

fissile material Although sometimes used as a synonym for fissionable material, th acquired a more restricted meaning; namely, any material fissionable by thermal (sl The three primarily fissile materials are uranium-233, uranium-235, and plutonium-2

fission The splitting of a nucleus into at least two other nuclei and the release amount of energy. Two or three neutrons are usually released during this type of tr

fission products The nuclei (fission fragments) formed by the fission of heavy ele nuclides formed by the fission fragments' radioactive decay.

fissionable material Commonly used as a synonym for fissile material, the meaning o has been extended to include material that can be fissioned by fast neutrons, such

fluorides Gaseous or solid compounds containing fluorine emitted into the air from industrial processes.

free liquid Liquid that is not absorbed into host material such that it could readi solid portion of a waste under ambient temperature and pressure and spill or drain

fugitive dust Dust that is stirred up and released into the atmosphere during const Fugitive emissions composed of particulate matter.

fugitive emissions Those emissions which could not reasonably pass through a stack vent, or other functionally equivalent opening.

gamma-emitter A radioactive substance that decays by releasing gamma radiation.
gamma ray (gamma radiation) High-energy, short wavelength electromagnetic radiatio packet of energy) emitted from the nucleus. Gamma radiation frequently accompanies emissions and always accompanies fission. Gamma rays are very penetrating and are b shielded against by dense materials, such as lead or uranium. Gamma rays are simila are usually more energetic.
generator (generation) Organizations of the DOE that produce waste.
geologic repository A system that is intended to be used for, or may be used for, radioactive waste or Spent nuclear fuel in excavated geologic media. A geologic rep (a) the geologic repository operations area, and (b)the portion of the geologic set isolation. A near-surface disposal area is not a geologic repository.
geothermal energy The energy available from natural sources of heat, such as hot s near-surface heat sources in volcanically active areas.
graded approach A process by which the level of analysis, documentation, and actio to comply with a requirement are commensurate with (a) the relative importance to s and security; (b) the magnitude of any hazard involved; (c) the lifecycle stage of programmatic mission of a facility; (e) the particular characteristics of a facilit relevant factor.
graphite fuel Fuel that consists of small pellets of highly enriched uranium (HEU) surrounded by protective layers of other carbide compounds. These pellets are dispe larger graphite structures for handling and neutron moderation.
greater-than-Class-C waste (GTCC) Low-level radioactive waste that is generated by commercial sector and that exceeds U. S. Nuclear Regulatory Commission concentratio Class-C low-level waste as specified in 10 CFR 61. DOE is responsible for the dispo than-Class-C wastes from DOE nondefense programs.
groundwater Generally, all water contained in the ground. Water held below the wat available to freely enter wells.
grouting Grouting is the process of immobilizing or fixing solid forms of waste so more safely stored or disposed.
half-life The time in which half the atoms of a particular radioactive substance d another nuclear form. Measured half-lives vary from millionths of a second to billi Also called physical half-life.
hazard classification A safety classification based on potential onsite consequenc this classification are discussed in DOE Order 5480.23 (Nuclear Safety Analysis Rep
hazardous air pollutant Any air pollutant subject to a standard promulgated under Section 7412 or other requirements established under 42 U.S.C. Section 7412 of the including 42 U.S.C. Section 7412(g), (j), and (r) of the Clean Air Act.
hazardous substance Any substance that when released to the environment in an unco unpermitted fashion becomes subject to the reporting and possible response provisio Water Act and the Comprehensive Environmental Response, Compensation, and Liability
hazardous waste Under the Resource Conservation and Recovery Act, a solid waste, o combination of solid wastes, which because of its quantity, concentration, or physi infectious characteristics may (a) cause, or significantly contribute to, an increa increase in serious irreversible, or incapacitating reversible, illness; or (b)pose or potential hazard to human health or the environment when improperly treated, sto or disposed of, or otherwise managed. Source, special nuclear material, and byprodu defined by the Atomic Energy Act, are specifically excluded from the definition of
hazardous waste landfill A disposal facility or part of a facility where hazardous in or on land and which is not a pile, a land treatment facility, a surface impound underground injection well, a salt dome formation, a salt bed formation, an undergr cave.
heavy metals Metallic elements with high atomic weights (for example, mercury, chr cadmium, arsenic, and lead) that can damage living things at low concentrations and accumulate in the food chain.
heterogeneous Pertaining to a substance having different characteristics in differ synonym is nonuniform.
high-efficiency particulate air (HEPA) filter A filter with an efficiency of at lea used to separate particles from air exhaust streams prior to releasing that air to
high-level waste The highly radioactive waste material that results from the repro nuclear fuel, including liquid waste produced directly from reprocessing and any so from the liquid that contains a combination of transuranic and fission product nucl that require permanent isolation. High-level waste may include other highly radioac the U. S. Nuclear Regulatory Commission, consistent with existing law, determines b permanent isolation.

Holocene In the geological scale of time, the more recent of the two epochs of the period (10,000 years ago to the present); that period of time since the last ice ag
hot cell/hot cell facility A heavily shielded enclosure for handling and processing means or automatically) or storing highly radioactive materials.
hydraulic conductivity Capacity of a porous media to transport water.
hydraulic gradient The slope of the water table per unit of distance, resulting in movement.
hydrogeochemistry The study of the chemical interactions between the earth's compo including rocks, minerals, and water.
hydrogeology The study of the geological factors relating to water.
hydrology The study of water, including groundwater, surface water, and rainfall.
infiltrate Water passing from the land surface through the vadose zone into the aq
intermittent surface water A stream, creek, or river which does not contain water d all of the year.
inadvertent intrusion The inadvertent disturbance of a disposal facility or its im environment by a potential future occupant that could result in loss of containment exposure of personnel. Inadvertent intrusion is a significant consideration that sh in the design requirements or waste acceptance criteria of a waste disposal facilit
incineration The efficient burning of combustible solid and liquid wastes to destr constituents and reduce the volume of the waste. Incinerators are designed to burn high efficiency. The greater the burning efficiency, the cleaner the air emission. radioactive materials does not destroy the radionuclides but does significantly red these wastes. High-efficiency particulate air (HEPA) filters are used to prevent ra heavy metals from going out of the stack and into the atmosphere.
industrial commercial waste Material that is not subject to Resource Conservation Act Subtitle C or Atomic Energy Act regulation. It is generated by manufacturing or processes. Industrial commercial waste is also known as solid waste and is regulate Conservation and Recovery Act, Subtitle D.
INEL industrial waste Industrial commercial waste generated at the INEL is categor industrial waste.
institutional control The control of waste management facilities by human institut
Interagency Agreement (IAG) See Federal Facility Agreement and Consent Order.
interim status facility See RCRA interim status facility.
Interim action (CERCLA) A remedial action undertaken to clean up or contain a pote to human health and the environment that can or should be addressed within a short study associated with an interim action may be completed within an "umbrella" remed investigation/feasibility study. Interim actions are completed on an accelerated sc deal with well-defined contamination problems that present a significant, although threat to human health and the environment.
interim action (NEPA) An action that may be undertaken while work on a required pr is in progress and the action is not covered by an existing program statement. An i not be undertaken unless such action: (a) is justified independently of the program accompanied by an adequate EIS or has undergone other NEPA review; and (c) will not ultimate decision on the program. Interim action prejudices the ultimate decision o when it tends to determine subsequent development or limit alternatives.
internal accidents Accidents that are initiated by man-made energy sources associa operation of a given facility. Examples include process explosions, fires, spills, forth.
inversion In the atmosphere, a condition in which air temperature warms with incre
isotope One of two or more atoms with the same number of protons, but different nu neutrons, in their nuclei. Thus, carbon-12, carbon-13, and carbon-14 are isotopes o carbon, the numbers denoting the approximate atomic weights. Isotopes have very nea chemical properties, but often different physical properties (for example, carbon-1 stable, carbon-14 is radioactive).
Kjeldahl nitrogen A method of nitrogen analysis designed to measure nitrogen prese organic compounds.
lacustrine Pertaining to, produced by, or formed in a lake or lakes; growing in or
Land Disposal Restrictions A Resource Conservation and Recovery Act (RCRA) program restricts land disposal of RCRA hazardous and RCRA mixed wastes and requires treatm promulgated treatment standards. Land Disposal Restrictions identify hazardous wast restricted from land disposal and define those limited circumstances under which an prohibited waste may continue to be land disposed.
land-use planning A decisionmaking process to determine the future or end use of a land, considering such factors as current land use, public expectations, cultural c

ecological factors, legal rights and obligations, technical capabilities, and costs
lapse In the atmosphere, a condition in which air temperature cools with increasin
less-than-go-day storage The onsite accumulation and/or storage of hazardous waste of less than 90 days by a generator subject to the requirements of 40 CFR 262.34(a)
life cycle The entire time period from generation to permanent disposal or elimina
liquid metal fast breeder reactor A reactor that operates using a type of fission fission where the neutrons that are used to split the atoms are not slowed down or usually the case with normal fission. It creates more fissionable material than it liquid metal as a coolant. Liquid sodium is a common metal used to cool this type o
listed waste Under the Resource Conservation and Recovery Act, waste listed in 40 Subpart D, as hazardous. Listed hazardous wastes include wastes from specific sourc sources, and discarded commercial chemical products. These wastes have not been sub toxicity characterization leaching procedure because the dangers they present are c
loess A homogeneous deposit consisting predominantly of silt, with subordinate amo fine sand and/or clay.
long-term storage The storage of hazardous waste (a) Onsite (a generator site) for days or greater, other than in a satellite accumulation area, or (b)off-site in a p treatment, storage, or disposal facility for any period of time.
low-level waste Waste that contains radioactivity and is not classified as high-le transuranic waste, or spent nuclear fuel. Test specimens of fissionable material ir and development only, and not for the production of power or plutonium, may be clas level waste, provided the concentration of transuranic elements is less than 100 na of waste.
mafic Pertaining to or composed predominantly of the magnesian rock-forming silicat some igneous rocks and their constituent minerals; synonymous with "dark minerals."
major radionuclides The radioisotopes that together comprise 95 percent of the tot of a waste package by volume and have a half-life of at least 1 week. Radionuclides important to a facility's radiological performance assessment and/or a safety analy the facility's waste acceptance criteria are considered major radionuclides.
management (of spent nuclear fuel) Emplacing, operating, and administering facilit transportation systems, and procedures to ensure safe and environmentally responsib storage of spent nuclear fuel pending (and in anticipation of) a decision on ultima
maximally exposed co-located worker (MCW) A hypothetical individual defined to all or dosage comparison with numerical criteria for co-located workers. This individu whichever is the greater of 0.4 miles from the facility area boundary (that is, the boundary) or 75 percent of the distance to the nearest independent facility area (t population zone boundary). The MCW is irrelevant if the DOE site boundary is closer MCW location.
maximally exposed individual (MEI) A hypothetical individual defined to allow dose comparison with numerical criteria for the public. This individual is located at th site boundary nearest to the facility in question. Sometimes called maximally expos individual (MOI).
maximally exposed offsite individual (MOI) A hypothetical individual defined to all dosage comparison with numerical criteria for the public. This individual is locate the DOE site boundary nearest to the facility in question. Sometimes called maximal individual (MEI).
maximum concentration level These are the maximum concentrations of radionuclides estimated to correspond to a lifetime cancer risk of 1/10,000, assuming a lifetime of 2 liters of water. These concentrations assume radionuclides emit only one type nonradioactive, noncarcinogenic compounds, maximum concentration levels are based o observable effect levels.
maximum contaminant level (MCL) Under the Safe Drinking Water Act, the maximum permissible concentrations of specific constituents in drinking water that are deli public water system that serves 15 or more connections and 25 or more people. The s maximum contaminant levels take into account the feasibility and cost of attaining
meteorological classifications Categories defining various states of atmospheric t (dispersion and dilution) that are used to estimate diffusion of radioactive materi accident scenarios. The criteria consider the relationship of wind speed, insolatio incoming solar radiation), and cloudiness (see Brenk et al. 1983).

Average (50 percent) meteorology: Average meteorological dispersion condition favorable and less favorable to dispersion conditions will each occur 50 perc

Conservative (95 percent) meteorology: Adverse meteorological dispersion cond (unfavorable to dispersion) which will not occur more than 5 percent of the t

Neutral meteorology: Pasquill Stability Class D, conditions which neither enh

inhibit vertical diffusion in the atmosphere.
Stable meteorology: Pasquill Stability Class F, moderately stable conditions; atmospheric condition existing when the temperature of the air rises rather t altitude. It allows for little or no vertical air movement.

metric tons of heavy metal (MTHM) Quantities of unirradiated and spent nuclear fuel are traditionally expressed in terms of metric tons of heavy metal (typically urani inclusion of other materials, such as cladding, alloy materials, and structural mat is 1,000 kilograms, which is equal to about 2,200 pounds.

millirem One thousandth of a rem (see rem).

mitigation Those actions that avoid impacts altogether, minimize impacts, rectify or eliminate impacts, or compensate for the impact.

mixed waste Waste that contains both hazardous waste under the Resource Conservatio Recovery Act and source, special nuclear, or by-product material subject to the Ato 1954.

mixing depth The height to which pollutants can freely disperse, above which inver exist.

moment magnitude A measure of earthquake size. The rigidity of the rock times the a faulting times the amount of slip.

M(s) Surface wave magnitude; motion is restricted to near the ground surface. Such correspond to ripples of water that travel across a lake. Most of the wave motion i outside surface itself; and, as the depth below this surface increases, wave displa and less.

nanocurie One billionth of a curie (see curie).

National Environmental Policy Act of 1969 (NEPA) A law that requires Federal agenc include in their decisionmaking processes appropriate and careful consideration of environmental effects of proposed actions, analyses of their alteratives, and measu minimize adverse effects of a proposed action that have the potential for significa environment. These analyses are presented in either an environmental assessment (EA environmental impact statement (EIS).

National Oceanic and Atmospheric Administration (NOAA) A Federal agency that colle and analyzes information on the weather. NOAA has an office at INEL for collecting information. NOAA also is involved with the environmental monitoring programs at IN

National Priorities List (NPL) A formal listing of the nation's worst hazardous wa established by the Comprehensive Environmental Response, Compensation, and Liabilit (CERCLA), that have been identified for remediation.

natural phenomena accidents Accidents that are initiated by phenomena such as earth tornadoes, floods, and so forth.

near-surface disposal Disposal in the uppermost portion of the earth, approximatel Near-surface disposal includes disposal in engineered facilities that may be built above-grade provided that such facilities have protective earthen covers. A near-su facility is not considered a geologic repository.

nearest public access For facility accident analyses, the location of the nearest where members of the public could be present.

new facilities Any facility that is not an existing facility or an existing hazard management facility.

nitrogen oxides (N0x) Gases formed in great part from atmospheric nitrogen and oxyg combustion takes place under conditions of high temperature and high pressure; cons air pollutant. Two major nitrogen oxides, nitric oxide (NO) and nitrogen dioxide (important airborne contaminants. In the presence of sunlight, nitric oxide combines oxygen to produce nitrogen dioxide, which in high enough concentrations can cause l

nonattainment area Any area which has been designated as not meeting (or contribut ambient air quality in a nearby area that does not meet) the national primary or se quality standard for the pollutant.

noncertifiable waste Waste that is not able to meet the waste acceptance criteria treatment, storage, or disposal facility; transportation requirements; or waste tha to characterize adequately to prove that it meets the applicable criteria.

nonreactor nuclear facility Those activities or operations that involve radioactive fissionable materials in such form and quantity that a nuclear hazard potentially e employees or to the general public. These activities or operations include producin storing radioactive liquid or solid waste, fissionable materials, or tritium; condu operations; conducting inspections of irradiated materials, fuel fabrication, decon recovery operations; conducting fuel enrichment operations; or performing environme or waste management activities involving radioactive materials.

nonhazardous Waste that does not pose risks to human health and the environment.

Industrial/commercial waste is an example (see hazardous waste).
normal conditions All activities associated with a facility mission, whether operat maintenance, storage, and so forth, which are carried out within a defined envelope can be design process conditions, performance in accordance with procedure, and so
normal operation All normal conditions and those abnormal conditions that frequenc techniques indicate occur with a frequency greater than 0.1 events per year.
NO(x) A generic term used to describe the oxides of nitrogen (see nitrogen oxides)
nuclear criticality A self-sustaining chain reaction that releases neutrons and en radioactive by-product material.
nuclear fuel Materials that are fissionable and can be used in nuclear reactors to
nuclide A general term referring to all known isotopes, both stable (279) and unst 5,000), of the chemical elements.
off-link doses Doses to members of the public within 800 meters (2,625 feet) of a railway.
offsite facility A facility located at a different site or location than the shipp
offsite population For facility accident analyses, the collective sum of individual an 80-kilometer (50-mile) radius of the INEL facility and within the path of the pl blowing in the most populous direction.
on-link doses Doses to members of the public sharing a road or railway.
onsite The same or geographically contiguous property that may be divided by public right-of-way, provided the entrance and exit between the properties is at a cross-r and access is by crossing as opposed to going along the right-of-way. Non-contiguou owned by the same person but connected by a right-of-way that he/she controls and t public does not have access is also considered onsite property.
onsite facilities Buildings and other structures, their functional systems and equ fixed systems and equipment installed onsite.
operable unit A discrete portion of a Waste Area Group (WAG) consisting of one or sites considered together for assessment and cleanup activities. The primary criter release sites into an operable unit include geographic proximity, similarity of was site types, and the possibilities for economy of scale.
operator The organization that operates a facility.
organic compounds Chemicals containing mainly carbon, hydrogen, and oxygen. Petrol products, petroleum-based solvents, and pesticides are samples of organic compounds some organic compounds can produce toxic effects on body tissues and processes.
orphan wastes Wastes in a classification that currently have no long-term disposal anticipated. An example of an orphan waste is low-level mixed waste. Orphan waste i radioactive enough to qualify for disposal at the Waste Isolation Pilot Plant and i of onsite because it has hazardous components.
orthophosphate The phosphate ions including H(2)O(4), HPO(4)^2-, and PO(4)^3-.
overpack A secondary container placed around a primary container to provide additi to or from the contents of a waste package or enclose a damaged primary container.
package The packaging plus its contents.
packaging A receptacle and any other components or materials necessary for the rec perform its required containment function.
particulate matter Any material, except water in uncombined form, that exists as a solid at standard conditions.
passivation The process of making metals inactive or less chemically reactive. For passivate the surface of steel by chemical treatment.
perched water A discontinuous saturated water body above the water table with unsa conditions existing both above and below.
perennial surface water A stream, creek, lake, pond, or river which contains water
performance assessment A systematic analysis of the potential risks posed by waste management systems to the public and environment and a comparison of those risks to performance objectives.
performance assessment limited waste Special-case waste comparable to greater-than- waste but generated by the government. This is a low-level waste but has unique cha make it unsuitable for shallow land burial.
performance-assessment-limited alpha waste Any alpha-contaminated waste, not meeti definition of transuranic waste, that cannot be disposed of by shallow land burial, documented site-specific performance assessment approved by the DOE Operations Offi Headquarters.
performance objectives Parameters within which a facility must perform to be consi acceptable.
permeability The degree of ease with which water can pass through a rock or soil.

person-rem A unit of collective radiation dose applied to populations or groups of collective dose).
playa The shallow central basin of a desert plain in which water gathers and then
Pleistocene The older of the two epochs of the Quaternary period (2 million to 10,0
plume The three-dimensional area containing measurable concentrations of a compoun which has migrated from its source point.
PM-10 All particulate matter in the ambient air with an aerodynamic diameter less a nominal ten (10) micrometers.
pollutant migration The movement of a contaminant away from its initial source.
pollution prevention The use of any process, practice, or product that reduces or generation and release of pollutants, hazardous substances, contaminants, and waste that protect natural resources through conservation or more efficient utilization.
polychlorinated biphenyls (PCBs) A class of chemical substances formerly manufactu insulating fluid in electrical equipment that is highly toxic to aquatic life. In t exhibit many of the characteristics of dichloro diphenyl trichloroethane (DDT); the environment for a long time and accumulate in animals.
population dose The overall dose to the offsite population.
porosity (n) Porosity is an index of the relative pore volume. It is the total uni or rock divided into the void volume.
preferential pathways Preferred pathways for fluid flow. They are dependent upon t content of the porous media.
pressurized water reactor A nuclear power reactor that uses water under pressure as The water boiled to generate steam is in a separate system.
primary ambient air quality standard That air quality that, allowing an adequate m safety, is requisite to protect the public health.
probable maximum flood The largest flood for which there is any reasonable expecta specific area. The probable maximum flood is normally several times larger than the record.
process knowledge The set of information that is used by trained and qualified indi are cognizant of the origin, use, and location of waste-generating materials and pr detail so as to certify the identity of the waste.
processing (of spent nuclear fuel) Applying a chemical or physical process designed characteristics of a spent nuclear fuel matrix.
public Anyone outside the DOE site boundary at the time of an accident or during n operation. With respect to accidents analyzed in this EIS, anyone outside the DOE s the time of an accident.
quality assurance All those planned and systematic actions necessary to provide ad confidence that a facility, structure, system, or components will perform satisfact service. Quality assurance includes quality control, which is all those actions nec verify the features and characteristics of a material, process, product, or service requirements.
quality factor (Q) The modifying factor that is used to derive dose equivalent fro
Quaternary The younger of the two geologic periods in the Cenozoic Era (2 million y the present). Quaternary is subdivided into the Pleistocene and Holocene epochs.
rad The special unit of absorbed dose. One rad is equal to an absorbed dose of 100
radiation (ionizing radiation) Alpha particles, beta particles, gamma rays, x-rays speed electrons, high-speed protons, and other particles capable of producing ions. used in this EIS, does not include nonionizing radiation, such as radio- or microwa infrared, or ultraviolet light.
radiation worker A worker who is occupationally exposed to ionizing radiation and specialized training and radiation monitoring devices to work in such circumstances
radioactive waste Waste that is managed for its radioactive content.
radioactivity The property or characteristic of material to spontaneously "disinte emission of energy in the form of radiation. The unit of radioactivity is the curie
radioisotope An unstable isotope, of an element, that decays or disintegrates spon emitting radiation. Approximately 5,000 natural and artificial radioisotopes have b
radiological survey The evaluation of the radiation hazards accompanying the produ existence of radioactive materials under a specific set of conditions. Such evaluat includes a physical survey of the disposition of materials and equipment, measureme of the levels of radiation that may be involved, and a sufficient knowledge of proc materials to predict hazards resulting from unexpected or possible changes in mater
Radiological and Environmental Sciences Laboratory (RESL) A facility involved in environmental monitoring of INEL onsite and offsite radiation and research on its e
radionuclide See radioisotope.

RCRA See Resource Conservation and Recovery Act.

RCRA accumulation point There are two types of accumulation areas allowed under the Resource Conservation and Recovery Act (RCRA):

Satellite Accumulation Areas (SAAs): Locations where hazardous waste generat allowed to accumulate waste at or near the point of generation. Generators m up to 55 gallons of hazardous waste or one quart of acutely hazardous waste point of generation. Upon reaching 55 gallons, the generator has 72 hours to hazardous waste to either a temporary accumulation area or a permitted facil

Temporary Accumulation Areas (TAAs): Under RCRA, the location where hazardous waste may be stored by a generator without a RCRA permit, TAAs are limited by of time they can store a hazardous waste. Generators may store hazardous wast 90 days without a permit if the generator complies with other safety and stor including a personnel training plan, a contingency plan, and an emergency pre response plan.

RCRA interim status facility Hazardous waste management facilities (that is, treat or disposal facilities) subject to Resource Conservation and Recovery Act requireme existence on the effective date of regulations are considered to have been issued a interim basis as long as they have met notification and permit application submissi Such facilities are required to meet interim status standards until they have been or until their interim status is withdrawn.

RCRA storage A facility used to store Resource Conservation and Recovery Act (RCRA hazardous waste for greater than 90 days. To be in compliance with the regulatory r RCRA, the facility must meet both documentation requirements (for example, continge analysis plans) and physical requirements (for example, specific aisle widths and s incompatible wastes).

reclassified low-level waste See alpha low-level waste.

Record of Decision (ROD) A public document that records the final decision(s) conc proposed action. The Record of Decision is based in whole or in part on information analysis generated either during the Comprehensive Environmental Response, Compensa Liability Act (CERCLA) process or the National Environmental Policy Act (NEPA) proc which take into consideration public comments and community concerns.

recycling Recycling techniques are characterized as use, reuse, and reclamation te (resource recovery). Use or reuse involves the return of a potential waste material originating process as a substitute for an input material or to another process as Reclamation is the recovery of a usefill or valuable material from a waste stream. potential waste materials to be put to a beneficial use rather than going to treatm disposal.

regulated substances A general term used to refer to materials other than radionuc regulated by Federal, State, (or possibly local) requirements.

release site A location at which a hazardous, radioactive, or mixed waste release is suspected to have occurred. It is usually associated with an area where these wa contaminated with them, have been used, treated, stored, and/or disposed of.

rem The dosage of an ionizing radiation that will cause the same biological effect of X-ray or gamma-ray exposure.

remedial investigation (RI) The Comprehensive Environmental Response, Compensation Liability Act of 1980 (CERCLA) process of determining the extent of hazardous subst contamination and, as appropriate, conducting treatability investigations. The RI p site-specific information for the feasibility study (FS).

remediation Process of remedying a site where a hazardous substance release has oc

remote-handled waste Packaged waste whose external surface dose rate exceeds 200 m per hour.

remote handling The handling of wastes from a distance so as to protect human oper unnecessary exposure.

repository A permanent deep geologic disposal facility for high-level or transuran spent nuclear fuel.

representative sample A sample of a universe or whole (for example, waste pile, la water) that can be expected to exhibit the average properties of the universe or wh

reprocessing (of spent nuclear fuel) Processing of reactor irradiated nuclear mate spent nuclear fuel) to recover fissile and fertile material, in order to recycle su for defense programs. Historically, reprocessing has involved aqueous chemical sepa elements (typically uranium or plutonium) from undesired elements in the fuel.

research reactor A nuclear reactor used for research and development.

Resource Conservation and Recovery Act (RCRA) A Federal law addressing the managem of waste. Subtitle C of the law addresses hazardous waste under which a waste must

"listed" on one of the U. S. Environmental Protection Agency's (EPA's) hazardous wa meet one of EPA's four hazardous characteristics of ignitability, corrosivity, reac measured using the toxicity characterization leaching procedure (TCLP). Cradle-to-g management of wastes classified as RCRA hazardous wastes must meet stringent guidel environmental protection as required by the law. These guidelines include regulatio transportation, treatment, storage, and disposal of RCRA-defined hazardous waste. S law addresses the management of nonhazardous, nonradioactive, solid waste, such as wastes.

retrieval The process of recovering wastes that have been stored or disposed of on be appropriately characterized, treated, and disposed of.

rhyolite A very acid volcanic rock that is the lava form of granite.

risk Quantitative expression of possible loss that considers both the probability harm and the consequences of that event.

roentgen A unit of exposure to ionizing radiation. It is that amount of gamma or X to produce ions carrying one electrostatic unit of electrical charge in one cubic c under standard conditions.

safe and secure Storage with design and operational features that maintain the int cladding, prevent criticalities, preclude diversion, and so forth. Safe and secure generally meet the intent of DOE Orders, but waivers may be required and granted fo requirements on a case-by-case basis where warranted.

safety analysis report A report, prepared in accordance with DOE Orders 5481.1B an that summarizes the hazards associated with the operation of a particular facility safety requirements.

safety class structures, systems, and components Those systems, structures, or com whose functioning is necessary to keep maximally exposed offsite individual (MOI) e dose of 25 rem or an Emergency Response Planning Guideline-2 dosage for design basi and evaluation basis accidents.

sanitary landfill A facility for the disposal of solid waste where there is no rea of adverse effects on health or the environment from disposal of the solid waste at facility is not an open dump and is not for disposal of hazardous waste.

sanitary waste Liquid or solid wastes that are generated as a result of routine ope facility and are not considered hazardous, or radioactive.

satellite accumulation See RCRA accumulation point.

saturated zone That part of the earth's crust in which all naturally occurring voi water.

scaling factor A multiplier that allows the inference of one radionuclide concentr another that is more easily measured.

scientific notation A notation adopted by the scientific community to deal with ve very small numbers by moving the decimal point to the right or left so that only on zero is to the left of the decimal point. Scientific notation uses a number times t positive or negative exponent to show how many places to the left or right the deci moved. For example, in scientific notation, 120,000 would be written as 1.2 x 10^5, would be written as 1.2 x 10^-5. In a variation of scientific notation often used i the multiplication sign and number 10 are replaced by the letter E. The above numbe written as 1.2E5 and 1.2E-5, respectively.

scrubber A device that uses a liquid spray to remove aerosol and gaseous pollutant airstream. The gases are removed either by absorption or chemical reaction. Solid a particulates are removed through contact with the spray.

secondary ambient air quality standard That air quality which is requisite to prot welfare from any known or anticipated adverse effects associated with the presence the ambient air.

secondary emissions Emissions which would occur as a result of the construction, m or operation of a stationary source or facility but do not come from the stationary itself.

sedimentary interbeds Rock layers composed of materials, such as sand or gravel, w derived from the breakdown of various rocks that are layered between other rock typ

segregation The process of separating (or keeping separate) individual waste types order to facilitate their cost-effective treatment and storage or disposal.

seismicity The phenomenon of earth movements; seismic activity. Seismicity is rela location, size, and rate of occurrence of earthquakes.

site inspection The Comprehensive Environmental Response, Compensation, and Liabili 1980 (CERCLA) process to acquire the necessary data to confirm the existence of env contaminatiOn and to assess the associated potential risks to human health, welfare environment. The data collected must be sufficient to support the decision either f

a remedial investigation/feasibility study (RI/FS) or for removing the site from fu through a decision document.
site waste management organization The functional organization at a DOE site whose responsibility it is to manage waste generated by that site's operations.
sizing The process of reducing the size of various types of solid wastes by compac mechanical reduction.
small quantity generator A generator who generates less than 1,000 kilograms of haz waste in a calendar month.
sodium-bearing waste Liquid radioactive waste generated from decontamination of pr equipment and other miscellaneous activities at the Idaho Chemical Processing Plant
sole source aquifer A designation granted by the U. S. Environmental Protection Ag groundwater from a specific aquifer supplies more than 50 percent of the drinking w overlying the aquifer. Sole source aquifers have no alternative source or combinat which could physically, legally, and economically supply all those who obtain their from the aquifer. Sole source aquifers are protected from federally financially ass determined to be potentially unhealthy for the aquifer.
solid waste Any garbage, refuse, or sludge from a waste treatment plant, water sup plant, or air pollution control facility and other discarded material, including so or contained gaseous material resulting from industrial, commercial, mining, and ag operations, and from community activities. It does not include solid or dissolved m sewage, or solid or dissolved materials in irrigation return flows or industrial di point sources subject to permits under Section 402 of the Federal Water Pollution C amended, or source, special nuclear, or by-product material as defined by the Atomi 1954, as amended [Public Law 94-580, 1004(27) (Resource Conservation and Recovery A
solid waste management units (SWMU) Any site, excluding Land Disposal Units, that or handled solid waste, whether or not hazardous constituents were involved.
solvents Liquid chemicals, usually organic compounds, that are capable of dissolvi substance. Exposure to some organic solvents can produce toxic effects on body tiss processes.
source material (a) Uranium, thorium, or any other material that is determined by Regulatory Commission pursuant to the provisions of the Atomic Energy Act of 1954, be source material; or (b)ores containing one or more of the foregoing materials, i concentration as the Nuclear Regulatory Commission may by regulation determine from [Atomic Energy Act 11 (z)]. Source material is exempt from regulation under the Res Conservation and Recovery Act.
source term The type and quantity of pollutants emitted to air from a specific sou sources.
SO(x) A generic term used to describe the oxides of sulfur. The combination of sul water vapor produces acid rain (see sulfur oxides).
special nuclear material (a) Plutonium or uranium enriched in the isotope 233, or 235, and any other material that the U. S. Nuclear Regulatory Commission, pursuant provisions of the Atomic Energy Act of 1954, Section 51, determines to be special n or (b) any material artificially enriched by any of the foregoing, but does not inc Special nuclear material is exempt from regulation under the Resource Conservation Act (RCRA).
special-case waste Radioactive waste owned or generated by DOE that does not fit i management plans developed for the major radioactive waste types.
spent nuclear fuel Fuel that has been withdrawn from a nuclear reactor following i constituent elements of which have not been separated. For the purposes of this EIS fuel also includes uranium/neptunium target materials, blanket subassemblies, piece debris.
stabilization (of spent nuclear fuel) Actions taken to further confine or reduce t associated with spent nuclear fuel, as necessary for safe management and environmen storage for extended periods of time. Activities that may be necessary to stabilize include canning, processing, and passivation.
stabilized waste (stability) Treatment or packaging of a waste stream that is inten that the waste does not structurally degrade and affect overall stability of the di slumping, collapse, or other types of failures that will lead to water infiltration Stabilization is also a factor in limiting exposure to an inadvertent intruder sinc recognizable and nondispersible waste.
stable Low potential for vertical mixing.
stakeholder Any person or organization with an interest in or affected by DOE acti Stakeholders may include representatives from Federal agencies, State agencies, Con American Tribes, unions, educational groups, industry, environmental groups, other

members of the general public.
stationary source Any building, structure, emissions unit, or installation which e any air pollutant.
storage The collection and containment of waste or spent nuclear fuel in such a ma constitute disposal of the waste or spent nuclear fuel for the purposes of awaiting disposal capacity (that is, not short-term accumulation).
storativity Storativity of a saturated aquifer is defined as the volume of water t the aquifer releases from storage under a unit decline in hydraulic head.
sulfur oxides Pungent, colorless gases formed primarily by the combustion of fossil considered major air pollutants, sulfur oxides may damage the respiratory tract as (see SOx).
subsurface The area below the land surface (including the vadose zone and aquifers
superfund The common name used for the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and its amendments.
superfund site Any site that has been listed on the National Priority List (NPL) b been identified by the EPA as having the potential to harm human health and the env and cleanup activities at these sites are regulated by the Comprehensive Environmen Compensation, and Liability Act (CERCLA). "Superfund" sites at Federal facilities m up by the operating agency (lead agency) under the oversight of the U. S. Environme Agency and other parties to a Federal Facility Agreement.
surface dose The radiological dose emanating from a container of material (waste), expressed as a measurement at contact and at one meter.
tank A stationary device designed to contain an accumulation of waste, which is co primarily of non-earthen materials (for example, wood, concrete, steel, plastic) wh structural support.
target A tube, rod, or other form containing material that, on being irradiated in would produce a designed end product (that is, uranium-238 produces plutonium-239 a 237 produces plutonium-238).
technical safety requirement Those requirements that define the conditions, safe b the management or administrative controls necessary to ensure the safe operation of and reduce the potential risk to the public and co-located workers from uncontrolle radioactive materials, radiation exposure due to inadvertent criticality, or uncont nonradiological material or energy hazards.
tectonics Geological structural features as a whole, or a branch of geology concer structure of the crust of a planet and especially with the formation of folds and f
tephra Solid material ejected into the air during a volcanic eruption, including v and cinders.
Tertiary The older of the two geologic periods in the Cenozoic Era (63 to 2 million
thermal treatment The treatment of hazardous waste in a device which uses elevated as the primary means to change the chemical, physical, or biological character or c hazardous waste. Examples of thermal treatment processes are incineration, molten s calcination, wet air oxidation, and microwave discharge.
total effective dose equivalent The sum of the external dose equivalent (for exter and the committed effective dose equivalent (for internal exposures).
total suspended particulates All particulate matter in the ambient air as measured method described in Appendix B of 40 CFR Part 50.
toxic air pollutant Under the Idaho Air Quality Control Regulations, any air pollu determined by the Idaho Department of Health and Welfare to be, by its nature, toxi animal life or vegetation.
toxic air pollutant reasonably available control technology (T-RACT) An emission st based on the lowest emission of toxic air pollutants that a particular source is ca the application of control technology that is reasonably available, as determined b Department of Health and Welfare, considering technological and economic feasibilit
toxicological hazard Any material defined in 40 CFR 355 Appendix A as an extremely substance.
transient A change in the reactor coolant system temperature and/or pressure. Tran caused by adding or removing neutron poisons, by increasing or decreasing the elect turbine generator, or by accident conditions.
transmissivity The rate at which water of a prevailing density and viscosity is tr a unit width of an aquifer under a unit hydraulic gradient. It is a function of pro the porous media, and the thickness of the porous media.
transuranic waste Waste containing more than 100 nanocuries of alpha-emitting tran isotopes with half-lives greater than 20 years per gram of waste, except for (a) hi waste; (b)waste that the U. S. Department of Energy has determined, with the concur

Administrator of the U. S. Environmental Protection Agency, does not need the degre required by 40 CFR 191; or (c) waste that the U. S. Nuclear Regulatory Commission h for disposal on a case-by-case basis in accordance with 10 CFR 61.

transuranium radionuclide Any radionuclide having an atomic number greater than 92

treatment Any method, technique, or process designed to change the physical or che character of the waste to render it less hazardous, safer to transport, store or di volume.

treatment facility Land area, structures, and/or equipment used for the treatment nuclear fuel.

ultimate disposition The final step in which a material is either processed for so disposed of.

United States Geological Survey (USGS) A Federal agency that collects and analyzes mation on geology and geological resources including ground and surface water.

vadose zone The zone between the land surface and the water table. Saturated bodie perched groundwater, may exist in the vadose zone. Also called the zone of aeration unsaturated zone.

vapor vacuum extraction (VVE) A technology that applies a vacuum to a well field t volatile organic contamination from soils and permeable rock layers in that well fi

vitrification The process of immobilizing waste material that results in a glass-l

volatile organic compound (VOC) Chemical containing mainly carbon, hydrogen, and o that readily evaporates at ambient temperature. Exposure to some organic compounds toxic effects on body tissue and processes.

Volcanic Rift Zones Linear belts of basaltic vents marked by open fissures, monocli normal faults. Volcanic rift zones were produced during the propagation of vertical dikes that fed surface eruptions.

vulnerabilities Conditions or weaknesses that may lead to radiation exposure to th unnecessary or increased exposure to the workers, or release of radioactive malrial environment. For example, some DOE facilities have had leakage from spent fuel stor excessive corrosion of fuel causing increased radiation levels in the pool, or degr systems. Vulnerabilities are also caused by loss of institutional controls, such a funding or reductions in facility maintenance and control.

waste Any waste defined as solid waste by 40 CFR 261.2. Solid waste excluded from by the Resource Conservation and Recovery Act (RCRA) is still considered a waste. T wastes of all types (solid, liquid, gaseous, hazardous, radioactive, sanitary, and

waste acceptance criteria (WAC) The requirements specifying the characteristics of waste packaging acceptable to a waste receiving facility; and, the documents and pr generator needs to certify that waste meets applicable requirements.

waste acceptance specifications The functions to be performed and the technical req for a Waste Acceptance System for accepting spent nuclear fuel and high-level waste Radioactive Waste Management System according to the Waste Acceptance System Requir Document (DOE/RW-0352P, January 1993, Office of Civilian Radioactive Waste Manageme

waste analysis plan (WAP) A plan that specifies the parameters for which each wast analyzed. These include a testing and sampling method(s), timing, and the rationale or the facility operator responsible for treatment, storage, or disposal. It ensure type and composition determinations are made as required by law, regulation, or goo

waste area group (WAG) Ten groupings of release sites under the INEL Federal Facil Agreement and Consent Order (FFA/CO). Groupings are for efficiency in managing the and cleanup process. Nine of these WAGs are associated with specific facilities, an associated with the remaining miscellaneous facilities. Each WAG may be broken down individual operable units.

waste certification A process by which a waste generator certifies that a given wa stream meets the waste acceptance criteria of the facility to which the generator i waste for treatment, storage, or disposal. Certification is accomplished by a combi characterization, documentation, quality assurance, and periodic audits of the cert

waste certification plan A plan or collection of plans used by a generator to spec which waste is prepared and certified to meet applicable waste acceptance and safet hazardous and radiological waste handling, treatment, transportation, and packaging other local or site requirements. Certification plans result in developing the info receiving facility needs to confirm the suitability of waste for acceptance.

waste certification program A systematic approach to ensure that waste characteriza conducted in a manner to provide reasonable assurance that the receiving facility's criteria are met. A waste certification program consists of all the functional elem and activities necessary to provide reasonable assurance that waste characterizatio sufficient accuracy to ensure proper handling. These functions can be performed by

organizations.
waste characterization See characterization.
waste container A receptacle for waste, including any liner or shielding material to accompany the waste in disposal.
waste generation Any waste (after being declared a waste, see "waste") produced du particular calendar year. This does not include waste produced in previous years th repacked, treated, or disposed of in the current calendar year. It does include any (for example, clothing, gloves, waste from maintenance operations, and so forth) ge treatment, storage, or disposal activities of previously generated wastes.
waste generator organization Any organization that is responsible for the individua of waste.
Waste Isolation Pilot Plant (WIPP) A facility near Carlsbad, New Mexico, authorize demonstrate safe disposal of defense-generated transuranic waste in a deep geologic
waste management The planning, coordination, and direction of those functions rela generation, handling, treatment, storage, transportation, and disposal of waste, as surveillance and maintenance activities.
waste management facility All contiguous land, structures, other appurtenances, an improvements on the land, used for treating, storing, or disposing of waste or spen facility may consist of several treatment, storage, or disposal operational units (more landfills, surface impoundments, or combinations of them).
waste management program A systematic approach to organize, direct, document, and activities associated with waste generation, treatment, storage, or disposal. A wa program consists of all the functional elements, organizations, and activities that needed to properly manage waste. These functions and activities can be performed by organizations.
waste management systems assessment A systems assessment of the entire low-level wa management (or all of waste management) structure/program at a given site that cons storage, and disposal, as well as onsite and offsite points of generation with an e optimization of all aspects of the operations, including, but not limited to, prote and the environment, regulatory compliance, and cost effectiveness.
waste minimization An action that economically avoids or reduces the generation of source reduction, reducing the toxicity of hazardous waste, improving energy usage, These actions will be consistent with the general goal of minimizing present and fu human health, safety, and the environment.
waste receiving facility A facility that formally accepts waste from a waste gener for treatment, storage, or disposal.
waste segregation The process of separating (or keeping separate) individual waste forms in order to facilitate their cost-effective treatment and storage or disposal
waste stream A waste or group of wastes with similar physical form, radiological p U. S. Environmental Protection Agency waste codes, or associated land disposal rest standards. It may be the result of one or more processes or operations.
waste type The waste types being considered in this EIS are high-level waste, tran mixed low-level waste, low-level waste, hazardous waste, or nonhazardous waste.
water pool A type of facility usually used for the storage of irradiated nuclear m fuel. The water shields the material being stored while allowing it to be accessibl Sometimes referred to as a water pit.
water table The surface below which is saturated with water (an aquifer) and above saturated with water (the vadose zone).
weathering The process by which rocks are broken down and decomposed by the physic chemical actions of wind, rain, temperature change, plant colonization, and bacteri
weighing factor (W (T)) For an organ or tissue, (W (T)) is the proportion of the ri (cancer fatalities) resulting from irradiation of that organ or tissue to the total (cancer fatalities) when the whole body is irradiated uniformly.
wet storage Storage of spent nuclear fuel in a pool of water, generally for the pu and/or shielding.
zone of aeration See vadose zone.
zone of saturation That part of the earth's crust in which all voids are filled wi

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APPENDIX F TECHNICAL METHODOLOGIES AND KEY DATA

F-1 Socioeconomics

SECTION F-1 CONTENTS

TABLES

by fiscal year, including baseline effects

F-1-7. Baseline employment: Idaho National Engineering Laboratory direct employment, secondary employment, and total employment

#F-1 SOCIOECONOMICS

The socioeconomic impact analysis conducted for this Environmental Impact Sta potential effects of the proposed Idaho National Engineering Laboratory (INEL) alte economic resources of the region of influence, defined in terms of employment, inco education, and community services. The changes in U.S. Department of Energy (DOE) workforce, and payroll that would occur under each of the alternatives impact the c effects on regional business activity and employment. Changes in DOE expenditures services, as well as changes in household expenditures made by INEL employees, affe business activity generated within the region of influence, the demand for communit care and public education), and the ability of local government agencies to fund su

This analysis evaluates the effects of the proposed alternatives relative to conditions described in Section 4.3, Socioeconomics, in Volume 2 of this Environmen The existing and projected economic conditions in the region of influence provide t assessing the impacts of the socioeconomic effects that may result from implementat alternatives. The impact analysis, as described in the following methodology secti the alternatives on regional employment (the number of direct and secondary jobs) a wages and salaries, proprietors' income, and other labor income). These employment then generate potential changes in regional population and demand for housing and c

In general, the results of the impact analysis indicate that each of the prop generate initial increases in employment within the region of influence, primarily activities. Alternatives A (No Action) and C (Minimum Treatment, Storage, and Disp phaseout of the Expanded Core Facility, would result in employment declines by 2004 (Ten-Year Plan) and D (Maximum Treatment, Storage, and Disposal) would result in em However, the projected decreases in baseline expenditures and employment at INEL ar magnitude to offset any increases projected as a result of the proposed alternative cumulative socioeconomic impact of INEL activity over the forecast horizon would be employment and economic activity.

F-1.1 Region of Influence

The analysis of socioeconomic impacts is limited to the seven-county area sur comprised of Bannock, Bingham, Bonneville, Butte, Clark, Jefferson, and Madison cou influence was determined according to the following criteria:

- Counties that contain the residences of at least 85 percent of the curr and construction workforce
- Counties in which the resident INEL workforce comprises 5 percent or gr county's civilian labor force.

F-1.2 Methodology and Key Assumptions

The analysis of socioeconomic impacts considers both impacts on economic acti changes in employment and earnings, and the community, as measured by changes in po demand for housing and community services. The impact analysis conducted for Volum Nuclear Fuel and INEL Environmental Restoration and Waste Management Environmental (SNF and INEL EIS) estimates the potential social and economic impacts expected to of influence as a result of implementation of any of the proposed INEL environmenta management alternatives.

The socioeconomic impacts estimated in this analysis would be generated by th expenditures and employment at INEL, which includes employment at DOE and site-rela subcontractors, and would consider both direct and secondary effects. Direct impac changes in INEL employment and earnings that occur during the construction and oper

alternative over the period of analysis and the resultant effects on regional popul community services.

Secondary impacts include both indirect and induced impacts. Indirect impact regional economic activity that result from changes in DOE purchases of goods and s expected to occur under any of the alternatives. Induced impacts are the additiona economic activity that result from changes in the household spending of employees w by (a) the change in employment at INEL and (b) the change in employment at regiona from the indirect impacts to regional economic activity.

F-1.2.1 Economic Activity

Analysis of socioeconomic effects utilized total output, employment, and earn region of influence, obtained from the U.S. Bureau of Economic Analysis Regional In System (RIMS II). Interindustry multipliers were prepared by the Bureau of Economi United States input-output table in combination with the most recent region-specifi the relationship of the regional economy to the national economy. The Bureau of Ec II model is based on research by Cartwright et al. (1981).

The direct economic impacts of each alternative were estimated based on proje descriptions developed by DOE, INEL contractors, and their representatives. The pr descriptions identify employment and expenditure requirements during the preconstru operations phases of each alternative. (For the purposes of this analysis, precons activities were combined.) Direct earnings were estimated based on average INEL wa direct employment impact under each alternative represents only the additional or n expected to occur under implementation of an alternative. The reassignment of exis would not represent a change in total INEL staffing; therefore is not included as p impact.

These direct effects were then multiplied, using RIMS II coefficients specifi economy, to provide estimated total employment and earnings associated with the pro Input-output sectors were selected to appropriately reflect the activities associat alternatives in order to capture the economic characteristics of each scenario with For the purposes of this analysis, the construction activities under each alternati Construction Industry, and the operations phase activities are represented by the C Refining Industry.

The number of in-migrant or out-migrant workers associated with implementatio was estimated according to a set of proportional assumptions. Most INEL employees which increases the likelihood of migration from the area. Construction and relate employed under service contracts at the site, many of which are in lower-skilled po the likelihood of out-migration.

F-1.2.2 Population and Housing

Population changes associated with projected baseline conditions and the prop an important determinant of other socioeconomic and environmental impacts. These p three key components: (a) baseline growth, (b) relocation of workers and their dep increase of population (births minus deaths) over the long term. The projected pop region of influence, as presented in Section 4.3, assumed continuation of current o forecasts were then adjusted to reflect the impacts of projected baseline decreases the potential effects of each of the alternatives.

The relocation of workers in response to the projected declines in baseline a implementation of each of the alternatives was determined by utilizing the methods discussed in Section F-1.2.1. The number of dependents expected to relocate with t estimated based on household-size parameters derived from U.S. Census Bureau demogr

The population changes associated with the alternatives would result in furth demand. Housing demand impacts were estimated from migration projected for each sc in-migrating household would require one unit and each out-migrating household woul The number of relocating households was determined assuming that each relocating wo single household.

Expected housing availability was considered for the region of influence and on recent housing market conditions and vacancy trends. Projected demands associat were then assessed in the context of recent housing construction trends and vacanci

F-1.2.3 Community Services and Public Finance

Potential impacts to local community services due to changes in demand associ proposed alternatives were determined for the region's key public services. Impact jurisdictions that have the closest linkages to INEL personnel and their dependents likely to be most affected by the activities planned under the alternatives.

Projected changes in public school enrollments were estimated based on the re analysis. The effects on public schools was based on the number of school-age chil households, current enrollment projections, and existing student/teacher ratios. L public services was determined based on the current levels and service and the expe the population to be served.

Local jurisdiction finances were evaluated based on changes in historic reven levels, changes in fund balances, and reserve bonding capacities. The effects of i alternatives and projected declines in baseline INEL activity were evaluated based

- Gains (or losses) of jobs in the region
- Population increases (or decreases) in each jurisdiction, including sch
- Earnings and income gains (or losses)
- Potential changes in each jurisdiction's property tax base.

F-1.3 Key Assumptions

The following section documents the key assumptions used to establish baselin estimate economic and community impacts.

F-1.3.1 Idaho National Engineering Laboratory Employment and Earnings

- The Argonne National Laboratory-West (ANL-W) workforce was assumed to b from Fiscal Year 1999 to Fiscal Year 2004.
- Baseline workforce data for INEL include the effects of contractor cons that the West Valley Demonstration Project is not included.
- The baseline workforce is assumed to be nonconstruction-related.
- All construction workers were assumed to be new personnel for the four on information received from construction contractors, 85 percent of co would be hired from existing labor force in the region of influence.
- Construction staffing was based on project descriptions. Where no staf available, the construction staff was assumed to be one full-time emplo million in expenditure. (The average expenditure per one full-time con was derived from those projects that had construction staffing data).
- 97.45 percent of new operation and construction employees were expected region of influence.
- Preconstruction staffing levels were determined by assuming one full-ti million dollars in construction expenditure.
- Operations staff requirements were based on information provided by pro and were assumed to be per year for the life of the project.
- Employees classified as existing were assumed to be transferred from ex

at INEL. Existing employees were considered to be part of the baseline

- Operations staffing requirements that would be filled by reassignment o personnel were not considered in the impact analysis. The impact analy personnel.
- An average annual wage of $27,168 was assumed for construction employee annual wage of $43,304 was assumed for operation employees at INEL (U.S Economic Analysis, INEL Finance Office).
- 19.7 percent of all nonpayroll expenditures were assumed to be spent wi influence.

F-1.3.2 Idaho National Engineering Laboratory Funding

- Funding for environmental restoration and waste management does not inc Valley Demonstration Project.
- Ongoing projects identified by Science Applications International Corpo to be part of the baseline activities at INEL.
- Projects included under the alternatives were not included in baseline Funding data received from DOE were adjusted to take into account the e projects.
- Duration of projects was rounded down to the nearest full year.
- For projects for which the funding period was not provided, funding was over the project period.
- Funding for the Office of Civilian Radioactive Waste Management does no West Valley Demonstration Project.
- Argonne National Laboratory-West was assumed to operate at projected le Year 1999 and then hold constant through 2004.

F-1.3.3 Idaho National Engineering Laboratory Related Population

- One household per INEL employee is assumed.
- The average household size per INEL household is assumed to be 3.47 peo
- An 80-percent migration rate is assumed for population effects related employment. A 10-percent migration rate is assumed for population effe change in secondary employment.

F-1.3.4 Project Information

- Construction and Operations schedule, cost, and staffing data were obta summaries found in Appendix C of Volume 2 of this Environmental Impact
- Preconstruction and construction phases were combined for this analysis
- Project schedules were based on project summaries. If not provided, th was assumed to be 2004 (last year in analysis timeframe).

F-1.4 Data Analysis

The following tables summarize the detailed economic data upon which the soci analysis was based. Table F-1-1 presents employment data derived from the project Appendix C). The employment data presented in the data sheets were categorized by and new workers for each project and then aggregated by alternative. Table F-1-2 s employment expected under each alternative and represents the direct employment imp presents the results of the multiplier effects, summarizing direct, secondary, and under implementation of each alternative. Table F-1-4 presents the direct, seconda expected under implementation of each alternative. Table F-1-5 presents the change region of influence that could occur under each alternative, including a breakdown secondary-related effects. Table F-1-6 presents the population change expected in to the declines in baseline INEL activity and the cumulative effect of the alternat presents historical and projected INEL baseline employment, INEL-related secondary direct and secondary employment.

F-1.5 References

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Tellez, C. L., 1995, Lockheed Idaho Technologies Company, Idaho Falls, Idaho U.S. Department of Energy, Idaho Operations Office, Idaho Falls, Idaho, subje Employment Numbers," CLT-4-95, January 9.

USBEA (U.S. Bureau of Economic Analysis), 1993, Regional Input-Output Modeli machine-readable regionalized input-output multipliers for the INEL region of Department of Commerce, Washington, D.C.

TABLES

Table F-1-1. Construction and operations employment (existing and new) at the Idah category and by fiscal year. ,b,c

	1995	1996	1997	1998	1999	2000	2001	2002	200
				Alternative A (No Action)					
Construction	409	424	223	77	155	80	0	0	0
Existing	44	43	27	2	0	0	0	0	0
Subcontractors	365	381	196	75	155	80	0	0	0
Operations	10	10	67	58	-92	-146	-390	-410	-41
Existing	10	10	20	61	61	161	103	103	103
Subcontractors	0	0	0	0	0	0	0	0	0
New hires	0	0	47	-3	-153	-307	-493	-513	-51
				Alternative B (Ten-Year Plan)					
Construction	592	778	718	595	720	630	310	574	524
Existing	217	284	244	207	200	160	130	85	60
Subcontractors	375	494	474	388	520	470	180	489	464
Operations	10	10	171	251	252	432	280	280	277
Existing	10	10	118	198	196	276	230	230	230
Subcontractors	0	0	6	6	6	6	0	0	0
New hires	0	0	47	47	50	150	50	50	47
			Alternative C (Minimum Treatment, Storage, and						
Construction	501	659	418	272	350	300	70	202	202
Existing	86	78	72	47	45	45	45	2	2
Subcontractors	415	581	346	225	305	255	25	200	200

Operations	10	10	97	97	-53	-107	-351	-371	-37
Existing	10	10	50	100	100	200	142	142	142
Subcontractors	0	0	0	0	0	0	0	0	0
New hires	0	0	47	-3	-153	-307	-493	-513	-51
			Alternative D (Maximum Treatment, Storage, and						
Construction	642	933	873	754	1121	1036	746	826	801
Existing	267	289	249	216	251	216	216	161	121
Subcontractors	375	644	624	538	870	820	530	665	680
Operations	10	10	177	257	258	438	286	286	283
Existing	10	10	124	204	202	282	236	236	236
Subcontractors	0	0	6	6	6	6	0	0	0
New hires	0	0	47	47	50	150	50	50	47

a. Source: Project data sheets found in Volume 2, Appendix C, of this Environment
b. See Section F-1.3 for assumptions regarding existing and new personnel.
c. Totals may not add due to rounding.

Table F-1-2. Direct construction and operations employment impacts in the Idaho Na region of influence by alternative and by fiscal year. ,b,c

	1995	1996	1997	1998	1999	2000	2001	2002	200
					Alternative A (No Action)				
Direct employment	347	362	232	68	-2	-223	-480	-500	-50
Construction	347	362	186	71	147	76	0	0	0
Subcontractors	347	362	186	71	147	76	0	0	0
New hires	0	0	0	0	0	0	0	0	0
Operations	0	0	46	-3	-149	-299	-480	-500	-50
Subcontractors	0	0	0	0	0	0	0	0	0
New hires	0	0	46	-3	-149	-299	-480	-500	-50
					Alternative B (Ten-Year Plan)				
Direct employment	356	469	502	420	548	598	220	513	487
Construction	356	469	450	369	494	447	171	465	441
Subcontractors	356	469	450	369	494	447	171	465	441
New hires	0	0	0	0	0	0	0	0	0
Operations	0	0	52	52	54	152	49	49	46
Subcontractors	0	0	6	6	6	6	0	0	0
New hires	0	0	46	46	49	146	49	49	46
			Alternative C (Minimum Treatment, Storage,						
Direct employment	394	552	375	211	141	-57	-457	-310	-31
Construction	394	552	329	214	290	242	24	190	190
Subcontractors	394	552	329	214	290	242	24	190	190
New hires	0	0	0	0	0	0	0	0	0
Operations	0	0	46	-3	-149	-299	-480	-500	-50
Subcontractors	0	0	0	0	0	0	0	0	0
New hires	0	0	46	-3	-149	-299	-480	-500	-50
			Alternative D (Maximum Treatment, Storage,						
Direct employment	356	612	644	563	881	931	552	680	692
Construction	356	612	593	511	827	779	504	632	646
Subcontractors	356	612	593	511	827	779	504	632	646
New hires	0	0	0	0	0	0	0	0	0
Operations	0	0	52	52	54	152	49	49	46
Subcontractors	0	0	6	6	6	6	0	0	0
New hires	0	0	46	46	49	146	49	49	46

a. Source: project data sheets found in Appendix C, Volume 2, of this Environmenta
b. See Section F-1.3 for assumptions regarding existing and new personnel.
c. Totals may not add due to rounding.

Table F-1-3. Direct and secondary employment impacts in the Idaho National Enginee influence by alternative and by fiscal year. ,b,c

	1995	1996	1997	1998	1999	2000	2001	2002	2
					Alternative A (No Action)				
Total employment	835	872	566	164	-28	-585	-1233	-1283	-
Direct	347	362	232	68	-2	-223	-480	-500	-

Construction	347	362	186	71	147	76	0	0	0
Operations	0	0	46	-3	-149	-299	-480	-500	-
Secondary	489	510	334	96	-26	-361	-752	-783	-
Construction-related	489	510	262	100	207	107	0	0	0
Operations-related	0	0	72	-5	-233	-468	-752	-783	-
					Alternative B (Ten-Year Plan)				
Total employment	858	1130	1217	1020	1330	1465	537	1244	1
Direct	356	469	502	420	548	598	220	513	4
Construction	356	469	450	369	494	447	171	465	4
Operations	0	0	52	52	54	152	49	49	4
Secondary	502	661	715	600	781	867	317	731	6
Construction-related	502	661	634	519	696	629	241	654	6
Operations-related	0	0	81	81	85	238	76	76	7
		Alternative C (Minimum Treatment, Storage, and Dispo							
Total employment	950	1330	909	507	315	-184	-1175	-825	-
Direct	394	552	375	211	141	-57	-457	-310	-
Construction	394	552	329	214	290	242	24	190	1
Operations	0	0	46	-3	-149	-299	-480	-500	-
Secondary	555	778	535	297	175	-127	-719	-515	-
Construction-related	555	778	463	301	408	341	33	268	2
Operations-related	0	0	72	-5	-233	-468	-752	-783	-
		Alternative D (Maximum Treatment, Storage, and Dispo							
Total employment	858	1474	1560	1363	2131	2266	1338	1647	1
Direct	356	612	644	563	881	931	552	680	6
Construction	356	612	593	511	827	779	504	632	646
Operations	0	0	52	52	54	152	49	49	4
Secondary	502	862	916	801	1250	1335	786	966	9
Construction-related	502	862	835	720	1164	1079	709	890	9
Operations-related	0	0	81	81	85	238	76	76	7

a. Sources: USBEA (1993) and project data sheets found in Volume 2, Appendix C, o
b. See Section F-1.3 for assumptions regarding population migration.
c. Totals may not add due to rounding.

Table F-1-4. Direct and secondary earnings impacts in the Idaho National Engineeri by alternative and by fiscal year (in thousands of dollars). ,b,c

	1995	1996	1997	1998	1999	2000	2001
						Alternative A (No	
Total earnings	18,213	19,011	13,396	3,512	-4,035	-19,624	-37,
Direct	9,421	9,834	7,042	1,809	-2,456	-10,891	-20,
Construction	9,421	9,834	5,059	1,936	4,001	2,065	0
Operations	0	0	1,983	-127	-6,457	-12,955	-20,
Secondary	8,792	9,178	6,353	1,702	-1,579	-8,734	-17,
Construction-related	8,792	9,178	4,721	1,807	3,734	1,927	0
Operations-related	0	0	1,632	-104	-5,313	-10,661	17,1
						Alternative B (Te	
Total earnings	18,712	24,650	27,717	23,426	30,243	35,441	12,8
Direct	9,679	12,750	14,464	12,244	15,778	18,707	6,75
Construction	9,679	12,750	12,234	10,014	13,421	12,131	4,64
Operations	0	0	2,230	2,230	2,357	6,577	2,11
Secondary	9,033	11,900	13,253	11,181	14,465	16,734	6,07
Construction-related	9,033	11,900	11,418	9,346	12,526	11,321	4,33
Operations-related	0	0	1,835	1,835	1,939	5,412	1,73
					Alternative C (Minimum Trea		
Total earnings	20,708	28,991	20,880	10,996	3,449	-10,892	-36,
Direct	10,711	14,995	10,914	5,681	1,415	-6,374	-20,
Construction	10,711	14,995	8,930	5,807	7,872	6,581	645
Operations	0	0	1,983	-127	-6,457	-12,955	-20,
Secondary	9,997	13,995	9,967	5,316	2,034	-4,518	-16,
Construction-related	9,997	13,995	8,335	5,420	7,347	6,143	602
Operations-related	0	0	1,632	-104	-5,313	-10,661	-17,
					Alternative D (Maximum Trea		
Total earnings	18,712	32,134	35,202	30,911	47,707	52,905	30,2

Direct	9,679	16,621	18,335	16,116	24,811	27,741	15,7
Construction	9,679	16,621	16,105	13,886	22,454	21,164	13,6
Operations	0	0	2,230	2,230	2,357	6,577	2,11
Secondary	9,033	15,513	16,866	14,795	22,896	25,164	14,5
Construction-related	9,033	15,513	15,031	12,959	20,957	19,752	12,7
Operations-related	0	0	1,835	1,835	1,939	5,412	1,73

a. Sources: USBEA (1993) and project data sheets found in Appendix C, Volume 2, o
b. See Section F-1.3 for assumptions regarding wages and salaries.
c. Totals may not add due to rounding.

Table F-1-5. Direct and secondary population impacts in the Idaho National Enginee alternative and by fiscal year, not including baseline effects. ,b,c

	1995	1996	1997	1998	1999	2000	2001
					Alternative A (No Acti		
Population impact	350	365	340	62	-346	-916	-159
Direct-related	180	188	224	29	-337	-791	-133
Secondary-related	170	177	116	33	-9	-125	-261
					Alternative B (Ten-Yea		
Population impact	360	474	625	543	679	955	334
Direct-related	185	244	377	335	408	654	224
Secondary-related	174	229	248	208	271	301	110
			Alternative C (Minimum Treatment, Sto				
Population impact	398	557	484	206	-202	-749	-157
Direct-related	205	287	298	103	-263	-704	-132
Secondary-related	193	270	186	103	61	-44	-249
			Alternative D (Maximum Treatment, Sto				
Population impact	360	618	769	687	1015	1290	670
Direct-related	185	318	452	409	581	827	397
Secondary-related	174	299	318	278	434	463	273

a. Sources: USBEA (1993) and project data sheets found in Volume 2, Appendix C, o
b. See Section F-1.3 for assumptions regarding population migration.
c. Totals may not add due to rounding.

Table F-1-6. Direct and secondary population impacts in the Idaho National Enginee year, including baseline effects. ,b,c

				Fiscal year		
	1995	1996	1997	1998	1999	2000
Baseline effects						
Change from 1995	0	-1451	-1620	-2715	-3638	-4534
Direct-related	0	-1213	-1355	-2271	-3042	-3792
Secondary-related	0	-237	-265	-444	-595	-742
					Alternative A (No	
Population impact	350	-1085	-1280	-2653	-3984	-5451
Direct-related	180	-1025	-1131	-2242	-3380	-4583
Secondary-related	170	-60	-149	-411	-605	-868
					Alternative B (Te	
Population impact	360	-977	-994	-2172	-2959	-3579
Direct-related	185	-969	-977	-1936	-2634	-3138
Secondary-related	174	-8	-17	-236	-324	-441
		Alternative C (Minimum Treatment, Sto				
Population impact	398	-893	-1136	-2509	-3840	-5283
Direct-related	205	-926	-1056	-2168	-3306	-4496
Secondary-related	193	32	-80	-342	-535	-786
		Alternative D (Maximum Treatment, Sto				
Population impact	360	-833	-851	-2028	-2623	-3244
Direct-related	185	-895	-903	-1862	-2461	-2965
Secondary-related	174	62	53	-167	-162	-279

a. Sources: Tellez (1995), DOE-ID (1994), USBEA (1993), and project data sheets f
b. See Section F-1.3 for assumptions regarding population migration.

c. Totals may not add due to rounding.

Table F-1-7. Baseline employment: Idaho National Engineering Laboratory direct em

							Fisca
	1990	1991	1992	1993	1994	1995	1996
							Di
Contractors	7,500	7,985	7,901	7,820	7,700	6,097	6,047
DOE-ID	402	531	587	491	499	499	499
Argonne National Laboratory-West	786	882	905	943	890	880	860
Naval Reactors Facility	2,434	2,252	2,263	2,017	1,640	1,144	777
Total direct employment	11,122	11,650	11,656	11,271	10,729	8,620	8,183
							Se
Secondary employment	17,415	18,242	18,251	17,648	16,799	13,497	12,813
							To
Total employment	28,537	29,892	29,907	28,919	27,528	22,117	20,996

a. Sources: Tellez (1995), DOE-ID (1994b), USBEA (1993).
b. Direct employment is defined as historical and projected baseline employment a as non-DOE employment generated in the region as a result of baseline INEL employme is direct plus secondary employment.

F-2 Geology and Water

SECTION F-2 CONTENTS

TABLES

#F-2 GEOLOGY AND WATER

This section describes the methodology used to support the conclusions regardi at the INEL site and local and regional water resource impacts for the four alterna of this Environmental Impact Statement. These conclusions resulted from an extensi documentation characterizing the geologic and hydrologic conditions at the INEL sit this material into a concise description of the existing conditions and potential i Appendix F directly supports the summaries provided in Sections 4.6 and 5.6 (Geolog (Water Resources) of Volume 2 of this Environmental Impact Statement.

F-2.1 Geology

The evaluation of geology at the INEL site focused on the geologic hazards tha impact the environmental restoration, waste management, and spent nuclear fuel man proposed under the four alternatives. The following sections discuss the methods u magnitude and likelihood of the hazards associated with seismicity and volcanism at

F-2.1.1 Seismic Hazards Assessment

Since the early 1970s, seismic hazards assessments have been conducted at the potential earthquake ground motions for establishing seismic design criteria. Sinc seismology hazard assessment and Federal regulations evolved. To keep pace with th deterministic evaluations were conducted for specific sites (WCC 1990), and determi seismic hazards assessments were conducted for the proposed New Production Reactor (WCC 1992). Also, an INEL site probabilistic seismic hazard assessment is underway contributions from potential local and regional earthquake sources on the magnitude motions and their estimated return periods for all facility areas (WCFS 1993).

F-2.1.1.1 Current Deterministic and Probabilistic Evaluations. Both deterministic and

probabilistic evaluations used the same geologic information and numerical techniqu deterministic evaluation (WCC 1990) and additional information collected under the Geologic/Seismological/Geotechnical Studies program, which was conducted during the Under this program, paleoseismic investigations were conducted on the Lemhi Fault t magnitude and recurrence, and a deep hole [1,520 meters (5,000 feet)] was drilled a Production Reactor site to determine the near-surface geology (core samples). Addi studies are being conducted to assess the seismogenic potential of the Arco Segment

The INEL site is located adjacent to the Basin and Range province, which is ch extensional tectonics and associated normal faulting earthquakes. Limited empirica motion attenuation exist from the Basin and Range province, necessitating the use o other regions and direct modeling results of ground motions using numerical techniq hazards evaluations, seismic wave transmission characteristics were developed using relationships based mostly on California data and a site-specific model based on th stratigraphy obtained from the deep hole. To model the effects of INEL site geolog stochastic ground motion modeling approach was used to develop site-specific attenu Band-Limited-White-Noise model, combined with random vibration theory, captures the ground motion with a minimum of free parameters (WCC 1990).

The sources for the New Production Reactor site deterministic evaluation inclu magnitude (MW) 7.0 earthquake on the Lemhi fault, (b) a MW 5.5 earthquake randomly kilometer (15.5 mile) radius of the proposed New Production Reactor site, and (c) a earthquake associated with the axial volcanic zone. Peak horizontal and vertical a spectra were estimated for the 50th and 84th percentiles based on the range of unce and ground motion model. The predicted 50th percentile peak horizontal acceleratio

Lemhi fault and 0.18g from the volcanic earthquake at the New Production Reactor si accelerations would be approximately two-thirds of the horizontal accelerations (WC

The New Production Reactor site probabilistic evaluation considered ground mot from the following earthquake sources: (a) Basin and Range faults, (b) Eastern Sna rift zones and the axial volcanic zone, (c) the Eastern Snake River Plain areal sou and (d) the Yellowstone Plateau and Idaho Batholith tectonic provinces (WCC 1992). analyses performed with the input source parameters and choice of attenuation relat size and location of the random earthquake and seismicity rates in the Eastern Snak important contributors to the uncertainty in the hazard at high peak acceleration l

A probabilistic evaluation is underway to estimate site-specific seismic hazar spectra for major INEL site facility areas. This evaluation will incorporate geolo New Production Reactor geological, seismological, and geophysical studies and the r fault paleoseismological studies. As with past studies, the results will undergo e being considered for use in INEL site seismic design criteria. Preliminary results motion levels, the Lemhi and Lost River faults are the largest contributors to the motion levels, the hazard is dominated by the Eastern Snake River Plain areal sourc because it considers the occurrence of an earthquake in the immediate INEL site vic

F-2.1.1.2 Seismic Design Criteria. Following completion of the 1990 deterministic evaluation,

the results were subjected to extensive peer review by the U.S. Geological Survey, Engineering, INEL subcontractors, the U.S. Department of Energy (DOE), and the Defe Safety Board. The deterministic peak accelerations were adopted into the INEL arch standards in 1991 (DOE-ID 1993a). The results of the New Production Reactor 1992 d probabilistic evaluations were extensively reviewed by a panel of experts. This pa recognized experts in the fields of seismology, tectonics, statistics, and structur convened by DOE through Lawrence Livermore National Laboratory to review and approv recommendations for New Production Reactor structural design criteria (including se Ground motion results of the 1990 and 1992 studies indicate that INEL seismic desig appropriate for the estimated seismic hazards. The probabilistic seismic hazard as 1993) has undergone this review process.

F-2.1.2 Volcanism

Hazards associated with INEL-area volcanism, as well as distant volcanic sourc by several investigators. A Volcanism Working Group consisting of experts from the laboratories, the U.S. Geological Survey, and universities was convened in 1990 to volcanism on the INEL site (VWG 1990).

For volcanic areas such as the Eastern Snake River Plain with no historical vo incomplete chronologic record of prehistoric volcanism, assessments of potential vo volcanic risks are estimated based on interpretation of the long-term geologic reco effects of historical eruptions in analog regions such as Iceland and Hawaii. Volc site are related to future basaltic and rhyolitic eruptions along volcanic-rift zon The most significant volcanic hazard to the INEL site is the inundation or burning lava flows from volcanic-rift zones. A significant related hazard is disruption of deformation accompanying magma intrusion along volcanic-rift zones: opening of fiss and broad-region tilting and uplift within several kilometers of vents. Other, les include volcanic-gas emission and disruption of groundwater.

Available geologic map data, flow volume estimates, and geochronometry of INEL flows suggest maximum (most conservative) volcanic frequencies of 10-4 to 10-5 per volcanic zone, and the Arco and Lava Ridge-Hell's Half Acre volcanic-rift zones. T basalt-lava inundation or intrusion-related ground disturbance at a specific facili be less than 10-5 per year for facilities on the southern INEL site. Risk from the INEL site facilities is still lower because volcanism there has been less frequent probability of significant impact from all other volcanic phenomena, such as growth the Eastern Snake River Plain or thicker than 8-centimeter (3-inch) tephra fall fro Plain vents, is estimated to be much less than 10-5 per year due to the combined ef infrequency, low volume, and topographic or atmospheric barriers to the dispersal o

F-2.2 Water Resources

The evaluation of potential consequences to water resources at the INEL site f potential and water quality and use. The following sections discuss the methods an determine impacts resulting from the implementation of environmental restoration an activities proposed under the alternatives.

F-2.2.1 Surface Water

Surface water studies and data were reviewed during a literature search perfor Environmental Impact Statement (EIS). This section presents the methodology used f potential impacts of the proposed alternatives to natural and artificial (manmade) the vicinity of, the INEL site. These methods were used to determine existing surf potential (which could conceivably cause surface contamination to enter surface wat Geological Survey has been compiling surface water quality data for many years. In Geological Survey and INEL studies have been conducted concerning flood potential a

F-2.2.1.1 Surface Water Quality. INEL site activities do not directly affect the quality of surface

water outside the INEL site because the INEL site is located within a closed draina does not flow directly offsite (Hoff et al. 1990). All major drainages within the Big Lost River Playa in the northern portion of the INEL site. However, water from well as from seepage of evaporation basins and storm water injection wells, does in River Plain Aquifer.

Physical, chemical, and radioactive water quality parameters have been measure River, the Little Lost River, and Birch Creek. As a result of intermittent flow al consequently limited sampling opportunities, insufficient information is available comparisons. However, the water quality of these three intermittent streams is sim varied relatively little over time (USGS 1963-1993). Chemical and physical paramet three water tributaries do not exceed water quality standards (Estes et al. 1995), for all INEL site uses. However, surface water is not withdrawn from these tributa site.

The Big Lost River System (the Big Lost River, Little Lost River, Birch Creek, and playas) is defined as "waters of the United States" as specified by the Clean W Water Act, two National Pollutant Discharge Elimination System General Permits for Discharges were issued for the INEL site, one for industrial activities and one for permit requirements for both of these activities specify the development of a site- Prevention Plan. Any facility at the INEL site having the potential to discharge s River System associated with industrial or construction activities is subject to th requirements of the INEL Storm Water Pollution Prevention Plans (FR 1992a, b). The Pollution Prevention Plans (DOE-ID 1993b, c) were established to assess potential s sources; select and implement appropriate management practices and controls to prev storm water runoff; and implement monitoring, inspection, and notification programs are performed to determine the effectiveness of the plans to prevent storm water po

Many potential sources of surface water contamination are also identified in t Agreement/Consent Order. All potential contamination sources must be evaluated, in activities, material inventory, past spills and leaks, nonwater discharge, and exis data. Other activities required under the Federal Facility Agreement/Consent Order summarizing potential pollutants, identifying and implementing best management prac runoff maps, and identifying potential pollutants in the runoff.

F-2.2.1.2 Flood Analysis. Several studies have been performed to evaluate the potential for

flooding to occur at the INEL site. A frequency analysis of local basin snowmelt f INEL site was conducted in 1986 using historical data (Koslow and Van Haaften 1986) from the Central Facilities Area weather station for 1956 to 1985 were used in the data from the Central Facilities Area station were assumed to be representative of

INEL site (Koslow and Van Haaften 1986).

In general, flood plains at the INEL site are poorly defined, primarily becaus flood hydrographic data are not available for much of the INEL site. Studies are c determine the 100-year flood plain for the Big Lost River at the INEL site. These rigorous assessment of the relationship between the Mackay Dam failure probable max in Section F-2.2.1.3) and the INEL site 100-year flood plain for the Big Lost River Sagendorf (1991) for a design analysis conducted by Zukauskas et al. (1992) used me Central Facilities Area for 1950 through 1990 and, for the 25- and 100-year return maximum 24-hour precipitation amounts and 25- and 100-year maximum snow depths at t Waste Management Complex.

During the winter months, mid-November through mid-March, a rain-on-snow event the ground is frozen. The 25- and 100-year, 24-hour duration rainfall amounts for determined to be 2.3 and 2.9 centimeters (0.92 and 1.13 inches), respectively. Bas year, the 25- and 100-year, 24-hour duration amounts were found to be 3.5 and 4.2 c 1.64 inches), respectively. The expected 25-year maximum snow depth was determined centimeters (22.6 inches), and the 100-year maximum snow depth was found to be 77.7 inches). The peak discharges for the 25- and 100-year rainfall-on-snowmelt floods Management Complex watershed were estimated by Zukauskas et al. (1992) to be 18.2 a per second (643 and 704 cubic feet per second), respectively.

Zukauskas et al. (1992) conducted another flooding study at the Radioactive Wa Complex. The effects of natural topographic depressions, railroad embankments, and discharges at the Radioactive Waste Management Complex were evaluated. The study w parts. The first part was a hydrologic modeling study that evaluated the adequacy water drainage control system in preventing flooding of the Transuranic Storage Are year return interval, 24-hour duration storm events. The second part of the study drainage plan for the area.

The Zukauskas et al. (1992) study computed reservoir stages and peak discharge using the U.S. Army Corps of Engineering HEC-1 flood hydrograph package. Precipita inputs for modeling the 25- and 100-year return period events were derived from the Service records for the INEL site. Water surface profiles for the main channel flo elevations for computing culvert flow at critical locations were computed with the profiles program. The study concluded that, with some minor reconfigurations and g channel and the upgrading of two berms, the existing surface water drainage control flooding resulting from the 25- and 100-year, 24-hour rainfall/snowmelt storm.

McKinney (1985) documents flooding events that have occurred at the INEL Diver Big Lost River. The report presents an evaluation of Big Lost River flow records, System, the 1983 Mount Borah Earthquake, record low temperatures in December 1983, jam on the diversion system that forced the river to pond along and nearly overtop

Several flood routing studies have been conducted over smaller areas near spec One of these was conducted by Martineau et al. (1990) at the Subsurface Disposal Ar Radioactive Waste Management Complex. The objective of this study was to determine Subsurface Disposal Area berm is sufficient to prevent floodwater from entering the Area if Dike 2 fails. The Martineau et al. (1990) investigation showed that the Su berm could be in danger of being overtopped by a breach flood from Dike 2. For exa from Dike 2 could be initiated by a large flood in the Big Lost River.

F-2.2.1.3 Probable Maximum Flood. Analysis of high-magnitude flooding caused by a dam

failure relies on hydrodynamic theory to describe the dam-break wave and to propaga Closed-form solutions do not exist for the partial differential equations of unstea numerical techniques are employed to achieve solutions. Koslow and Van Haaften (19 DAMBRK model developed by the National Weather Service to simulate four different p Dam failure scenarios: seismic dam failure, hydraulic (piping) failure of the dam hydraulic (piping) failure with 500-year flood, and overtopping failure. DAMBRK ha tested against data from a number of actual dam failures, including the 1976 Teton Idaho.

Three functional elements are involved in DAMBRK: description of the dam fail conditions; computation of the time-varying flow and water surface elevations at th the flood through the downstream valley. These functions are accomplished using a elements, including breach description, reservoir inflow and storage characteristic resistance, flow losses, and downstream channel geometry. The DAMBRK simulation ro along the Big Lost River channel from Mackay Dam to Test Area North at the INEL sit river into the INEL site diversion channel were estimated by the broad-crested weir

DAMBRK. Koslow and Van Haaften (1986) used a total of 259 channel cross sections i flood analysis.

Peak flow rate, peak water surface elevation, flood wave arrival time, and max were presented for eight cross sections along the Big Lost River. In the event of any of the four scenarios, there would be flooding along the Big Lost River channel water depths on the INEL site. The water velocity on the INEL site would range fro second (0.6 to 3.4 feet per second), with water depths outside the banks of the Big 0.61 to 1.22 meters (2 to 4 feet) (Koslow and Van Haaften 1986). No significant di inundation was formed for the seismically induced dam failure and the piping failur 100- and 500-year floods. Significantly higher flow downstream and a greater exten the overtopping failure of the dam from a probable maximum flood.

The flat, open topography on the INEL site results in considerable spreading o facilities subject to encroaching floodwaters are the Idaho Chemical Processing Pla Facility, and the Loss-of-Fluid Testing Facility near Test Area North. As part of Koslow and Van Haaften (1986) of the flood potential at the INEL site facilities, S a probable maximum flood inflow hydrograph to the Mackay Reservoir.

The use of the probable maximum flood represents a conservative estimate of th because the amount of water resulting as inflow into the reservoir would be far gre year or 500-year storm events. Inflow resulting from the probable maximum flood wo meters per second (82,100 cubic feet per second) compared with 140 and 160 cubic me and 5,760 cubic feet per second) for the 100-year or 500-year storm event, respecti Haaften 1986). Modeling of the probable maximum flood scenario was performed assum rose above the dam and caused failure. This is likely because the spillways built able to release the flow fast enough. Results predict that 8,700 cubic meters per per second) would be released immediately downstream of the dam. This peak flow at meters per second (71,850 cubic feet per second) at the INEL Diversion Dam and to 9 second (34,810 cubic feet per second) at the Test Area North. The flood wave reach Dam in 10 hours with flow rates of 0.028 to 0.085 cubic meters per second (1 to 3 c the INEL site. These flow rates would not be great enough to cause structural dama facilities.

F-2.2.2 Subsurface Water

Subsurface water quality and quantity, hydrologic properties, waste inputs, an gathered through a literature search. This section contains a summary of the docum used to characterize subsurface water quality and use at the INEL site and to suppo impacts to water resources from the proposed alternatives. Section F-2.2.2.1 discu techniques; Section F-2.2.2.2 presents methodologies and references utilized to cha resources. Section F-2.2.2.3 discusses modeling methodologies, individual modeling and the assumptions on which the models are based.

F-2.2.2.1 Data Collection Techniques. Hydrologic parameters at the INEL site, specifically

hydraulic conductivity and transmissivity, are often determined by single-well pump Ackerman 1991). Storativity values must be determined from multi-well pumping test method for determining transmissivity involves pumping water from a well at a rate aquifer and creates drawdown in the well. The amount of drawdown is inversely rela of the aquifer. The drawdown in the well is recorded as a function of time. Time- are also used and involve measuring the water level recovery as a function of time Curve matching techniques that compare the observed curves against type curves are aquifer parameters (Freeze and Cherry 1979, Driscoll 1986, Domenico and Schwartz 19

Finite-difference computer modeling as performed by Garabedian (1992) can also the hydraulic parameters by matching observed water levels to simulated levels. Th finite-difference approximations of equations representing the hydrologic flow, whi hydraulic conductivity, storativity, porosity, hydraulic gradient, and transmissivi parameters until a match between actual and modeled water levels occurs, the parame Linear regression techniques have also been used to estimate transmissivity from sp 1991).

Groundwater chemistry data are obtained by water sampling and chemical analysi sampled are purged until field parameters (that is, pH, temperature, conductivity) This ensures that the water sampled is formation water and not residual water that

altered in the well. The U.S. Geological Survey has been routinely monitoring well 1949 and uses these methods of sampling (Barraclough et al. 1976, Pittman et al. 19 techniques used to determine concentrations of solutes include liquid scintillation testing for radionuclides; atomic adsorption for metals and anions; and gas chromot spectrometry for volatile organic compounds (Mann 1990, Driscoll 1986). Recently, inductively coupled plasma-mass spectrometry for chemical analysis of cations, whic limits and an expanded analyte list (McCurry et al. 1994).

F-2.2.2.2 Water Resources Characterization. This section presents the methodologies and

briefly summarizes sources of information used to characterize subsurface condition describing aquifer properties, water quality, and contaminant distribution are iden elements are highlighted. Factors affecting background water chemistry and groundw references for source term determination are also provided.

F-2.2.2.2.1 Description of Physical Properties and Flow

Characteristics-Determining the aquifer properties of the Snake River Plain Aquifer standing goal of the U.S. Geological Survey, INEL, and other investigators. Aquife include the hydraulic conductivity, transmissivity, specific capacity, flow rates a of static head levels. Because of the significant heterogeneity of the aquifer, th several orders of magnitude (tens to hundreds of meters) within the Snake River Pla 1991, Robertson et al. 1974). Several investigators attribute the heterogeneity to stratigraphy, which consists of numerous relatively thin basalt flows with rubble z sedimentary interbeds (Robertson et al. 1974, Whitehead 1992). Groundwater flow ve aquifer are greatest along fractures, rubble zones, and boundaries between basalt f 1994). Locally, the variance can be important; but on an intermediate (hundreds of regional (kilometers to tens of kilometers) scale, the properties are easier to mod average out (Garabedian 1986, 1992). References that address hydrologic property t hydrologic parameters, and modeling of properties in the Snake River Plain Aquifer Pittman et al. (1988), Ackerman (1991), Garabedian (1986, 1992), Robertson et al. (et al. (1976).

Of these references, Ackerman (1991) and Garabedian (1986, 1992) are the most details on transmissivity distributions at the INEL site. Ackerman (1991) utilized well pumping tests within the Snake River Plain Aquifer to determine the distributi under the INEL site. Type-curve matching methods as discussed by Driscoll (1986) w linear regression of specific capacity-transmissivity relationships. Conclusions s values ranged from 0.6 to 70,000 liters per minute per meter (0.05 to 6000 gallons transmissivity values varied over six orders of magnitude from 0.09 to 90,000 squar 106 square feet per day). Garabedian (1986) used parameter estimation techniques t and estimated values ranged from 400 to 3.5 y 105 square meters per day (4,300 to 3 day) on a regional scale.

F-2.2.2.2.2 Subsurface Water Quality and Contaminant Distribution-The natural

groundwater chemistry of the Snake River Plain Aquifer is determined by inputs from anthropogenic inputs, and water-rock reactions (Wood and Low 1988). The background Snake River Plain Aquifer has been the subject of investigation and is important fo where elevated contaminant levels may exist. Robertson et al. (1974) provides a de recharge water quantity and quality entering the Snake River Plain Aquifer and pres evolution of the natural groundwater chemistry. The study was a mass balance appro inputs from the Mud Lake area, the Big Lost River System, and local precipitation.

Water-rock interactions taking place from the recharge to discharge zones of t natural water chemistry of the aquifer. Robertson et al. (1974) and Wood and Low (mass balance studies consisting of a series of equations to explain chemical change southern part of the INEL site. The equations consist of dissolution reactions for anorthite, pyroxenes, and olivines, as well as precipitation reactions for calcite reactions, which are responsible for the formation of clays (Drever 1988), were als the calculations indicate that about 20 percent of the solutes in the groundwater c

dissolution reactions and that precipitation of quartz and calcite have an importan capabilities of the aquifer.

Knowledge of individual contaminant behavior is also necessary to understand c and residence times below the surface. Properties affecting contaminant behavior i dispersion, and radioactive decay. These parameters are used in transport models; are required. Retardation factors are typically determined by laboratory column an which are performed considering site-specific conditions (for example, soil and roc (Drever 1988, Domenico and Schwartz 1990). Retardation factors of 5-130, 1, and 2 tritium, and iodine-129, respectively, have been used for modeling studies at the I 1993, 1994).

Strontium-90 was chosen for modeling conducted in support of this EIS for seve cesium-137 and strontium-90 were both disposed of by direct injection into the Snak from 1953 to 1984, extensive aquifer sampling showed that cesium-137 had not migrat distance from the injection well, while strontium-90 has been detected in enough we geometry of plumes over time and space (Arnett and Rohe 1993). This observation su laboratory data regarding the relatively greater sorbtion and retardation propertie to strontium-90 (Arnett and Rohe 1993), clearly indicates that strontium-90 has mor INEL and regional water quality, and provides strontium-90 plume migration data for

Dispersivities used in contaminant transport models range from 91 to 140 meter the longitudinal and transverse directions, respectively. Radioactive decay is con and the values used for the radionuclides are 26.6, 12.5, and 15,700,000 years for iodine-129, respectively (Arnett and Rohe 1993, 1994; Schafer-Perini 1993; Robertso References that address the determination of retardation factors and dispersion coe use in transport equations include Freeze and Cherry (1979), Domenico and Swartz (1 (1988).

Contaminants interact differently below the surface, depending on whether they or the saturated zone. The vadose zone at the INEL site is very thick and acts as between the surface and the saturated zone. As a result, several studies have exam vadose zone, such as the infiltration rates of water in basalt and sediments, locat perched water zones, and location of contaminants sorbed to interbeds and the basal 1992, Marts and Barrash 1991, Ackerman 1992, Hubbell 1990, and Cecil et al. 1991). Bishop (1991), and Cecil et al. (1992) address infiltration rates of water in subsu Results indicate that the infiltration rates are highly dependent on the degree of Under highly unsaturated conditions, rates can be as slow as 0.36 centimeter per ye Bishop (1991) showed rates of water movement in a dry block of basalt to be approxi investigators have shown rates to be higher under saturated conditions in the vados

Water quality evaluation and determining distribution of contaminants in the S Aquifer beneath the INEL site is the primary goal of the U.S. Geological Survey mon U.S. Geological Survey has conducted routine sampling of monitoring wells and maint chemical analyses in a database (Barraclough et al. 1981). Typically, wells are sa basis for major anions and cations, radionuclides, some trace metals, and field phy temperature, conductivity, pH). Many wells constructed within the perched zones be ponds at the Test Reactor Area and Idaho Chemical Processing Plant are sampled quar parameters but include an expanded list of radionuclides (Cecil et al. 1991, Marts addition to the routine studies, special studies have been conducted to define the contaminants. For example, several studies evaluated the distribution of volatile 1990, Liszewski and Mann 1992, Mann and Knobel 1987). Routine monitoring is requir updated information characterizing the levels and distribution of contaminants. Th subsurface distributions of contaminants are transient. Hubbell (1990) describes t levels and perched water chemistry at the Radioactive Waste Management Complex as a Cecil et al. (1991) and Robertson (1977) discuss the relationship between waste inp chemistry at the Test Reactor Area. The distribution of contamination within the a over time. Golder (1994) discusses the time relation of contaminant distribution a of the plumes at various time intervals. Additional references addressing aquifer of contaminants include Robertson et al. (1974), Barraclough et al (1976), Cecil et et al. (1988), Whitehead (1992), and Barraclough et al. (1981).

F-2.2.2.2.3 Source Terms-Many references provide information identifying and

characterizing source terms of liquid effluents as well as discuss the processes th information is important for the overall characterization of the contaminant budget kept by INEL site facility operating personnel and from monitoring devices are used

inputs. Input data from 1953 to 1970 are sparse compared to after 1970, because re sampling programs were not as comprehensive as they are today. References addressi INEL site include Creed (1994), Lehto (1993), Arnett and Brower (1994), Arnett and Golder (1994), IDHW (1994), Arnett (1994a), and Bobo (1993).

Golder (1994), prepared for this EIS, describes the baseline contaminants in t history of contaminant plumes, background chemistry, concentrations of contaminants Plain Aquifer, and contaminants within the perched zones is summarized in this repo studies. Lehto (1993) was also prepared for this EIS and addresses the past histor summarizes the volumes and radionuclide concentrations disposed of at the Test Reac Chemical Processing Plant, Test Area North, and several inactive areas. Data in th from the Radioactive Waste Management Information System and Non-Radioactive Waste Information System and were used as input for the modeling performed by Arnett and Arnett (1994b).

Creed (1994) discusses source terms for a generic spent nuclear fuel storage f quality data from the Idaho Chemical Processing Plant Fluorinel and Storage Facilit nuclear fuel storage facility design (Hale 1994) used to identify impacts to the wa unintentional discharge of 18.9 liters per day (5 gallons per day) for 30 days cons radionuclide concentrations:

- Tritium - 10,000 picocuries per liter
- Strontium-90 - 810 picocuries per liter
- Antimony-125 - 100 picocuries per liter

- Cobalt-60 - 9,290 picocuries per liter
- Cobalt-58 - 148 picocuries per liter
- Cesium-137 - 101 picocuries per liter.

Creed (1994) also describes the scenario leading to the hypothetical leak, which co leakage from secondary containment around the spent nuclear fuel storage pools.

Constant process monitoring, mass-balance, and facility design in accordance w including double-walled confinement of all vessels and piping, would be used by DOE operational releases from a new spent nuclear fuel storage facility to a goal of es operational releases postulated would result from degraded equipment. Arnett (1994 that this leak would have on subsurface water resources. Results indicate that the contaminants above maximum contaminant levels at the INEL site boundary resulting f operational leak.

F-2.2.2.2.4 Water Use-The amount of water consumed above the baseline differs for each

alternative, with Alternative B (Ten-Year Plan) consuming the greatest quantity of alternative, the impacts to water quantity are expected to be minor compared to the under the INEL site yearly [1.77 y 109 cubic meters (470 y 109 gallons)] (Robertson 65 percent of the water consumed under current operations is returned to the aquife and infiltration. Similar returns to the aquifer are expected to occur regardless The amount of water to be consumed under each alternative is estimated based on an descriptions and conversations with project personnel.

F-2.2.2.2.5 Data Limitations-Groundwater samples used to characterize subsurface water

quality are taken from dedicated pumps that access the most permeable parts of the are homogenized by the pump and represent a composite of the entire well. Chemical depending on the particular interval being sampled, and some intervals may have hig others (McCurry et al. 1994). Hence, intervals with elevated concentrations of con detected.

Retardation coefficients and dispersivity values used in contamination transpo site are not well known and were initially estimated from previous investigations (Arnett and Rohe 1993, 1994) The final values used are from calibration of the mode factor and dispersivity are varied until a match is obtained between the simulated concentrations for a 20-year timeframe. In that sense, they are fitting parameters derived parameters from field or laboratory experiments. The significant contamina considered as large-scale, long-term tracer tests that provide intermediate scale p factors obtained in this manner were lower than those obtained from laboratory scal retardation estimated by model calibration for strontium-90, for example, was five,

than obtained from laboratory tests. The lower, more conservative value was used i
This is more important for the nonconservative contaminants because the value
elements. An assumed retardation factor of one for conservative contaminants (indi
used in all models for tritium and volatile organic compounds (Schafer-Perini 1993;
1994; Robertson 1974, 1977). A small value of two was used for iodine-129. Labora
difficult to extrapolate to the field because of large scale differences. In addit
specific laboratory conditions that may or may not accurately reflect real conditio
are preferred because of the scaling towards a larger system. Other than the migra
plumes themselves, no empirical studies to date have been performed at the INEL sit
dispersivities or retardation coefficients for radionuclides. A large-scale aquife
a site on the INEL to determine field-scale contaminant transport properties (Wood
transport parameters, including retardation and dispersion used in contaminant tran
EIS have been conservatively estimated to account for potential uncertainties in pa
ensure that modeled impacts to the Snake River Plain Aquifer equal or exceed potent
high degree of certainty (Arnett and Rohe 1993, 1994; Arnett 1994a, b).

Values for hydrologic parameters derived from pumping tests (for example, cond
transmissivity) are difficult to determine in the Snake River Plain Aquifer because
transmissivity and is difficult to stress. Formations yielding large volumes of wa
rates, but drawdowns of more than a few feet are difficult to obtain (Ackerman 1991
Transmissivity values determined from pump tests are underestimated due to effects
with the aquifer by the wells (Garabedian 1986, 1992). The effective portion of th
understood, especially beneath individual wells (Ackerman 1991, Garabedian 1986, 19
(1992) compared modeled values to empirical values and determined that the empirica
smaller values, because the wells tested are only completed in the upper portion of

Porosity values are a limiting factor in transport modeling. Highest porosity
Plain Aquifer are the rubble zones and fractures, although saturated vesicular basa
capacity. Porosity estimates range from near zero to 20 percent (Robertson et al.
estimates of 5 to 10 percent are commonly used in modeling studies (Robertson 1974,
Schafer-Perini 1993). Because the Snake River Plain Aquifer is semiconfined, stora
equal to porosity, and values for storativity are also estimated.

The levels of contaminants in the vadose zone need further study because their
moderately characterized and concentrations change with time (Cecil et al. 1991, Ma
The lack of information is partially due to the lack of monitoring wells that acces
water zones. Several perched water zones are known and have been characterized for
water, but other perched zones may exist that have not been studied yet. Hubbell (
Marts and Barrash (1991), and Cecil et al. (1991) suggest the presence of possible
the ones documented, located along deeper sedimentary interbeds. Known perched zon
and characterized at the Idaho Chemical Processing Plant and Test Reactor Area with
quarterly. Nonradiactive metallic contaminants in unsaturated parts of the vadose
locally but would probably be bound to sediments by sorption.

Infiltration rates in the vadose zone are one of the most poorly characterized
for modeling contaminant transport to the saturated zone. Two of the important stu
of water in the surface sediments near the Radioactive Waste Management Complex hav
Cecil et al. (1992) and Kaminsky (1991). Arnett and Rohe (1993) use a rate of 47 m
per year) as a conservative assumption in modeling the flow of liquids from the Ida
Plant and Test Reactor Area surface ponds to the saturated zone.

F-2.2.2.3 Modeling Contaminant Transport. For this EIS, computer modeling was performed

to predict the fate and transport of contaminants in the vadose and saturated zones
1994; Schafer-Perini 1993; Dames and Moore 1993; Arnett 1994b). The modeling chara
contaminant behavior in the subsurface based on established theories of contaminant
transport, and hydrologic flow. The models are capable of estimating contaminant m
timeframe specified by the user and results provide information on future impacts.
general approach to modeling, provides a discussion of the modeling studies used, a
of limitations and assumptions on which the models are based. See Table F-2-1 for
contaminant transport models used to evaluate consequences to subsurface water reso
includes a brief model description, assumptions, calibration methods, modeling resu
consequences to water resources.

F-2.2.2.3.1 Techniques in Contaminant Fate and Transport Modeling-Fate and

transport modeling requires an understanding of the subsurface in addition to under work. The steps involved in modeling include (a) data assembly and verification, (conceptual model, (c) code selection, (d) model calibration, and (e) computer simul

Conceptual model development is one of the first steps in the modeling process a complicated system such as the aquifer located under the INEL site and making sim This simplification process involves defining (a) the geometry, including boundarie input and output; (c) locations of important features such as sedimentary interbeds wastes and rates of discharge. Depending on the area being modeled, several differ were developed for the models addressed in this EIS (Arnett 1994b; Arnett and Rohe Perini 1993; Dames and Moore 1993; Robertson 1974, 1977).

For the modeling conducted in this EIS, several codes are available to model c the Snake River Plain Aquifer. Arnett et al. (1993) provides a detailed discussion bases for selecting the codes used. The codes MODFLOW and MT3D were chosen because acceptance in the scientific community. GFLUX is a modification of a U.S. Nuclear code, GWSCREEN, which is widely used in the scientific

Table F-2-1. Matrix of contaminant transport models used to evaluate consequences t (page 1)

Table F-2-1. (page 2) Table F-2-1. (page 3) community and is accepted for use at th FLAME for modeling organic plumes.

Calibration is an important step in the modeling process, because the validity relies on the accuracy of the match between simulated groundwater flow patterns and and observed data. Calibration of a flow model of the regional aquifer involved pr contours for multiple time periods (Arnett and Brower 1994, Arnett 1994b). Time ve (hydrographs) were also prepared for selected wells. Hydrologic parameters were va resembled observed contours. This method required several iterations with manual p before a suitable match was obtained. Calibration of the contaminant transport mod approach (Arnett and Rohe 1994). Errors in calibration are usually associated with parameters are uncertain because of the high degree of heterogeneity within the ba transport modeling typically requires adjustment of the retardation and dispersion scale values are not known (Arnett and Rohe 1993, 1994; Schafer-Perini 1993, Dames Robertson 1974).

The general approach to groundwater modeling by computer simulation is to solv flow equation to predict hydraulic heads and to use the head distribution in the tr the advective flow (velocity). Hydrologic flow equations for transient conditions changing hydraulic gradient in time and space (water input and output), storativity compressibility, and transmissivity. Contaminant transport equations are a functio factors, dispersion coefficients, decay constants, advective transport, and rates o flow equations must be solved first because results provide input into contaminant flow and transport equations used in this EIS are widely accepted and utilized in m codes (Arnett 1994b; Arnett and Rohe 1993, 1994; Robertson 1974). Flow and contami are discussed in Freeze and Cherry (1979), Driscoll (1986), and Domenico and Schwar

A primary step in performing computer simulation is to establish the model's s then divided into a set of similar units of specified dimensions which are assigned Each node is assigned material properties. The edges of the domain are assigned bo information external to the model (Arnett 1994b; Arnett and Rohe 1993, 1994). In g the more accurate the predictions, but the longer the computational time. Grid pat Arnett and Rohe (1993, 1994), and Robertson (1974) consisted of a rectangular patte northwestern mountain range and east about 16 kilometers (10 miles) past the INEL s northern grid boundary was along the mountain front, and the southern boundary exte (5 miles) south of the INEL site. A submodel with a final grid was set up within t contaminant plumes for finer detail. The finite-element grid formed by Schafer-Per contained more complicated triangular elements near sources of contamination (for e injection well).

The flow and contaminant transport equations are solved by finite-difference o techniques (approximations of the partial differential equations) for each node wit predict hydraulic head and concentrations of contaminant distributions as a functio patterns are needed around some waste sources to simulate steeper hydrologic and ch element techniques have some advantages in these situations. Arnett (1994b), Arnet and Robertson (1974) used the finite-difference techniques, whereas Schafer-Perini element techniques. After completion of the simulation (that is, equations solved increments) the concentrations and hydraulic heads within the nodes are contoured,

plume maps and hydraulic head contours. The modeling grid used for this EIS was bo variable head and no-flow boundaries to the west. No-flow boundaries were assigned the mountains and Snake River Plain Aquifer, whereas variable head boundaries were areas such as mouths of the Big Lost River, Little Lost River, and Birch Creek. Sc considered variable head boundaries for the Test Area North model. Eastern and sou considered constant head and at sufficient distances from contaminant plumes such t defining the boundary conditions had a negligible effect on the simulated groundwat areas.

F-2.2.2.3.2 Modeling Studies-Table F-2-1 presents the different models used in the

assessment of predicted consequences to water resources. Table F-2-1 describes the results produced, potential impacts to the water resources, calibration of the mode models are based on. Modeling was performed by several investigators for the vados zone, for a bounding accident scenario, and for an unintentional release from a gen storage facility. Iodine-129, tritium, and strontium-90 plumes extending from the Idaho Chemical Processing Plant were modeled by Arnett and Rohe (1993). Organic co Area North and the Radioactive Waste Management Complex were modeled by Schafer-Per Dames and Moore (1993), respectively. In addition, an accident scenario for a high the Idaho Chemical Processing Plant was modeled. The accident scenario model concl would not extend beyond the INEL site boundary above maximum contaminant levels thr implementation period (Arnett 1994a). The results of the tank failure model were d amount of liquid in the tank being the only hydraulic driver; it appears reasonable be taken by authorities to mitigate the impacts of such an accident through capping means. The source terms for unintentional discharges at a generic spent nuclear fu negligible compared with the strontium-90 source terms in the high-level waste tank past strontium-90 discharges.

A simple, one-dimensional model was used to estimate flow and contaminant tran zone below the disposal ponds. Average vertical water velocity was calculated from time and vadose zone thickness. The conclusion that strontium-90 is strongly retar based on laboratory and theoretical data to a limited degree. It is based more on amounts of strontium-90 have been discharged to the Test Reactors Area radioactive past 40 years and very little, if any, strontium-90 (near detection limit) concentr aquifer directly beneath or near the Test Reactors Area perched water body. Again, data (which integrate the effects of local heterogeneities) were available to provi model parameter. In the case of strontium-90, the retardation factor was calculate 90 would experience break-through in the near future.

F-2.2.2.3.3 Modeling Assumptions and Limitations-Table F-2-1 lists the

assumptions that provide the bases for the different models used to support the env described in Section 5.8, Water Resources, of Volume 2 of this Environmental Impact following briefly discusses the assumptions and limitations.

- Transient versus steady-state modeling: Garabedian (1986, 1992), Arnett (and Rohe (1993, 1994), and Robertson (1974) concluded that the Snake River system is best simulated by considering transient conditions and a transie Modeling can be conducted under transient (time-dependent) or steady-state Steady-state modeling is used when aquifer conditions (for example, water be considered constant for approximately the period of simulation. Mathem in hydraulic gradient with time is considered zero, and storativity terms assuming steady-state conditions. The steady-state assumption cannot be m levels and recharge volumes change with time.

- Aquifer anisotropy and two dimensional flow: Garabedian (1992) concluded regional scale the groundwater flow is predictable and can be simulated in Vertical flow was found to be several orders of magnitude less than horizo scales vertical flow may be significant, but on regional scales the assump

- No new discharge of radioactive wastes with concentrations above the maxim contaminant level or derived concentration guides: One of the primary ass for modeling and in the evaluation of impacts to the water resources is th

discharges of radioactive wastes with concentrations above the maximum con derived concentration guides will be discharged to the subsurface. Modeli fate and transport of contaminant plumes assumes this in evaluating baseli migration from the vadose zone to the saturated zone (Arnett and Rohe 1993 individual project descriptions indicates that wastes will be disposed of and liquid waste condensers. Sources of wastes are slowly declining due t management practices and engineering and institutional controls; therefore operating conditions no liquid wastes will have concentrations above maxim levels or derived concentration guides which would enter the subsurface. assumes no accidental or unintentional releases will occur. Bounding cond effects from a series of accidental spills indicate that even under conser will not likely affect water quality beyond the immediate facility area (A

- Boundary conditions: The boundary conditions imposed for the INEL site mo consisted of constant head, no-flow, and variable head. Boundaries to the to have sufficient distances from contaminant plumes such that reasonable boundary conditions have negligible effects on the simulated groundwater v areas. These boundaries were assigned constant heads. The boundaries alo border were considered to have no flow along the mountain fronts and varia recharge zones. Variable head boundaries were used on the Schafer-Perini northern recharge zones. Model calibration indicates that these boundarie because a suitable match between simulated and observed flow patterns was 1970-to-1990 time period (Arnett 1994b).

- Precipitation is insignificant to recharge: The amount of precipitation t the vadose zone and migrates to the aquifer is negligible when compared to underflow. This is a good assumption considering the amount of precipitat per year, 8.7 inches per year) and the evaporation rate (125 centimeters p year). Thirty percent of the average annual precipitation at the INEL sit content in snow (Bishop 1993). Snowmelt creates ponding in localized area infiltrates to the Snake River Plain Aquifer. However, this recharge is i the water flow under the INEL site each year is 1.77 billion cubic meters (Robertson et al. 1974).

- Contaminant transport occurs in the upper 74-100 meters (243-325 feet) of Several modelers assume that the contaminant transport occurs in the upper feet) of the aquifer because this is the portion with the highest hydrauli and Rohe 1993, 1994; Schafer-Perini 1993; Robertson 1974, 1977). Vertical wastes downward below this zone is considered insignificant. Several stud be the effective portion of the aquifer (Ackerman 1991; Robertson et al. 1 al. 1976, Garabedian 1986, 1992), hence for regional scale modeling this i assumption. On a local scale, downward vertical movement of contaminants

- No speciation of the contaminant of interest: The models that were used i consider speciation of contaminants (specifically strontium-90) with other The contaminants are assumed to be in their valance state and not bound to thus preventing sorption. Equilibrium modeling using the U.S. Environment Agency-developed code MINTEQA2 indicated that the contaminants of interest would be unspeciated and would be expected to sorb as discussed in the mod

The mathematics used in the models are founded on other assumptions that are n example, it is assumed that flow can be described by Darcy's Law and that the parti can be approximated for solution by numerical methods. For more detail, see Domeni (1990).

F-2.2.2.3.4 Potential Contaminant Migration from Solid Waste-Solid low-level

radioactive and transuranic waste have been disposed of in several pits at the Subs within the Radioactive Waste Management Complex since 1952, and these dispositions continue until 2020. Transuranic waste disposal at the complex was discontinued in of low-level radioactive waste is projected to continue until 2020. A preliminary radioactive waste disposal practices during the time period from 1952 to 1996 is cu as part of a Comprehensive Environmental Response, Compensation, and Liability Act

investigation is being conducted under the Federal Facility Agreement/Consent Order negotiations among DOE, the U.S. Environmental Protection Agency, and the State of purposes of this EIS, impacts are being evaluated from 1995 to 2005. Results of th assessment indicate that contaminants would not reach the INEL site boundary exceed drinking water standards through 2005 (Loehr et al. 1994). For the next 100 years, highest 30-year average concentration in groundwater are predicted to be carbon-14 4,510 picocuries per liter, respectively. These levels are well below DOE's Derive established for carbon-14 (70,000 picocuries per liter) and the U.S. Environmental Maximum Contaminant Level established for tritium (20,000 picocuries per liter).

A radiological performance assessment was also conducted for low-level waste b Radioactive Waste Management Complex from 1984 through present operations and proje disposed through 2020 (Maheras et al. 1994). The results of the assessment indicat pathway exposure occurring by the year 2060 at the INEL site boundary would be less year (Maheras et al. 1994). No significant impacts are expected to occur within th the EIS. However, further information is required before an accurate evaluation of contaminant transport from the Radioactive Waste Management Complex to the environm completed. Information is currently being compiled to characterize source terms, m water, infiltration rates through soil coverings, sorptive characteristics of conta information. A Remedial Investigation/Feasibility Study and a risk assessment is b the potential impacts of past, present, and future activities at the Radioactive Wa but is not available for this EIS.

New wastes resulting from sources outside the INEL site identified under the p would not be addressed by the Remedial Investigation/Feasibility Study or the risk new wastes transported to the INEL site under the alternatives would be addressed u Environmental Policy Act documentation, and/or as specified under the Resource Cons and the Comprehensive Environmental Response, Compensation, and Liability Act.

Loehr et al. (1994) and Maheras et al. (1994) used computer models including G PORFLOW to predict the levels of contaminants that would occur at the INEL site bou considered the leaching and migration of contaminants through the vadose zone and i For a detailed discussion of methods used in the modeling approach, refer to these

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F-3 Air Resources

SECTION F-3 CONTENTS

FIGURES

TABLES

#F-3 AIR RESOURCES

Section F-3 provides supplemental information on methodology and other techni for the air resources sections of Volume 2 of the Spent Nuclear Fuel and INEL Envir Restoration and Waste Management Environmental Impact Statement (SNF and INEL EIS).

F-3.1 Overview

Activities proposed under the Environmental Restoration and Waste Management Program at the Idaho National Engineering Laboratory (INEL) site may affect the qua air resources in various ways. The alternative courses of action proposed under thi consequences that vary both in nature and magnitude. These consequences must be tho characterized to provide information needed to support the selection of proper cour Assessments have been performed to characterize the existing conditions of radiolog nonradiological air quality, as well as the consequences of alternative courses of presents background information related to these assessments, including description

- The regulatory framework under which air quality standards and criteria established and administered
- Airborne emissions of radiological and nonradiological pollutants from e

site facilities and proposed projects

- The data, methods, and computer models applied to estimate concentration pollutants at various locations as a result of airborne emissions.

The information presented herein supports the summary results presented in Se 5.7 (Air Resources) of Volume 2 of the SNF and INEL EIS, which respectively describ environment and consequences of alternatives on air quality. In addition to establi basis for those summary results, this section presents detailed emissions estimates proposed facilities. Additional details on the assessment results, including predic all combinations of alternative and waste management options and selected individua (including incineration at the Waste Experimental Reduction Facility), are presente Support Document for Air Resources, INEL Environmental Restoration and Waste Manage Programs (Belanger et al. 1995a).

F-3.1.1 Scope

The assessments described in Section F-3 consider both nonradiological and ra quality related to baseline conditions, projected increases to the baseline, and th ER&WM alternative courses of action. Specifically, the scope includes background in air resources, air quality regulation, and assessments related to (a) existing cond actual emissions from INEL site facilities (termed the actual emissions baseline), would be experienced if existing facilities operated to the maximum extent allowed permits or limits (termed the maximum emissions baseline), and (c) the estimated co emissions from projects associated with each of the four ER&WM alternatives.

The assessments focus on conditions or impacts that result at onsite and offs the release of contaminants from various categories of sources. The types of emissi include radionuclides and the two major categories of nonradiological pollutants-th pollutants and toxic air pollutants. The categories of sources assessed include sta as facility stacks and vents), mobile sources, and sources related to construction locations for which baseline conditions and impacts are assessed include major work INEL site, locations along the INEL site boundary and public roads, and the Craters Wilderness Area. Assessment results are summarized in Sections 4.7 and 5.7 (Air Res main text and are presented in additional detail in Belanger et al. (1995a).

F-3.1.2 Supporting Documentation

Section F-3 summarizes the methods of independent analyses performed by sever specialists from contractor organizations. In some cases, those analyses are docume prepared for this EIS. These documents are considered key references. Their content manner in which they were used in the air resources assessments are summarized as f

- A report prepared by Science Applications International Corporation (Belanger 1995a), which provides additional detail on assessment methodology and result including projected emissions and impacts for specific projects and waste man options.
- Two reports prepared by Science Applications International Corporation (Rauds al. 1995 and Belanger et al. 1995b), which provide specific information on th assessment of Prevention of Significant Deterioration.
- A report prepared by EG&G Idaho, Inc. (Leonard 1993), which presents estimate radiological doses resulting from airborne radionuclides released by faciliti INEL site. This report was used as a basis for the existing radiological air conditions.
- A document prepared by Ecology and Environment, Inc. (E&E 1994), describing t methods and results of the assessment of baseline conditions for toxic air po These results were used to establish the actual and maximum baseline levels o air pollutants.
- An Engineering Design File prepared by EG&G Idaho, Inc. (Leonard 1994), which presents estimated radiation doses to the maximally exposed worker and offsit individual and population dose resulting from specific projects associated wi ER&WM alternative actions. These results were used as the basis for estimatin radiological doses for radionuclide emissions associated with specific altern

waste stream management options.

- Engineering Design Files prepared by EG&G Idaho, Inc, describing the source t estimated for no action projects (Staley 1993a) and proposed action projects 1993b). These source terms were used as input to the air quality assessments projected increases to the baseline and ER&WM alternatives, which included no action and proposed action projects.

- A document prepared by Ecology and Environment, Inc. (E&E 1993), describing t methods and results of assessments to estimate impacts from mobile and constr source emissions. These results were used as a basis for estimating consequen mobile sources and construction activities related to ER&WM alternatives.

Section F-3 attempts to integrate the descriptions of methods, assumptions, a information from the analyses cited above into a single source.

F-3.1.3 Organization

The remainder of this section is organized as follows:

- Section F-3.2 presents the background environmental information on the including background levels of radiation. radioactivity, and nonradiol
- Section F-3.3 contains a description of air quality regulations and gu discussion of how they apply to sources at the INEL site
- Section F-3.4 describes the methods and assumptions used to estimate e assess conditions and impacts for releases of radiological and nonradi pollutants and presents listings of these emissions for specific proje ER&WM alternatives.

F-3.2 The Idaho National Engineering Laboratory Site Environment

This section describes background levels of radiation, airborne radioactivity nonradiological air quality in the environs of the INEL site.

F-3.2.1 Radiation and Airborne Radioactivity

The population of the Eastern Snake River Plain is exposed to environmental r both natural and anthropogenic sources (that is, sources of human origin). This sec background levels of radiation and airborne radioactivity in this geographical regi of population exposure not related to INEL site emissions. Monitoring data for area influence of INEL site emissions are also presented. Additional information related conditions (including monitoring results and airborne radioactivity associated with facilities) is presented in Hoff et al. (1993).

F-3.2.1.1 Sources of Radiation Exposure Not Related to Idaho National

Engineering Laboratory Site Operations. The predominant source of radiation in the the natural radiation background, a term that refers to natural sources of radiatio are continuously exposed. Background radiation includes sources such as cosmic rays naturally present in soil, rocks, and the human body; and airborne radionuclides of (such as radon). The dose from background radiation results from sources that can b (outside the body) or internal (within the body). External sources consist primaril and radioactivity within soil and rocks. Internal sources include radioactivity nat the human body and airborne radioactivity that can deposit in the lungs when inhale background dose is increased by radioactivity still remaining in the environment as atmospheric testing of nuclear weapons, although this increase is very minor (less

Table F-3-1 presents a summary of the estimated background dose by various ex categories for residents of the Eastern Snake River Plain. As can be seen from thes cumulative annual dose, 351 millirem, is due largely to the inhalation of airborne

radioactivity consists almost entirely of radioactive particles formed by the decay occurring radon.

In addition to natural background sources, residents of the Eastern Snake Riv exposure from radiation sources of human origin (anthropogenic sources), including nuclear medicine diagnostic procedures, consumer products (such as televisions, smo self-luminous products), and radioactivity remaining in the environment as a result testing of nuclear weapons. Collectively, these result in an animal dose of about 6 average U.S. population member, with most of this dose (about 54 millirem per year) the medical use of radiation (NCRP 1987). This dose does not include the contributi radioactivity in tobacco products, which results in a substantial radiation dose (s to the lungs of smokers.

Table F-3-1. Summary of environmental radiation dose from natural background source of the Eastern Snake River Plain for 1991.^a

Source	Annual dose (millirem)
External sources^b	
Terrestrial radioactivity	73
Cosmic rays	39
Total external	112
Internal sources^c	
Airborne (inhaled) radioactivity	200
Radioactivity in the body	39
Total internal	239
Total dose	351

a. Dose is expected to vary by a small amount from year to year.
b. Source: Hoff et al. (1992).
c. Regional data are not available; internal dose values are effective doses for a member of the U.S. population but are likely to be representative of the Eastern S Plain (NCRP 1987).

F-3.2.1.2 Radiological Environmental Monitoring. Over the years, radiological

conditions in the INEL Site environs have been characterized by various monitoring Monitoring refers to a variety of activities (for example, sampling, analysis, and performed to measure ambient radiation exposure rates and airborne radioactivity le Environmental Surveillance Program includes a comprehensive network of 23 continuou samplers. Twelve of the sampling locations are located within the boundaries of the are located offsite, including seven stations near the INEL site boundary and four located within the communities of Blackfoot, Idaho Falls, and Rexburg, and in Crate Wilderness Area. It is assumed that results from onsite and boundary community loca contributions from background conditions and INEL site emissions, while distant loc background conditions beyond the influence of INEL site emissions. A summary of gro beta activity measurement results for distant and INEL site boundary community loca in Table F-3-2, indicates that there is no significant difference in airborne radio these locations. Additional details regarding this program are provided in Hoff et

The Environmental Surveillance Program also includes direct measurements of a (environmental) radiation levels using thermoluminescent dosimeters (TLDs). These d

Table F-3-2. Airborne radioactivity levels for Idaho National Engineering Laborator boundary communities, and distant locations for 1991.^a

	Average concentration^b (10^-15 microcuries per milliliter)

Location	Alpha	Beta
Distant	2.0 +/- 0.2	27 +/- 1
Boundary	1.8 +/- 0.1	28 +/- 1
Onsite	1.7 +/- 0.1	29 +/- 1

a. Source: Hoff et al. (1992).
b. Values are arithmetic means with 95 percent confidence interval.

ionizing radiation exposure rates due to the combined sources of natural radioactiv soil, cosmic rays, residual fallout from nuclear weapons tests, and radioactivity f operations. Dosimeters are placed at seven distant community locations and six boun The average annual exposure measured by the thermoluminescent dosimeters for 1991 w 123 milliroentgen (which corresponds to a dose of 127 millirem) for distant locatio 121 milliroentgen (125 millirem) for boundary community locations (Hoff et al. 1992

F-3.2.2 Background Nonradiological Air Quality

As used here, the term background air quality refers to the levels of nonrad pollutants in ambient air that are not attributable to INEL site activities. Limite available for characterization of background air quality levels, since only particu monitored at locations beyond the influence of the INEL site. The INEL Environmenta Surveillance Program, which is conducted by the Department of Energy (DOE) Idaho Op Office Radiological and Environmental Sciences Laboratory (RESL), monitors airborne matter concentrations at INEL Site boundary communities and distant and onsite loca illustrated in Figure F-3-1. Onsite data are considered to include background leve from INEL site activities. Results for airborne particulate monitoring at distant, and onsite locations for the period 1988 through 1992 are presented in Table F-3-3. other pollutant levels, including nitrogen dioxide and sulfur dioxide, is performed Nitrogen dioxide is monitored at two locations onsite to fulfill one of the conditi Construct issued by the State of Idaho. Sulfur dioxide is also measured at one of t

<u>Figure F-3-1. The airborne raioactivity monitoring network operated by the Radiolog</u>

Table F-3-3. Environmental surveillance program particulate matter monitoring data National Engineering Laboratory for 1988 through 1992.^a

Year	Concentration^b (micrograms per cubic meter)		
	Distant group	Boundary group	Onsite group
1988	50 +/- 20	35 +/- 9	32 +/- 13
1989	40 +/- 14	30 +/- 7	17 +/- 2
1990	36 +/- 12	32 +/- 8	20 +/- 9
1991	30 +/- 20	28 +/- 12	18 +/- 3
1992	26 +/- 19	23 +/- 10	13 +/- 2

a. Source: Hoff et al. (1993).
b. Values are arithmetic group means of quarterly composites of weekly samples with 95 percent confidence level for the mean.

The State of Idaho has conducted particulate monitoring at the Craters of the Wilderness Area. Monitoring results for this activity, which was discontinued in 19 in Table F-3-4. Since this location is approximately 20 kilometers (12.4 miles) fro boundary (and much further from most major emmisions sources), these levels can be representative of general background.

Table F-3-4. Summary of total suspended particulate matter monitoring data for Crat Wilderness Area.^a

	Concentration

(micrograms per cubic meter)

Year	24-year maximum	Standard^b	Annual average	Stand
1984	41	260	6	75
1985	48	260	10	75
1986	41	260	10	75
1987	35	260	15	75
1988	43	260	14	75

a. Source: IDHW (1991). Data are for the last five years for which results are ava
b, These are primary State standards for total suspended particulates; secondary s 150 micrograms per cubic meter for 24-hour total suspended particulates and 60 mic cubic meter for annual average.

F-3.3 Air Quality Standards and Regulations

To protect the public from potential harmful effects of air pollution, air qu have been established by Federal and State agencies. These regulations are based on strategy that incorporates the following principal elements:

- Designation of acceptable levels of pollution in ambient air to protect
- Establishment of limits on emissions of air pollutants from vehicular an sources
- Implementation of a permitting program to regulate (control) emissions f stationary (nonvehicular) sources of air pollution
- Issuance of prohibitory rules, such as rules prohibiting open burning.

At the INEL, programs have been developed and implemented to ensure complianc quality regulations by (a) identifying sources of air pollutants and obtaining nece Federal permits, (b) providing adequate control of emission of air pollutants, (c) sources and ambient levels of air pollutants to ensure compliance with air quality (d) operating within permit conditions, and (e) obeying prohibitory rules.

This section describes Federal and State air quality regulations that are app proposed actions and programs established by DOE to comply with environmental, safe requirements in general and air quality requirements in particular.

F-3.3.1 Federal and State Air Quality Requirements

The Federal Clean Air Act establishes the framework to protect the nation's a public health and welfare. The U.S. Environmental Protection Agency (EPA) and the S are jointly responsible for establishing and implementing programs that meet the re Act. Facilities planned or currently operating at the INEL are subject to air quali standards established under the Clean Air Act and by the State Department of Health (IDHW), Division of Environmental Quality, and to internal policies and requirement quality standards and programs applicable to INEL operations are summarized in Figu Volume 2 of this EIS and are described in further detail below.

F-3.3.1.1 Ambient Air Quality Standards. The Federal Clean Air Act establishes

National Ambient Air Quality Standards (NAAQS) to protect public health and welfare standards define the ambient concentration of an air pollutant below which no adver human health is expected. A second category of standards (called secondary standard established to prevent adverse impacts on public welfare, including aesthetics, pro vegetation. Certain standards apply to long-term (annual average) conditions; other applying to conditions that persist for periods ranging from one hour to three mont the toxic properties of the pollutant in question. Ambient standards have been deve

few specific contaminants, namely, respirable particulate matter (particles not lar 10 micrometers in diameter, which tend to remain in the lung when inhaled), sulfur dioxide, carbon monoxide, lead, and ozone. In addition, the State of Idaho has als additional State ambient air quality standard for total suspended particulates (all regardless of size) and a standard for fluorides in vegetation. (a) These pollutant criteria air pollutants. A listing of National Ambient Air Quality Standards is pro

Table F-3-5.

The U.S. Environmental Protection Agency and State of Idaho have monitored am quality in an attempt to define areas as either attainment (that is, the standards nonattainment of the ambient air quality standard, although many areas are unclassi of regional monitoring data. The attainment status is specific to each pollutant an Designation as either attainment or nonattainment not only indicates the quality of also dictates the elements that must be included in local air quality regulatory co Unclassified areas are generally treated as being in attainment. The elements requi nonattainment areas are more comprehensive (or stricter) than in attainment areas.

a. In the assessments performed for this EIS, all particulate matter was assumed to (termed PM-10), with the exception of fugitive dust sources. Since the standard for than that for total particulates, the former standard was used as basis for compari assessment for flourides in vegetation was omitted in favor of a more stringent co of toxic air pollutants in air (see Section F-3.3.1.5). Therefore, discussions that detail on total suspended particulates and flourides.

Table F-3-5. National Ambient Air Quality Standards and increment values for Preven Significant Deterioration (micrograms per cubic meter).

		Standard		Increment	
Pollutant	Averaging time	Primary	Secondary	Class II area	Cla
Sulfur dioxide	3-hour	(a)	1300	512	25
	24-hour	365	(a)	91	5
	Annual	80	(a)	20	2
Particulate matter^b	2-hour	150	150	30	8
	Annual	50	50	17	4
Nitrogen dioxide	Annual	100	100	25	2.5
Carbon monoxide	1 hour	40,000	(a)	(a)	(a)
	8-hour	10,000	(a)	(a)	(a)
Lead	Quarterly	1.5	1.5	(a)	(a)
Ozone	1-hour	235	235	(a)	(a)

a. No standard or increment for this pollutant or averaging time.
b. Refers to particulate matter less than 10 microns in size (PM-10). Includes rece promulgated increment for PM-10.

encompasses the environs of the INEL has been classified as attainment or unclassif National Ambient Air Quality Standards, meaning that air pollution levels are expec considered healthful. The nearest nonattainment area lies some 50 miles south of th Power and Bannock Counties. This area has been designated as nonattainment for the related to respirable particulate matter.

F-3.3.1.2 Prevention of Significant Deterioration. The Clean Air Act contains

requirements to prevent the deterioration of air quality in areas designated as att ambient air quality standards. These requirements are contained in the Prevention o Deterioration (PSD) amendments and are administered through a program that limits t specific air pollutants above the levels that existed in what has been termed a bas year. The amendments specify maximum allowable ambient pollutant concentration incr increments. Increment limits for pollutant level increases are specified for the na (designated as Class II areas), and more stringent increment limits (as well as cei

for designated national resources, such as national forests, parks, and monuments (Class I areas). In Southeastern Idaho, the Craters of the Moon Wilderness Area is t area. Increment values applicable to the INEL site are presented in Table F-3-5.

The State of Idaho Department of Health and Welfare, Division of Environmenta (DEQ), administers the Prevention of Significant Deterioration Program. Proposed ne emissions at the INEL site and modifications are evaluated to determine the expecte emissions of all pollutants. The INEL site is considered a major source, since faci of some air contaminants exceed 250 tons per year. As such, a Prevention of Signifi Deterioration analysis must be performed whenever any modification would result in increase of any air pollutant. Levels of significance range from very small quanti pound) to over 100 tons per year, depending on the toxic nature of the substance. F significance levels range from any increase in emissions to that which would result of 0.1 millirem per year or greater, depending on total facility emissions. If an I requires a Prevention of Significant Deterioration permit, it must be demonstrated

- Will be constructed using best available control technology (a level o technologically feasible and considered cost-effective) to control sig in air emissions
- Will operate in compliance with all prohibitory rules
- Will not cause a detriment to ambient air quality at the nearby Crater Wilderness Area, a Prevention of Significant Deterioration Class I are
- Will not result in an exceedance of an ambient air quality standard.

The evaluation also includes an assessment of potential growth and associated quality-related values-visibility, vegetation, and soils. Generally, all Prevention Deterioration projects must go through a public comment period with an opportunity review. The INEL has been granted a total of 23 Prevention of Significant Deteriora construct by the Division of Environmental Quality; applications for an additional been submitted and are pending approval (Hoff et al. 1992).

F-3.3.1.3 National Emission Standards for Hazardous Air Pollutants, In addition to

ambient air quality standards and Prevention of Significant Deterioration requireme Act designates requirements for sources that emit substances designated as hazardou These requirements are specified in a program termed National Emission Standards fo Pollutants (NESHAPs). This program was substantially amended in 1990 and has yet to implemented. However, one section of the National Emission Standards for Hazardous program that currently applies to INEL Operations is contained in Title 40 of the C Regulations (CFR) Part 61, Subpart H, National Emissions Standards for Radionuclide Department of Energy Facilities. This regulation establishes a limit to the dose th by a member of the public due to operations at the INEL. The annual dose limit (10 applies to the maximally exposed offsite individual and is designed to be protectiv with an adequate margin of safety. The regulation also establishes requirements for emissions from facility operations and analysis and reporting of dose.

The INEL complies with the requirements of the National Emission Standards f Air Pollutants through programs to monitor radionuclide emissions, evaluate dose to residences, and report doses annually to the U.S Environmental Protection Agency. P sources of emissions at the INEL and modifications are evaluated to identify the ex to dose to nearby residents. If specified levels (fractions of the acceptable dose Operations) are exceeded, a National Emission Standards for Hazardous Air Pollutant application is prepared for submittal to the U.S Environmental Protection Agency. N also evaluated to determine emissions monitoring requirements The INEL currently h National Emission Standards for Hazardous Air Pollutants Permits granted by the U.S Protection Agency (Hoff et al. 1992).

In addition to radionuclides, emissions standards have been established unde Emission Standards for Hazardous Air Pollutants Program for several nonradiological pollutants, including benzene, asbestos, and others. The INEL complies with the req evaluation, control, and permitting of nonradiological hazardous air pollutants thr are also administered by the U.S. Environmental Protection Agency. In accordance wi Amendments to the Clean Air Act, maximum achievable control technology (MACT) will by the U.S. Environmental Protection Agency for various sources. Those sources will implement programs or controls to achieve maximum achievable control technology by implementation date and analyze residual risk. If the residual risk is above specif limits, additional controls will be required. Only a few maximum achievable control levels have been proposed, and the INEL is not yet directly affected. It is expecte

controls will be required as maximum achievable control technology levels are promu categories, including (but not limited to) waste treatment, storage and disposal fa boilers, process heaters, stationary internal combustion engines, hazardous waste i remediation activities.

F-3.3.1.4 State of Idaho Permit Programs. The Idaho Air Pollution Control Program,

administered by the Division of Environmental Quality, requires that permits be obt sources of air pollutants. Unless the source is specifically exempt from permitting Permit to Construct must be obtained before a Source can be constructed. The list o very specific and limited; most new INEL sources and modifications to existing sour subjected to a Permit to Construct. Under Title V of the 1990 Clean Air Act Amendme would also be subjected to an Operating Permit, which must be renewed periodically. typically issued with specific emissions limits and conditions for operation. This process allows the State to determine that emissions will be adequately controlled, comply with all emission standards and regulations, and public health and safety wi Protected. Generally, Operating Permit reviews must go through a public review peri opportunity for public comment.

In addition to the Prevention of Significant Deterioration permits cited in S as of January 1992 the State had issued 29 Permits to Construct for Sources at INEL do not exceed the threshold for Prevention of Significant Deterioration; the estima these sources are less than 10 percent of levels deemed significant by the Division Quality and Prevention of Significant Deterioration analysis is not required (DOE-I

F-3.3.1.5 State of Idaho Rules for Toxic Air Pollutants. The Idaho Division of

Environmental Quality has recently promulgated rules and methodologies to estimate potential human health impacts of toxic air pollutants (pollutants which by their n human or animal life or vegetation) from new or modified sources. These rules are c Title 1, Chapter 1, of the Rules for the Control of Air Pollution in Idaho (IDHW 19 implemented through the air quality permit program described above. Emission levels have been established for about 700 toxic air pollutants, based on the known or sus these substances. Expected emissions above administrative screening levels must be standard air dispersion modeling techniques (computerized programs to predict pollu concentrations based on source emissions, release characteristics, and meteorologic risk assessment methodologies to assess potential impacts. A facility will not be g unless it can be shown that the emissions will comply with all applicable toxic air for carcinogenic (cancer-causing) and noncarcinogenic substances (IDHW 1994). As pa permit evaluation process, requirements related to toxic air pollution control equi modifications, and materials substitutions may be specified to limit ambient levels pollutants.

The State has defined acceptable ambient concentration levels for many toxic including both carcinogenic and noncarcinogenic contaminants. These levels are incr existing levels and apply only to sources that became operational after May 1, 1994 contaminants known or suspected to cause cancer in humans, this level has been defi acceptable ambient concentration for a carcinogen (AACC). The acceptable ambient co a carcinogen is based on risk and corresponds to that concentration at which the pr contracting cancer is one in a million, assuming continuous exposure over a 70-year acceptable ambient concentration for a carcinogen differs for each carcinogenic sub carcinogenic potency, as defined by the U.S. Environmental Protection Agency. (The assess cancer health risk associated with air emissions from current INEL site faci actions is summarized in Section F-4, Health and Safety, of this appendix.) The Sta permit if the calculated incremental risk due to project emissions does not exceed ambient concentration for a carcinogen (that is, does not result in an individual e greater than one in a million). If this level is expected to be exceeded, a permit if (a) the calculated risk does not exceed ten in a million and (b) toxic reasonabl

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a. This probability is often described as an "individual excess cancer risk." Exces here, means above the normal cancer incidence rate, which is currently about one in An individual excess cancer risk of one in a million or less is generally considere

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technology (which is similar to best available control technology, or BACT) is empl emissions of carcinogenic substances.

Many air contaminants are not carcinogens but may contribute to other health as respiratory or eye irritants, or impacts to the cardiovascular, reproductive, ce other body systems. Levels of significance for noncarcinogenic substances are calle concentrations (AAC). The acceptable ambient concentration is based on acceptable e for occupational workers and other reference sources of information for the contami For an added margin of safety, the State generally sets the acceptable ambient conc hundredth of the acceptable occupational exposure level. Permits are granted if inc from the new or modified source are expected to result in annual average concentrat acceptable ambient concentration. However, if the acceptable ambient concentration exceeded, a permit may still be granted based on consideration of other factors, su the substance and anticipated level of exposure.

The acceptable concentration levels specified in the regulation are increment standards that apply to new and modified stationary sources. They are used as guide comparison (called reference levels) with the results of the toxic air pollutant as in Section 5.7, Air Resources, of Volume 2 of this EIS.

F-3.3.2 Department of Energy Orders and Guides

The DOE has developed and issued a series of orders and guides to ensure that comply with applicable environmental, safety, and health regulations and DOE intern including the concept of maintaining emissions and exposures to the public and work are as low as reasonably achievable (ALARA). The as-low-as-reasonably-achievable co employed in the design and operation of all facilities and applies to all types of example, radionuclides, carcinogens, and toxic and criteria air pollutants). Order designed for protection of environment, safety, and health are

- DOE Order 5400.1, "General Environmental Protection Program," establishes environmental protection program requirements pertaining to air and other environmental media intended to ensure that operations comply with applicable Federal, State, and local laws and regulations, as well as DOE internal polic Order defines environmental protection requirements established in more gener terms in DOE Order 5480.1B.
- DOE Order 5480.1B, "Environment, Safety, and Health Program for Department of Energy Operations," details overall requirements for environmental, safety, a programs.
- DOE 5480.4, "Environmental Protection, Safety, and Health Protection Standard specifies and provides requirements for the application of mandatory standard applicable to DOE and contractor operations.
- DOE Order 5400.5, "Radiation Protection of the Public and the Environment," prescribes exposure limits for exposure of the public to radiation from sitew activities that are equivalent to the 40 CFR 61 limits described in Section F As of December 1994, this order was in the process of being codified as Title Part 834, of the Code of Federal Regulations (that is, 10 CFR 834).
- DOE policy further requires effluent and environmental air monitoring program determine whether the public and the environment are adequately protected and whether operations are in compliance with applicable regulations. The "Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance" (DOE 1991) has been issued to assist operating fa in implementing this policy and specifies the required elements of a radiolog monitoring program.
- DOE Order 5483.1A, "Occupational Safety and Health Program for DOE Contractor Employees at Government Owned, Contractor Operated Facilities," establishes requirements and procedures to ensure that worker protection is consistent wi afforded private industry employees by the Occupational Safety and Health Act 1970.
- DOE Order 5480.11, "Radiation Protection for Occupational Workers," establish standards for protection of workers from occupational exposure to radiation. Order has been codified as Title 10, Part 835, of the Code of Federal Regulat (that is, 10 CFR 835).

F-3.4 Air Quality Impact Assessment Methodology

Distinct types of assessments have been performed to assess air quality for e and future actions. These are

- Radiological air quality assessments, which are performed for radionuc from stationary sources
- Nonradiological air quality assessments, which are performed for crite pollutant emissions from stationary (stack and diffuse) operational so dust and combustion product emissions associated with construction equ some operational sources
- Degradation of visibility assessments, which are performed for certain emissions from stationary sources
- Assessments of criteria pollutant emissions from mobile sources.

This section describes the methodology used in each type of air quality asse the general approach to source term estimation and atmospheric dispersion modeling, specific information on related assumptions, methods, and data used in the analyses

F-3.4.1 Source Term Estimation

The type and quantity of pollutants emitted to air from a specific source, o is often referred to as the source term. This Section summarizes methods used to es radiological and nonradiological source terms for current and projected INEL site f

F-3.4.1.1 Source Terms for Existing Facilities. The source terms used for existing

radiological conditions were obtained primarily from Engineering Design Files (EDFs prepare the 1991 INEL National Emission Standard for Hazardous Air Pollutants, Annu (DOE-ID 1992a) and Supplement (DOE-ID 1992b). Other source term-related data were o from the INEL Radioactive Waste Management Information System (RWMIS) (Litteer et a Taylor 1994) and from operating contractors of existing facilities. Radiological so existing INEL site facilities are summarized in Table 4.7-1 of Volume 2 of this EIS in Leonard (1993).

The maximum hourly and annual average emission rates for criteria and toxic from existing facilities and anticipated projects are listed in Table 4.7-2 of Volu Criteria pollutant emission rates for existing facilities are based on data contain Emissions Inventory for 1991 (DOE-ID 1992c). Toxic pollutant emission rates are fro Toxic Air Pollutant Emissions Inventory for 1989 (DOE-ID 1993a). These are the two years for which the required data are available. To characterize a maximum emission actual emission rates were increased by appropriate scaling factors. In general, th are based on maximum emission rates allowed by facility operating permits or on max throughput or capacity of the process producing the emissions. The rationale and me process is described in further detail in E&E (1994) and Belanger et al. (1995a).

Emission rates are estimated for all criteria pollutants. However, since the toxic air pollutants (many of which are released in only trace quantities), analyst approach to reduce the number requiring assessment to only those toxic emissions th potential to result in concentrations approaching applicable standards or guideline assessment, this was done by comparing current (1989) emission rates to the screeni proposed by the State of Idaho (IDHW 1994). Emission rates below this level are con State as not likely to have significant impacts and therefore do not warrant furthe the proposed State regulations would apply only to new (and not existing) facilitie screening emission levels are useful as indicators of potentially significant emiss

Some projects that were originally considered part of Alternative A (No Actio considered as projected increases to the baseline (that is, it was assumed, at the that they would become operational prior to the implementation start date for the E alternatives). Source terms for these projects were estimated as described below f alternative projects but are reported on Table 4.7-2.

F-3.4.1.2 Source Term Estimation for Environmental Restoration and Waste

Management Alternatives. Emission rates were estimated for each project associated more of the ER&WM alternatives. Source terms for specific projects associated with alternatives were estimated using conservative engineering calculations based on kn proposed facility or activity. Typically, these evaluations considered the processe materials to be used, activities to be performed within the systems, and operating similar systems. For some projects, emissions estimates had previously been made an as part of an Environmental Assessment, Permit to Construct, or other action. In su previously estimated source terms were either used directly or were revised to refl information. Where applicable, the analysis used emission factors from authoritativ sources, such as EPA (1992a).

Source term estimates for ER&WM projects include the following components:

- Radionuclide emissions from projected facility operation: as a minimum radionuclides that collectively contribute 95 percent or more of the p specified individually
- Criteria pollutant emissions from facility operations: all criteria po included in the estimates
- Toxic air pollutant emissions from facility operations: the toxic air assessed were those that were either (a) included in the baseline asse emitted by any proposed project or (b) emitted by proposed projects in quantity that exceeds the screening level emission rate proposed by th (even if the toxic was not assessed in the baseline)
- Fugitive dust and criteria pollutant emissions from construction and d is, decontamination and decommissioning projects) activities

- Fugitive dust and criteria pollutant emissions from mobile sources.

The radiological and nonradiological source terms for ER&WM projects are docu Staley (1993a, 1993b) for no action and proposed action projects, respectively. How time those documents were prepared, projects have been added, deleted, or changed i definition. Emissions data have been revised to reflect updated project information emission rates for radionuclides, criteria pollutants, and toxic air pollutants are Tables F-3-6, F-3-7, and F-3-8, respectively. These tables present emission rates f which emissions are expected, as well as the ER&WM alternative and waste stream or which each project is associated.

F-3.4.2 Radiological Assessment Methodology

This section summarizes information on the data and methods used to assess ra conditions and dose to individuals at onsite and offsite locations due to routine e radionuclides from existing and proposed INEL site facilities.

F-3.4.2.1 Model Selection and Application. The computer program GENII (Napier et

al. 1988) was used to calculate doses from all pathways and modes of exposure likel significantly to the total dose from airborne releases. These are

- External radiation dose from radionuclides in air
- External dose from radionuclides deposited on ground surfaces
- Internal dose from inhalation of airborne radionuclides
- Internal dose from ingestion of contaminated food products.

GENII incorporates algorithms, data, and methods for calculating doses to various t and for determination of effective dose equivalent, based on the recommendations of

Table F-3-6. Listing of projected Idaho National Engineering Laboratory site radion

Project, location, and program or streama	Assoc-iated altern-ativeb	Carbon monoxide		Nitrogen di
		Max.hr.	Annual	Max.hr.

		(g/hr)	(kg/yr)	(g/hr)
Radiological and Environmental Sci Laboratory Replacement, CFA, infrastructure	A,B,C,D	14	118	66
BORAX-V D&D, EBR-I/BORAX-V area, D&D				
Emergency generator	A,B,C,D	200	176	940
Demolition (blasting)		(c)	292	(c)
Pit 9 Retrieval, RWMC, remediation	A,B,C,D			
Retrieval of waste and soil		(c)	(c)	(c)
Thermal treatment		4,250	16,600	32,600
Boiler		418	3,680	1,880
Transuranic Storage Area Enclosure Storage, RWMC, transuranic waste	A,B,C,D	1,660	14,500	3,530
Waste Characterization Facility, R transuranic waste	A,B,C,D	1,700	3,450	6,800
Waste Handling Facility, ANL-W, low-level waste	A,B,C,D	122	23	564
Waste Immobilization Facility,d IC igh-level waste				
With separations	C,D	1,300	420	190,000
With direct vitrification	B	0.04	0.4	190,000
Mixed/Low-Level Waste Treatment Facility, RWMC,e low-level and mixed low-level waste	D			
Incineration		24	137	232
Sizing, compaction, treatment		(c)	(c)	(c)
Emergency generator		4,060	211	18,800
Fort St. Vrain Spent Nuclear Fuel and Storage, ICPP, spent nuclear fuel	B,Deipt	5.0	0.17	25
Idaho Waste Processing Facility,f RWMC, transuranic, low-level, and mixed low-level waste				
Incineration	B	6,790	17,650	18,430
Incineration	D	7,810	20,300	21,200
Emergency generator	B,D	7,290	379	27,700
Heating boiler	B,D	386	1,270	4,250
RWMC modifications to support priv sector treatment of alpha-contaminated mixed low-level waste, RWMC, transuranic waste	B,D	1,200	11,000	5,500
Waste Experimental Reduction Facil Incineration,g PBF, low-level and mixed low-level waste	B,D	330	1,900	400
Plasma Hearth Process, ANL-W, mixe low-level and hazardous waste	B,D	82	257	2,200
Totalh		29,550	74,295	316,686

a. Only those projects with criteria pollutant emissions are listed; CFA = Central Reactor Experiment-V; EBR-I = Experimental Breeder Reactor-I; D&D = decontamination Waste Management Complex; ICPP = Idaho Chemical Processing Plant; PBF = Power Burst Laboratory-West.
b. A = Alternative A (No Action); B = Alternative B (Ten-Year Plan); C = Alternati Disposal); D = Alternative D (Maximum Treatment, Storage, and Disposal).
c. No emissions of this type are predicted for the project.
d. The Waste Immobilization Facility may operate in either of two modes: direct v separations (under Alternative C or D).
e. The precise location for these facilities has not yet been determined; for purp is slightly east of RWMC.
f. Incinerator emissions under Alternative D are assumed to be 15 percent higher t Alternative B; similar emissions would also be projected for the Private Sector Alp Treatment Facility, which is a competing project that would have a similar design a
g. This project includes incineration only; other waste processing is assessed as

h. This total would apply only to Alternative D and only if all facilities were op for totals by alternative and program or waste stream.

Table F-3-8. Listing of projected Idaho National Engineering Laboratory site toxic rates by project and alternative.

Project name, location, and associated program or source groupa	Asso-ciated alter-nativeb	Compound	Emission rate Maximum hourly (Grams per hour)	(h
Radiological and Environmental Science Laboratory Replacement, Central Facilities Area, infrastructure	A,B,C,D	Hydrochloric acid	1.5 y 101	3
		Hydrofluoric acidc	3.0 y 100	6
		Nitric acid	7.0 y 100	1
		Sulfuric acid	2.0 y 101	4
Boiling Water Reactor Experiment V (BORAX-V) Decontamination and Decommissioning, Experimental Breeder Reactor-I/BORAX-V area, decontamination and decommissioning	A,B,C,D	Ammonia	1.1 y 102	2
		Benzene	3.0 y 100	6
		Formaldehyde	5.8 y 100	1
Pit 9 Retrieval, Radioactive Management Complex, remediation	A,B,C,D	Asbestos	1.1 y 10y1	2
		Benzene	4.7 y 100	1
		Beryllium	9.8 y 10y3	2
		Carbon tetrachloride	5.7 y 100	1
		Chloroform	1.3 y 100	2
		Chromium	6.4 y 10-2	1
		Formaldehyde	5.2 y 101	1
		Hydrochloric acid	2.1 y 101	4
		Mercury	9.3 y 10y1	2
		Nickel	7.3 y 10-1	1
		Perchloroethylene	1.3 y 100	2
		Trichloroethylene	1.9 y 100	4
Transuranic Storage Area Enclosure and Storage, Radioactive Waste Management Complex, transuranic waste	A,B,C,D	Asbestos	5.0 y 10y9	1
		Benzene	8.4 y 100	1
		Beryllium	7.5 y 10y13	1
		Cadmium	1.1 y 10y11	2
		Carbon tetrachloride	2.3 y 10y1	5
		Chromium	6.8 y 10y2	1
		Formaldehyde	9.3 y 101	2
		Methylene chloride	1.5 y 10y2	3
		Nickel	7.8 y 10y1	1
		Perchloroethylene	2.3 y 10y2	5
		Trichloro-trifluoroethane	1.4 y 10y1	3
		Trichloroethylene	1.5 y 10y1	3
Vadose Zone Remediation, Radioactive Waste Management Complex, remediation	A,B,C,D	Carbon tetrachloride	2.7 y 101	6
		Chloroform	9.0 y 10y1	2
		Perchloroethylene	1.1 y 100	2

		Trichloroethylene	4.7 y 100	1
Waste Characterization Facility, Radioactive Waste Management Complex, transuranic waste	A,B,C,D	Asbestos	2.9 y 10y9	6
		Benzene	1.9 y 10y1	4
		Beryllium	2.2 y 10y10	4
		Cadmium	3.2 y 10y12	7
		Carbon tetrachloride	4.5 y 10y1	9
		Chromium	1.2 y 10y4	2
		Formaldehyde	2.1 y 100	4
		Mercury	1.5 y 10y9	3
		Methylene chloride	1.1 y 103	2
		Nickel	1.3 y 10y3	2
		Nitric acid	1.0 y 102	2
		Polychlorinated biphenyls	9.0 y 10y9	2
		Perchloroethylene	4.5 y 10y2	9
		Sulfuric acid	1.4 y 101	3
		Trichloro-trifluoroethane	2.8 y 10y1	6
		Trichloroethylene	1.6 y 10y1	3
Waste Immobilization Facility, (separations)d, Idaho Chemical Processing Plant, high-level waste	C,D	Cadmium	8.1 y 10y5	1
		Chromium	2.6 y 10y5	5
		Hydrofluoric acidc	1.2 y 102	2
		Mercury	2.7 y 101	5
		Nickel	9.1 y 10y6	2
		Tributyl phosphate	1.1 y 102	2
Waste Immobilization Facility, (direct vitrification)e, Idaho Chemical Processing Plant, high-level waste	B	Cadmium	3.4 y 10y6	7
		Chromium	4.4 y 10y5	9
		Hydrofluoric acidc	1.2 y 102	2
		Mercury	2.7 y 101	5
		Nickel	1.4 y 10y8	3
Mixed/Low-Level Waste Treatment Facility, east of Radioactive Waste Management Complex, low-level and mixed low-level waste	D	Arsenic	1.4 y 10y1	3
		Benzene	6.0 y 101	1
		Cadmium	1.9 y 10y1	4
		Chromium	5.6 y 10y1	1
		Formaldehyde	1.2 y 102	2
		Mercury	1.5 y 101	3
		Polychlorinated biphenyls	4.8 y 10y3	1
Fort St. Vrain Spent Nuclear Fuel Receipt and Storage, Idaho Chemical Processing Plant, spent nuclear fuel	B,D	Benzene	5.6 y 10y2	1
		Formaldehyde	1.1 y 10y1	2
Idaho Waste Processing Facility, site not determined (reference site is east of Radioactive Waste Management Complex); transuranic, low-level, and mixed low-level waste	B	Asbestos	1.8 y 10y1	4
		Benzene	3.4 y 101	7
		Beryllium	2.7 y 10y2	5

		Cadmium	4.0 y 10y2	8
		Carbon tetrachloride	3.4 y 100	7
		Chromium	2.5 y 10y1	5
		Formaldehyde	8.1 y 101	1
		Hydrochloric acid	2.7 y 103	5
		Hydrofluoric acidc	1.3 y 101	2
		Mercury	6.0 y 10-4	1
		Methylene chloride	6.7 y 10y2	1
		Nickel	2.9 y 100	6
		Polychlorinated biphenyls	3.7 y 101	8
		Perchloroethylene	3.4 y 100	7
		Trichloro-trifluoroethane	3.4 y 100	7
		Trichloroethylene	1.0 y 101	2
Idaho Waste Processing Facility,f site not determined (reference site is east of Radioactive Waste Management Complex); transuranic, low-level, and mixed low-level waste	D	Asbestos	2.1 y 10y1	4
		Benzene	3.4 y 101	7
		Beryllium	3.1 y 10y2	6
		Cadmium	4.6 y 10y2	1
		Carbon tetrachloride	3.9 y 100	8
		Chromium	2.5 y 10y1	5
		Formaldehyde	8.1 y 101	1
		Hydrochloric acid	3.1 y 103	6
		Hydrofluoric acidc	1.5 y 101	3
		Mercury	7.0 y 102	1
		Methylene chloride	7.7 y 10y2	1
		Nickel	2.9 y 100	6
		Polychlorinated biphenyls	4.3 y 101	9
		Perchloroethylene	3.9 y 100	8
		Trichloro-trifluoroethane	3.9 y 100	8
		Trichloroethylene	1.2 y 101	2
Radioactive Waste Management Complex Modifications to Support Private Sector Treatment of Alpha Mixed Low-Level Waste Treatment of Alpha Mixed Low-Level Waste, Radioactive Waste Management Complex, transuranic waste	B,D	Asbestos	2.0 y 10y8	4
		Benzene	9.4 y 100	2
		Beryllium	3.0 y 10y12	6
		Cadmium	4.3 y 10y11	9
		Carbon tetrachloride	9.0 y 10y1	2
		Chromium	1.9 y 10y1	4
		Formaldehyde	1.0 y 102	2
		Methylene chloride	5.8 y 10y2	1
		Nickel	2.1 y 100	4
		Perchloroethylene	9.0 y 10y2	2
		Trichloro-trifluoroethane	5.4 y 10y1	1
		Trichloroethylene	5.8 y 10y1	1
Nonincinerable Mixed Waste, Power Burst Facility, mixed low-level waste	B,D	Mercury	5.5 y 10y3	1
Waste Experimental Reduction Facility Incineration,g Power Burst Facility, low-level and mixed low-level waste	B,D	Arsenic	8.4 y 10y2	1

		Beryllium	1.9 y 10y2	4
		Cadmium	2.0 y 10y1	4
		Chromium	3.8 y 10y3	8
		Hydrochloric acid	1.8 y 103	4
		Mercury	2.5 y 101	5
		Nickel	2.0 y 10y1	4
		Trichloroethylene	1.4 y 100	3
Plasma Hearth Process, Argonne National Laboratory-West, mixed low-level and hazardous waste	B,D	Arsenic	4.5 y 10y3	9.
		Beryllium	8.5 y 10y6	1
		Cadmium	9.1 y 10y3	2
		Chromium	2.0 y 10y3	4
		Hydrochloric acid	4.5 y 101	9
		Mercury	2.3 y 10y2	5
		Nickel	1.4 y 10y1	3
Spent Fuel Processing, Idaho Chemical Processing Plant, spent nuclear fuel	D	Ammoniah	1.8 y 104	4
		Hydrofluoric acidc	3.8 y 100	8
		Methyl isobutyl ketone	2.7 y 103	5
		Tributyl phosphate	8.6 y 100	1
Totali			2.9 y 104	6

a. Only those emissions that meet assessment criteria are listed (see text for exp
b. A = Alternative A (No Action); B = Alternative B (Ten-Year Plan); C = Alternati
Alternative D (Maximum Treatment, Storage, and Disposal).
c. Hydrofluoric acid is not listed as a toxic air pollutant by IDHW (1994), but is
d. Separations process is proposed under Alternatives C and D.
e. Direct vitrification process is proposed under Alternative B.
f. Under Alternative D, similar emissions would also be projected for the Private
Facility, which is a competing project that would have a similar design and process
g. Includes incineration only; other waste processing is assessed as foreseeable i
h. Includes emissions of ammonium hydroxide.
i. Total would apply only to Alternative D and only if all facilities were operati
Commission on Radiological Protection (ICRP), as contained in Publications 26 and 3 1979). This model has several technical advantages over other available methods, in ability to assess dose from many different release scenarios and exposure pathways. conforms to the strict quality assurance requirements of NQA-1, Basic Requirement 3 and Supplementary Requirement 3S-1 (Supplementary Requirements of Design Control), requirements for verification and validation of computer codes.

An additional dose model, CAP-88 (Clean Air Act Assessment Package), is routi the INEL for the specific purpose of evaluating compliance with National Emission S Hazardous Air Pollutants standard 40 CFR 61. As prescribed by that standard, CAP-88 calculate the highest offsite dose to any member of the public resulting from annua radionuclide emissions from cumulative INEL site operations. The result must be bel to demonstrate compliance with the standard. The CAP-88 model was used in the presc to support the 1991 and 1992 INEL National Emission Standards for Hazardous Air Pol Reports (DOE-ID 1992a, b; 1993). As part of that effort, detailed comparisons betwe obtained with GENII and CAP-88 were made and documented (Maheras 1992, Ritter 1992) comparison of GENII and CAP-88 dose results for the maximally exposed individual is

Table F-3-9. In both cases, the dose results represent a summation of the external equivalent (EDE) from the ground deposition and air immersion pathways and the 50-y effective dose equivalent (CEDE) from the inhalation and ingestion pathways. These directly comparable in that there were minor differences in the source terms used. the GENII and CAP-88 codes for application at the INEL site has been performed and (Maheras et al. 1994). These tests provide confidence that the application of GENII source term and receptor-related assumptions used in this Environmental Impact Stat results that are likely to be conservative.

F-3.4.2.2 Release Modeling- Releases from stacks or vents may be modeled as either

elevated or ground-level releases. For this EIS, the decision whether to model a gi as a stack or ground-level release was based on guidelines issued by the U.S. Envir Protection Agency (EPA 1993a) and the National Council on Radiation Protection and NCRP 1986). In essence, if the height of the release point is less than or equal to height of attached or nearby buildings, turbulent (wake and downwash) effects are a

Table F-3-9. Comparison of doses to maximally exposed individual due to Idaho Natio Engineering Laboratory site emissions as calculated by the GENII and CAP-88 compute

	Dose to maximally exposed individual (millirem)		
Source category	GENII 1991^a	CAP-88 1991^b	CAP-88 1992^c
Monitored	9.8 X 10^-3	4.1 X 10^-3	1.4 X 10^-3
Diffuse	3.0 X 10^-3	2.4 X 10^-5	3.1 X 10^-5
Unmonitored	3.0 x 10^-4	1.2 X 10^-4	1.0 x 10^-4
Total	1.3 X 10^-2	4.2 X 10^-3	1.5 X 10^-3

a. Source: Leonard (1993); calculation for monitored source emissions from Idaho Ch Processing Plant has been revised (Leonard, 1994).

b. Source: 1991 INEL National Emission Standards for Hazardous Air Pollutants Repor Supplement (DOE-ID 1992a, b).

c. Source: 1992 INEL Annual National Emission Standards for Hazardous Air Pollutant (DOE-ID 1993b).

influence the release, effectively lowering the release height to ground level. In were modeled as individual release points; in other cases, sources were grouped tog as a single release point. For example, elevated sources at the Power Burst Facilit Experimental Reduction Facility North and South Stacks, and the Power Burst Facilit modeled as individual elevated releases. Conversely, effluents from various vents a Reactors Facility were summed and treated as a single ground-level release. The man specific sources were modeled is described In Leonard (1993, 1994). Additional rela including specific facility locations and stack data, are presented in Belanger et

F-3.4.2.3 Meteorological Data. The atmospheric transport modeling performed as part of

these radiological assessments was based on actual meteorological conditions measur different locations at the INEL site. In particular, the data files prepared for th derived from observations at INEL site weather stations over the period 1987 throug was assumed to be representative of conditions during the years covered by the Envi Statement (1995 through 2005). The method used for incorporating these data into wi be used by the GENII program is documented in Leonard (1992).

F-3.4.2.4 Receptor Locations. Doses were assessed for individuals located at the onsite

and offsite locations of highest predicted dose and for the surrounding population, follows. In each case, the dose was assessed for baseline conditions, projected inc baseline, and ER&WM alternatives.

Maximally Exposed Individual. The offsite individual whose assumed loc habits are likely to result in the highest dose is referred to as the maximally exp (MEI). The location of the maximally exposed individual was identified on the basis receptor distance and direction combination that yielded the highest predicted offs INEL Site area, radionuclide concentrations were calculated for the minimum distanc site boundary for each of the 16 compass directions. Since this location was assess emissions from each of the INEL site areas, the maximally exposed individual recept merely points on the INEL site boundary and do not correspond to any actual residen

These maximum impacts were conservatively summed to derive cumulative impacts, alth occur at spatially distant locations. (The actual maximally exposed individual loca major INEL site facilities are all located along a segment of the southern boundary facilities in question.) Although unrealistic, this cumulative maximally exposed in process serves to establish the upper-bounding dose. Despite the inherent conservat obtained were low; and further resolution of the actual maximally exposed individua dose was not necessary. The same general method for dose determination to the maxim individual is used in the annual National Emission Standards for Hazardous Air Poll evaluation.

Population Dose. Dose was assessed for the collective population resid circular area defined by a radius of 80 kilometers (50 miles) extending out from ea facility. Population data used were based on 1990 census data provided by the U.S. For projects associated with ER&WM alternatives and for projects expected to become before June 1, 1995, growth projections for the counties surrounding INEL were appl growth estimates are approximately 10 percent per decade. Since the period of analy extends to the year 2005, the population doses reported in Section 5.7, Air Resourc of this EIS are the highest obtained for any year throughout this period.

INEL Site Worker. INEL site workers may be exposed to radiation attributable INEL sources both as a direct result of job performance (such as work within a radi controlled area) and incidentally (such as from airborne releases from facilities w as well as more distant sources within the INEL site). Onsite concentrations of rad incidental exposure were assessed as described in this section. (Direct, job-relate exposure is discussed in Section 4.12, Health and Safety, of Volume 2 of this EIS.) who would receive the highest dose due to incidental exposures is termed the maxima worker. The dose to the maximally exposed worker was assessed for all major INEL si as a result of radionuclide emissions from all current and projected sources. The d using the general methodology described in previous sections. One major difference the worker dose calculations did not include the food ingestion pathway, since work consume food products grown onsite.

F-3.4.3 Nonradiological Assessment Methodology

Air pollutant levels have been estimated by the application of air dispersion that incorporate mathematical functions to simulate transport of pollutants in the modeling methodology conforms to that recommended by the U.S. Environmental Protect (EPA 1993a) and the State of Idaho (DOE-ID 1991) for such applications. The models application methodology are designed to be conservative; that is, they employ data designed to prevent underestimating the pollutant concentrations that would actuall the methods used to assess consequences of proposed actions were identical to those baseline assessments. Minor exceptions (such as the use of refined versus screening will be noted where applicable. The primary objective of the assessments is to esti nonradiological pollutant concentration and other impacts in a manner that facilita (a) to applicable standards or guidelines and (b) between alternative courses of ac

The types of pollutants assessed include the criteria pollutants and certain pollutants. Criteria pollutant concentrations were estimated for locations and over corresponding to State of Idaho and National Ambient Air Quality Standards. Since t apply only to ambient air (that is, locations to which the general public has acces concentrations were assessed for offsite locations and public roads traversing the nonradiological assessment did not specifically address impacts related to ozone fo (a) volatile organic compound emission levels are below the significance level desi of Idaho; (b) no simple, well-defined method exists to assess ozone formation poten 1993); and (c) while the Idaho Division of Environmental Quality has no ozone monit the vicinity, it is not aware of problematic ozone levels in the area (Andrus 1994)

Offsite levels of carcinogenic and noncarcinogenic toxic air pollutants were basis of annual average emission rates and compared with annual average standards (recently promulgated by the State of Idaho. Toxic air pollutants were also assessed locations because of potential exposure of workers to these hazardous substances. O specific toxins were calculated using maximum hourly emission rates and compared wi exposure limits set for these substances by either the Occupational Safety and Heal (OSHA) or the American Conference of Governmental Industrial Hygienists (the lower limits being used).

F-3.4.3.1 Atmospheric Dispersion Models for Criteria and Toxic Air Pollutant

Evaluations. Atmospheric dispersion models used to estimate upper-bound levels of t criteria impacts, as well as impacts to visibility and highway hot spots, are descr

F-3.4.3.1.1 Model Description and Application- The modeling effort employed

two levels of sophistication-screening-level and refined. Screening-level modeling cases where a source's contribution to air quality levels was expected to be minima below acceptable standards). This method is less rigorous mathematically than refin results in an overestimation of pollutant concentrations (greater than that of refi

The short-term version of the U.S. Environmental Protection Agency Industrial Complex-2 (ISC-2) computer code (EPA 1992a) is a refined model that was used to est concentrations resulting from routine operational emissions of criteria pollutants. incorporates site-specific data (such as meteorological observations from INEL site This model takes into account effects such as stack tip downwash and turbulence ind presence of nearby structures. Account was taken for building wake effects in the b assessments of criteria pollutant emissions. However, it was not feasible to includ calculations into the proposed action assessments, since building dimensions and di been defined. This is not expected to show appreciable differences in results other in very close proximity of sources. In addition, the model accommodates multiple so calculates concentrations for user-specified receptor locations. Concentrations can a range of durations, from one-hour maximum values to annual averages. The ISC-2 mo well suited for conditions where the receptor elevation exceeds the stack height. H the case for the INEL; the terrain is generally flat enough to avoid use of models complex terrain (DOE-ID 1991). In summary, dispersion modeling using ISC-2 allows f reasonable prediction of the impacts of proposed facilities and, therefore, is idea the Environmental Impact Statement process.

The SCREEN model (EPA 1992b) was used to estimate toxic air pollutant concen SCREEN is a relatively simple model that incorporates conservative data and methods limited to the calculation of only one-hour maximum concentrations from a single so user-specified or predefined distances and performs iterations to determine the dis concentration at the point of maximum impact. Persistence factors (averaging time a factors) recommended by the U.S. Environmental Protection Agency or the Idaho Divis Environmental Quality were used to scale one-hour SCREEN results to other required times. A persistence factor of 0.125 was used to scale one hour results to annual a as recommended by IDHW (1994). For onsite concentrations, a factor of 0.7 was used hour results to eight-hour estimates suitable for comparison to occupational exposu

Since SCREEN can only accommodate a single source, most cases required multip within an area to be grouped and treated as a single source. This model incorporate algorithms; however, in the manner employed herein (that is, combining impacts from and simulating as a single source), this feature was not used. Wind direction is no account; therefore, impact levels were assumed to be equal in all directions from t SCREEN was used in these assessments only to estimate baseline concentrations of to and to identify which of these pollutants warranted further refined modeling. For c SCREEN model predicted that toxic air pollutant concentrations were close to (withi so) an acceptable level, remodeling with ISC-2 was performed to provide a more real

Those operations that would result in the generation of fugitive dust, includ activities and equipment, travel on paved or unpaved roads, the concrete batch plan pouring, and gravel pit and landfarming operations, were assessed using the U.S. En Protection Agency-recommended Fugitive Dust Model (FDM) (Winges 1991). The Fugitive Model was designed specifically for computing concentration and deposition impacts dust sources through improved algorithms for deposition. Sources may be either poin Model execution may include up to 20 particle size classes, with calculation of gra and deposition velocity for each hour. Similar to ISC-2, concentrations may be calc range of durations, from one-hour maximum values to annual averages; 24-hour and an assessments were conducted. Modeling of fugitive dust sources with the Fugitive Du been shown to be superior to ISC-2 for area ground-level ambient temperature releas (Winges 1991).

F-3.4.3.1.2 Model Input Data- The use of air dispersion models requires emission

parameters, such as stack height and diameter and exhaust gas temperature and flow (for example, disturbed areas related to construction sources); and pollutant emiss most part, emission parameter data were obtained from the INEL site air emissions i discussed above. In some cases, data were observed to be missing or in error. The m were replaced by substituting parameter values from similar sources at the INEL sit data for emergency generator combustion engines were obtained from other generators capacity.) The specific values used for stack-related parameters (height, diameter, temperature) are presented in Belanger et al. (1995a).

The estimation and evaluation of impacts from fugitive dust sources was depen type of source (see Section F-3.4.3.2). For construction sources, the size of the d assumed to be two times the construction project footprint. For example, constructi 100-meter building is expected to disturb a 200-by-200-meter area during constructi watering was assumed, providing a 50 percent reduction in fugitive emissions and pr removing larger-diameter particles. The resultant distribution was estimated to con dust of respirable size. (This follows methods developed by EPA (1993b)]. Construct emissions were averaged over the expected hours of construction activity- 12 hours per week, for 26 weeks per year. Fugitive dust emissions were similarly calculated projects. Emissions related to the use of unpaved roads were divided equally across Emissions of dust from paved roads were assumed to be generated primarily by the IN These emissions include tire wear and road dust but exclude exhaust particulates, w calculated separately in the evaluation of mobile source emissions. Paved road use site is heaviest along State Route 33 and U.S. Route 20/26. All emissions, therefor to occur along these routes. Because approximately 11.4 percent of the buses travel North, 11.4 percent of the total paved road emissions was assigned to State Route 3 route to the Test Area North facility, and 88.6 percent to U.S. Route 20/26. The es emissions from employee vehicles assumed 1.5 persons per vehicle, 100 mile round tr trips per year in light-duty (pickup) trucks.

F-3.4.3.1.3 Meteorological Data- The modeling effort made use of two types of

meteorological data: (a) ISC-2 and the Fugitive Dust Model modeling incorporated da measurements of meteorological conditions (temperature, wind speed and direction, a stability, and so forth) made at the INEL site by the National Atmospheric and Ocea Administration (NOAA); and (b) SCREEN modeling used a standard (not specific to INE meteorological data, which are incorporated into the model to derive a worst-case a pollutant concentrations. The following description pertains only to the site-speci ISC-2 and the Fugitive Dust Model.

Meteorological data collected by the National Oceanic and Atmospheric Admini meteorological monitoring towers located at Grid 3 (lower, north of Central Facilit Area North, and Argonne National Laboratory-West were used in the assessment of sou Conditions at these three locations are representative of the three major wind flow INEL Site (Clawson et al. 1989). Sources at Test Area North and Argonne National La were modeled with meteorological data from those respective locations. Ail other so modeled using data from the Grid 3 Station. The locations of these and other meteor monitoring stations on and around the INEL are shown in Figure F-3-2. The meteorolo used contained hourly observations of wind speed, direction, temperature, and stabi years 1991 and 1992. Data required for the calculation of mixing height are current at the INEL but are not available for these periods. Therefore, default mixing heig For short-term assessments, a value of 150 meters (500 feet), which represents the measured at the INEL site, was used. For annual average evaluations, 800 meters (2, used. This value has been calculated by the National Oceanic and Atmospheric Admini recommended for use in dispersion modeling assessments (Sagendorf 1991). Each case separately using data from these years, and the highest of the predicted concentrat

F-3.4.3.1.4 Receptor Locations- The ISC-2 and Fugitive Dust Model are capable

Figure F-3-2. Locations of meteorological monitoring stations at the Idaho National

of determining air quality impacts at receptor locations using either a grid layout user-specified receptor points. Based on modeling efforts performed previously, max ambient receptor locations are expected to occur either (a) along public roads that site or (b) along the INEL site boundary. No points of maximum impact are expected locations beyond the INEL site boundary. Thus, only discrete receptors at those loc opposed to a gridded array) have been used for regulatory air assessments at those Craters of the Moon Wilderness Area. (Gridded arrays were used, however, in modelin to identify the areas where fine spacing of discrete receptors points is necessary.

Due to the large areal extent of the INEL site, fine spacing of discrete rece regular intervals is not feasible. Therefore, an approach has been employed that ut coarse and fine receptor intervals, ranging from 100 meters (330 feet) to 2,500 met depending on the potential for maximum impact. The process used to develop the rece as a starting point the complete coarse grid of ambient air locations described in Permitting Handbook (DOE-ID-1991). This grid incorporates receptor locations spaced approximately 500-meter (1,640 foot) intervals along (a) the entire perimeter of th (b) public roads traversing the INEL site; and (c) the eastern and northern boundar of the Moon Wilderness Area. Fine-grid modeling [using intervals of approximately 1 (330-foot) x-y coordinate spacing] was then performed, and the results were plotted areas where closer receptor spacing was warranted. A substantial margin of conserva provided by extending the range of 100-meter (330-foot) spacing to well beyond the maximum impact (from several hundred to several thousand meters, depending on the u the case.) Once these ranges were established, Universal Transverse Mercator (UTM) were determined for receptor locations at 100-meter (330-foot) intervals along thes coordinates were incorporated into the receptor array file. The modeling also revea are clearly beyond the locations of maximum impact and that could be eliminated fro array. Additional details of the method for identifying the receptor areas of maxim including examples of isopleth plots used for this purpose, are presented in Belang and Raudsep et al. (1995).

Ambient air impacts, including Prevention of Significant Deterioration increm consumption, have also been assessed for the Craters of the Moon Wilderness Area, t nearest the INEL site. Previous modeling has shown that there is only minor variati concentrations between coarsely spaced receptor locations at the Craters of the Moo not surprising in light of the substantial distance between this Class I area and t Thus, Class I area increments have been assessed at discrete receptor locations alo northern boundaries at intervals of 2,500 meters (8,200 feet) (that is, using every receptor point).

Concentrations of air pollutants at onsite facility areas were assessed to in levels to which workers may be subjected. For the onsite assessments, 11 separate r were developed. In general, these were 2-by-2-kilometer (1.2-by-1.2-mile) grids wit 330-foot} spacing centered on the major source groups at each facility. The grids f North, Power Burst Facility, and Central Facilities Area were made larger to accomm distribution of sources within those areas. These grids are described in detail in (1995b) and were used to determine maximum impacts as a result of emissions from so low release elevations or building effects are prevalent. In addition to a fine gri each facility area also included discrete receptor locations of other facilities. F assessments for sources at the Central Facilities Area included discrete receptor p Chemical Processing Plant, Power Burst Facility, and other facilities. In this way, contributions of sources at locations other than the facility being assessed were r concentration.

F-3.4.3.2 Summation of Results. An important function of the modeling effort is to

identify the location of highest predicted impact and the magnitude of the impact. by the fact that there are numerous sources in widely dispersed locations at the IN determination of the highest concentration must consider the contributions from eac Also, in some cases, sources at different facility areas required different meteoro These factors precluded the execution of a single modeling run in which all sources arrays could be included and necessitated the application of computer-aided data co techniques. Since a common receptor array was used for all ambient air assessments, concentrations at each receptor point as a result of emissions from each source was value and location of highest impact were identified by entering the results from i runs for a specific type of assessment (for example, maximum one-hour carbon monoxi concentrations) into a spreadsheet program, summing the values for each receptor po

identifying the maximum value and corresponding location. The same process was used contributions from baseline sources, projected increases to the baseline, and propo

As provided by applicable regulations, the estimated impacts from temporary f sources, including construction and demolition activities, were characterized and e respect to ambient air quality standards (but not for Prevention of Significant Det which exclude these types of activities from review). The cumulative emissions from sources of a more permanent nature, including vehicle travel on paved and unpaved r and concrete batch plant operations, were assessed for compliance with ambient air However, these sources were not analyzed for Prevention of Significant Deterioratio became operational prior to the baseline date and are not associated with net emiss

The onsite assessments used separate grids, and the results had to be process This involved summing the contribution from each area to each area-specific discret This discrete receptor summation was then added to the maximum value calculated wit fine-grid network for the area under review. For example, maximum impacts at the Ce Area consist of the maximum-predicted impact from sources within the Central Facili sum of contributions from all other areas. In this way, it was ensured that contri at locations other than the facility being assessed were represented in the total c

F-3.4.3.3 Impacts on Visibility. Atmospheric visibility has been specifically designated as

an air quality-related value under the 1977 Prevention of Significant Deterioration Clean Air Act. Therefore, in the assessment of proposed projects that invoke Preven Significant Deterioration review (see Section F-3.1.1.2), potential impacts to visi evaluated and shown to be acceptable in, designated Class I areas and associated in Craters of the Moon Wilderness Area, located approximately 20 kilometers (12.4 mile the INEL site, is the only Class I area in the Eastern Snake River Plain.

The U.S. Environmental Protection Agency has designed methodologies to estima plume visual impacts due to emissions of proposed sources. The methodologies includ of sophistication. Level-1 is designed to be very conservative; it uses assumptions methodologies that will predict plume visual impacts larger than those calculated w input and modeling assumptions. Level-2 visual impact modeling employs more site-sp informatiOn than that of Level-1. It is still conservative and designed to overesti visibility deterioration. Level-3 visual impact modeling is more intensive in scope provide a more realistic treatment of plume visual impacts. The U.S. Environmental Agency has developed computer codes to implement the calculations associated with e visual impact modeling. The VISCREEN model is designed to implement the methodology Level-1 analysis (EPA 1992c).

The VISCREEN model was used to evaluate the potential visual impact of the c emissions of proposed sources at the INEL site on the Craters of the Moon Wildernes stated above, Level-1 screening is designed to provide a conservative estimate of p impacts, that is, to estimate impacts that would be larger than those calculated wi input and modeling assumptions. This conservatism is achieved by the use of worst-c meteorological conditions, including extremely stable (class F) stability coupled w speed (1 meter per second) persisting for 12 hours, with a wind that would transpor directly adjacent to a hypothetical observer in the Class I area. Maximum short-ter emission rates of particulates and nitrogen oxides and minimum and maximum distance source to the Class I area are used. The U.S. Environmental Protection Agency recom values for various model parameters. In this analysis, default values were used for with the exception of background ozone concentration, for which a site-specific val per million was used. Use of this value has been agreed to by the Idaho Division of Quality (DOE-ID 1991) and the National Park Service (NPS) (Notar 1993a). The annual background visual range as measured by the National Park Service at Craters of the estimated to be 140 kilometers (87 miles) Notar 1993b); however, as suggested by th Service, the maximum seasonal average of 158 kilometers (98 miles) was used in this (Notar 1993a, b).

The objective of the VISCREEN analysis was to calculate the potential visual plume of specified emissions for specific transport and dispersion conditions. If s calculations using VISCREEN demonstrate that during worst-case meteorological condi is either imperceptible or, if perceptible, is not likely to be considered objectio of plume visual impact would not be required (EPA 1992c). The VISCREEN model determ whether a plume is visible by calculating contrast. If a viewed object, such as a s is brighter than its background, it will have a positive contrast; alternatively, i than its background, its contrast is negative. In VISCREEN, contrasts at three visu

calculated to characterize blue, green, and red regions of the visual spectrum to d will be brighter, darker, or discolored compared to its viewing background. If plum positive, the plume is brighter than its viewing background; if negative, the plume contrasts are different at different wavelengths, the plume is discolored. If contr plume is indistinguishable from its background. With a range of wavelengths, a meas must recognize both overall intensity and perceived color; perceptibility is a func both brightness and color. To address the dimension of color, a parameter called de the primary basis for determining the perceptibility of plume visual impacts in scr order to ascertain whether the plume from a facility has the potential to be percep observers under worst-case conditions, the VISCREEN model calculates both delta E a two assumed plume-viewing backgrounds: the horizon sky and a dark terrain object. R provided for two assumed worst-case sun angles (to simulate forward and backward sc light), with the sun in front and behind the observer, respectively. If either of t is exceeded, more comprehensive and realistic analyses should be carried out. The f delta E value of 2.0; the second is a green contrast value of 0.05. Regional haze, multiple sources throughout a region, is not calculated or estimated with the VISCR

For this assessment, the potential impact of incremental emissions of partic oxides of nitrogen associated with each project was evaluated. Cumulative impacts w each alternative as the sum of the impacts from specific projects associated with t waste stream options. Current operations were considered in the baseline [that is, current emission levels is monitored at the Craters of the Moon, resulting in a 158 (98-mile) value for maximum seasonal visual range]; however, projected increases to were also evaluated and added to the cumulative assessment for each alternative. Al sources were included except construction emissions and emergency diesel generators evaluated in a Prevention of Significant Deterioration assessment.

F-3.4.3.4 Mobile Source Assessment Methodology. Ambient air quality impacts at

offsite receptor locations due to INEL bus fleet operations, INEL fleet light- and privately owned vehicles, and heavy-duty commercial vehicles servicing the INEL sit quantitatively predicted using emission factors and screening-level methodologies d U.S. Environmental Protection Agency. The methodology included the use of a compute mathematical model, CALINE-3 (Benson 1979), recommended for analysis of highways ch by uninterrupted traffic flows (EPA 1993a). CALINE-3 is designed to simulate traffi conditions and pollutant dispersion from traffic and was used to predict maximum on air concentrations of carbon monoxide and inhalable particulate matter. Regulatory-averaging time adjustment factors were used to scale results for other applicable a receptor locations were selected within 3 meters (10 feet) from the edge of the roa accordance with U.S. Environmental Protection Agency guidance.

Receptor locations were selected in accordance with DOE guidance for air per (DOE-ID 1991), including locations in the City of Idaho Falls near the central bus streets that are heavily travelled by INEL buses, and at selected ambient air locat routes to the INEL site. The receptor locations on the INEL site are accessible to where INEL traffic is heaviest. These locations include the INEL site main entrance Highway 20, the northern access point to Test Area North from State Highway 33, and where public highways carrying INEL site traffic cross site boundaries.

Modeling was conducted for the year 1993 to quantify the current impact due and traffic and projected impact of projects that would be constructed before 1995, projected impacts of alternatives. Additional details on the methodology used for m presented in E&E (1993).

F-3.5 Data Analysis

The previous subsections describe the methodology used to perform and the te the air analysis for this Environmental Impact Statement. The results of these anal summarized in Sections 4.7 and 5.7 (Air Resources) of Volume 2 of this Environmenta Statement and are not repeated here. Additional details on the analysis, including consequences for various combinations of alternative and waste management options a individual projects, are presented in the Technical Support Document for Air Resour National Engineering Laboratory Environmental Restoration and Waste Management Prog

(Belanger et al. 1995a).

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F-4 Health and Safety

SECTION F-4 CONTENTS

TABLES

#F-4 HEALTH AND SAFETY

Potential health impacts to the public and workers can arise from a variety several distinct circumstances. The appropriate methods for evaluating health impac different under each of these conditions. This appendix describes the methods used key data required for evaluating the health effect impacts reported in this EIS.

The methods presented here are organized under three broad categories: (a) he from effluent releases, (b)normal workplace hazards, and (c) chemical releases unde conditions. The first category includes effluent releases of radioactivity, carcino chemical toxins to air and water, and addresses health effects to both the public a second category includes radiological and nonradiological hazards to INEL workers i conduct of their jobs. The final category of methods addresses the special case of released under accident conditions.

F-4.1 Background Information

This section provides essential background information on health effects to I the public surrounding the INEL. The information provides a historical perspective safety concerns, and a basis for projecting future impacts to workers from normal o hazards.

F-4.1.1 Public Health and Safety

The primary public health and safety concern at the INEL is the potential for surrounding public to radioactivity. The principal pathway by which the public may radioactivity is through releases to the atmosphere. Radiation doses to members of airborne releases at the INEL are calculated annually by the Radioactive and Enviro Laboratory using information from the Radioactive Waste Management Information Syst (Chew and Mitchell 1988, Hoff et al. 1989, 1990, 1991, and 1992). Table F-4-1 prese of these calculations for the five years of site operation from 1987 through 1991. that offsite radiation doses to any individual member of the public from normal ope

Table F-4-1. Estimated doses to members of the public from Idaho National Engineeri airborne releases 1987 to 1991.

Year	Maximally exposed individual (millirem)	Principal radionuclides	Percent of dose	Population d (person-rem
1987	0.54	Sb-125	96.0	4.3
		I-129	1.1	
		Ar-41	1.0	
1988	0.13	Sb-125	68.0	1.7
		I-129	19.6	
		Ar-41	6.1	
1989	0.01	Ar-41	59.9	0.04
		Kr-88	12.3	
		Xe-138	11.6	
1990	<0.01	Ar-41	82.2	0.04
		Kr-88	6.3	
		I-129	3.4	
1991	0.02	Ar-41	45.1	0.06
		I-129	40.3	
		Cs-137	4.8	

substantially less than 1 millirem per year over the 5-year period examined. Curren releases of airborne radioactivity from DOE facilities to no more than 10 millirem member of the public.

The principal radionuclides contributing to offsite doses reflect the operati facilities. During 1987 and 1988, for example, the fuel dissolution facility at the Processing Plant was operating and the antimony-125 releases characteristic of that largest contributors to offsite dose. The fuel dissolution facility at the Idaho Ch Plant did not operate during 1989 or 1990. Consequently, offsite doses were smaller dominated by releases of argon-41 and other noble gases from the Advanced Test Reac the New Waste Calcining Facility operated for part of the year and contributed a sm other radionuclides such as iodine-129 and cesium-137.

Collective doses to the population residing in the vicinity of the INEL are annually by the Radioactive and Environmental Sciences Laboratory (Chew and Mitchel Hoff et al. 1989, 1990, 1991, and 1992). These calculations sum the potential radia population of approximately 121,000 people living within 80 kilometers (50 miles) o facilities. As indicated in Table F-4-1, site operations have resulted in an offsit 6.3 person-rem for a five-year period. The average for the period 1987 through 1991 person-rem.

Past activities at the INEL have resulted in larger doses to the public than Estimates of these doses have been made for all years of INEL operation before 1989

1991). The largest doses were during the late 1950s and mid-1960s and ranged betwee millirem. The organ receiving the largest dose has been the thyroid during years wh quantities of radioactive iodine were released, or the skin during years when relea by radioactive noble gases. Since the early 1970s, there has been a steady decline controls on emissions have improved and various reactor programs at the INEL have b

To put the offsite doses from the INEL into perspective, it is useful to com levels of natural background radiation in the vicinity of the INEL. Table F-4-2 sum estimated annual dose equivalent from natural sources for an individual living on t Plain (DOE-ID 1991).

Doses from airborne releases over the operating history of the INEL site hav compared to doses from sources of natural background radiation, a maximum of 3 perc natural background effective dose equivalent in 1956. Since the early 1970s, doses releases have been small, even when compared to the variability in natural backgrou

F-4.1.2 Occupational Health and Safety

F-4.1.2.1 Radiological Hazards. Because of the nature of the work done at the INEL site,

Occupational radiation exposures above background levels will inevitably occur for The radiation protection programs required by regulations and DOE orders are design no worker receives doses larger than the applicable limits and that worker doses ar reasonably achievable. In addition, Federal regulations and DOE orders require that occupational exposure are maintained. Reports of radiation doses are provided annua worker. Summary reports are also provided to DOE and published periodically.

Table F-4-2. Estimated natural background radiation dose for the Snake River Plain.

Source	Annual effective dose equivalent (mi
External	
Terrestrial	75
Cosmic	39
Subtotal	114
Internal	
K-40 and others	40
Inhaled nuclides^b	200
Subtotal	240
Total	334

a. From: Idaho National Engineering Laboratory Historical Dose Evaluation, Volume 1 DOE/ID-12119 (DOE-ID 1991).
b. The dose from inhaled radionuclides is due primarily to short-lived decay produc and varies widely with geographic location. The value shown represents the United S population average.

Workers at the INEL site may be exposed either internally or externally to ra exposures arise when radioactive materials are deposited in the body through inhala absorption through intact skin or wounds in the skin External exposures in the wor received from radiation-emitting sources outside the body.

All workers in areas with a potential for airborne or surface contamination a routinely for internal radioactivity using bioassay techniques. Whole body counting internally deposited gamma emitters. Urinalysis and fecal analysis are used to dete emitters that cannot be measured adequately using whole body counting, for instance uranium and plutonium uptakes. Radiation workers participate in the bioassay progra potential that they could receive intakes resulting in a dose of 100 millirem or mo period following an intake. If routine bioassay results indicate measurable intakes participate in follow-up bioassay programs to determine the date and source of the estimate the radiation dose received. Internal radiation doses constitute a small f occupational dose at the INEL site. All cases of measurable internal radioactivity thoroughly to determine the cause and to assess the potential for additional intern workforce.

External radiation dose is the largest fraction of the occupational dose rece site. There are many more facilities at the INEL site with a potential for external than there are with a potential for internal exposure, Facilities with a potential exposure are those containing large quantities of gamma-emitting radioactive materi devices, such as accelerators, x-ray machines, and nuclear reactors, can produce ex exposure while operating, whether or not radioactive materials are present. In add potential for external radiation dose during any maintenance, construction, environ or decontamination activities at facilities where gamma radioactive materials have in the past.

Personnel that could potentially receive annual external radiation exposures millirem are assigned a thermoluminescent dosimeter that must be worn at all times the INEL site. The dosimeter measures the amount and type of external radiation dos receives.

All INEL site facilities are required to keep records of the individual expos employee. For normal INEL site operations, the summary establishes a baseline for c potential impacts of alternatives considered in this EIS. Reported doses resulting site operations for a recent five-year period of site operation are representative operations, and are used here as a baseline for routine operational activities. Tab collective dose equivalent measured on personnel dosimeters for each of the last fi The number of individuals monitored for radiation exposure over the last five years about 6,000. Of these, an average of about 31 percent receive measurable radiation average dose equivalent of those individuals with measurable exposure ranges from a millirem. The average dose equivalent of all monitored individuals ranges from 27 t

The average radiation dose rate to all INEL site workers over this five-year millirem per year. This is the dose rate that is used to project doses to workers a under each of the alternatives of this EIS.

Table F-4-3. Total collective dose equivalent for Idaho National Engineering Labora from normal operations.

Year	Number of individuals monitored	Number of individuals with measurable exposure	Collective dose equivalent^a (person-rem)	Average dose equivalent^b per individual for all monitored individuals (millirem)	A e i m e (
1987	5,588	1,831	290	52	
1988	5,799	2,201	288	50	
1989	5,883	2,118	351	60	
1990	6,381	2,138	381	60	
1991	6,646	1,224	182	27	
Five-year average	6,060	1,902	298	49	

a. Collective Dose Equivalent: The sum of the dose equivalents to all members of a if 100 workers each received a dose equivalent of 0.1 rem, the collective dose equi (100 persons x 0.1 rem).
b. Average Dose Equivalent: The average dose to members of a group of interest. For dose equivalent for a group of 100 wokers was 1 person-rem, then the average dose e the group would be 0.01 rem (1 person-rem / 100 persons).

F-4.1.2.2 Workplace Hazards Other Than Radiation. There is widespread diversity of

the types and quantities of chemicals used at the various INEL facilities. Conseque hygiene monitoring and sampling programs are designed to ensure that personal and/o monitoring strategy is directed toward the chemicals that pose the greater risks an aspects of the toxic chemical control program are designed to reduce risks and main

exposures to hazards as low as reasonably achievable. The sampling and monitoring p INEL provide data to enable assessments for characterizing the more common material chemicals, such as asbestos, lead, cadmium, beryllium, formaldehyde, benzene, hydro nitric acid, sulfuric acid, hydrogen fluoride, sulfur dioxide, welding by-products, fired generation plants, solvents, NOx, and other potentially hazardous substances. common physical agents encountered include noise, heat stress, nonionizing radiatio ergonomic factors. Use of chemical carcinogens at the INEL is extremely limited and when absolutely required for a specific activity, and no other practical substitute used, every effort is made to minimize the potential of exposure to as low as reaso levels and to limit the size of and access to the work area.

The primary source of information on nonradioactive hazards to the workers at reports of occupational injuries. Data for DOE contractors were obtained from the E Performance Measurements System to provide comparative statistics for total recorda illness cases, lost workday cases, and lost workdays for 1987 to 1991 (EG&G Idaho 1 There were 1,337 total recordable injury/illness cases experienced at the INEL from an average of 8,385 employees that worked a total of 79,654,000 hours (EG&G Idaho 1 total recordable injury/illness cases rate of 3.4 for the INEL was slightly above t 2.9, but less than half the Bureau of Labor Statistics rate of 8.5.

Of the 1,337 total recordable injury/illness cases at the INEL from 1987 to 1 (50 percent) of the cases resulted in lost workdays or lost workdays restricted (EG The INEL lost workdays rate of 1.7 was slightly higher than the DOE-wide rate of 1. half the Bureau of Labor Statistics rate of 4.0. A total of 8,497 lost workdays res lost workdays cases. The INEL lost workdays rate of 21.3 is nearly half that of the of 36.0, and almost four times better than the Bureau of Labor Statistics rate of 7

Of the 1,337 total recordable injury/illness cases at the INEL, 114 cases wer occupational illnesses falling into the following six categories: (a) 34 cases were disorders, (b) 55 cases were repeated trauma disorders, (c) 13 cases were respirato because of toxic agents, (d) 4 cases were disorders caused from physical agents, (e diseases of the lungs, and (f) 6 cases were from all other illnesses (EG&G Idaho 19

Other measures of occupational hazards include motor vehicle accidents and pr to fire and other causes. The average number of government vehicles driven at the I the five-year period of 1987 to 1991 (EGG 1993d). The INEL experienced 90 recordabl vehicle accidents (over $500 loss) during 64,711,000 miles of travel (EG&G Idaho 19 resultant accident rate of 1.4 compares very favorably with the DOE-wide rates for period of 2.4, and is nearly nine times better than the National Safety Council fiv

The INEL Motor Vehicle accident loss was a total of $202,000 for the 1987 to (EG&G Idaho 1993d). An average loss rate of $3.11 per 1,000 miles traveled is only the DOE-wide average loss of $4.76 per 1,000 miles of travel (EG&G Idaho 1993d) and less than the National Safety Council rate of $12.47 for the same five-year period. rate for each of the five years is considerably below the DOE-wide average loss.

The INEL fire loss experience for the five-year period from 1987 to 1991 show reportable losses over $1,000. A loss in 1989 resulted in $25,000 damage and one in $63,000 in damage loss. The INEL experienced a total of 20 reportable non-fire prop losses (over $1,000) from 1987 to 1991. The total value of the loss from these 20 c $1,292,000. In 1988, seven cases accounted for a loss of $1,026,000, which represen the five-year total.

F-4.2 Health Effects Methodology

This section describes the methods used to evaluate (a) potential adverse hea workers and members of the public from releases of radioactive and nonradioactive e environment under routine operating conditions, and (b) hazards to workers from nor conditions. The scope of the health effects evaluation in the EIS follows the recom specified by the DOE Office of National Environmental Policy Act Oversight in their Recommendations for the Preparation of Environmental Assessments and Environmental Statements (DOE 1993a).

F-4.2.1 Health Effects from Effluent Releases to the Environment

In general, health impacts are estimated for releases of radioactive and nonr

contaminants to air and groundwater. However, the "sliding scale" concept has been evaluation of health effects by considering the relative importance of specific con exposure pathways. For example, there are no permanent surface waters on the INEL s surface drainage from the INEL to offsite locations. Therefore, this EIS does not i analysis of this exposure pathway

For routine or accidental releases from facilities, the following three catego individuals are addressed as a minimum: (a) maximally exposed individual located at boundary, (b) population within 80 kilometers (50 miles) of the operating facilitie workers. For routine releases, the population within an 80-kilometer (50-mile) radi For releases from accidents, the most populous section of a 16-point compass sectio In special circumstances, a fourth receptor location may be appropriate for evaluat releases at individual sites. For example, at the INEL, where the site is traversed highways, it is possible that a member of the public on or near the highway could b some potential accidents.

For offsite transportation accidents, four categories of exposed individuals (a) maximally exposed individual located 100 meters downwind of the accident scene, population density (3,861 persons per square kilometer), (c) suburban population de per square kilometer), and (d) rural population density (6 persons per square kilom transportation accidents are treated similar to facility accidents. However, onsite accidents may be treated using the methods described for offsite transportation acc deemed appropriate on a case-by-case basis. Impacts from transportation are present 5.11 of this EIS.

Health effects from radioactive and nonradioactive contaminants are reported are not summed. Adding these impacts can be misleading because of the differences i modeling methodology, health effect end-point, and basis for the risk factors used. distinctly different types of effects are reported for chemical exposures (that is, noncarcinogenic) they are reported separately and not summed.

F-4.2.1.1 Radiological Health Effects from Effluent Releases. Estimation of health

effects from radionuclides are based on the 1990 Recommendations of the Internation On Radiological Protection (ICRP 1991). The risk factors from Table F-4-4 were used

In the interests of clear and consistent presentation and to allow ready com impacts from other sources, such as chemical carcinogens, the measure of impact use of potential radiation exposures in this EIS is risk of fatal cancers. Population e

Table F-4-4 Risk of fatal cancers and other health effects from exposure to radiati

	Fatal cancer	Nonfatal cancer	Genetic effects	Tota
Workers	4.0 x 10^-4	8.0 x 10^-5	8.0 x 10^-5	5.6 x 10^
General public	5.0 x 10^-4	1.0 x 10^-4	1.3 x 10^-4	7.3 x 10^

a. Units when applied to an individual are "lifetime probability of cancer per rem applied to a population of individuals are "excess number of cancers per person-rem effects apply to populations, not individuals.

collective radiation dose (in person-rem) and the estimated number of fatal cancers population. The maximum individual effects are reported as individual radiation dos the estimated lifetime probability of fatal cancer. Estimates of health effects fro accidental radiation exposures are based on the 1990 Recommendations of the Interna Commission on Radiological Proteaton (ICRP 1991). The risk factors to be used in th consistent with those recommended by the DOE Office of National Environmental Polic Oversight and contained in the Preamble to Standards for Protection Against Radiati

The risk factors in Table F-4-4 are applicable for all cases involving low in (<20 rem) and low individual dose rates (<10 rem/hour). At higher doses, near-term than cancer are the primary concern. Those unusual accident situations that may res radiation doses to individuals are considered as special cases.

As indicated in Table F-4-4, the risk per unit of radiation exposure is sligh workers than for the general public. This is because the working population is made age group that excludes infants, children, and the elderly.

Other health impacts could result from environmental and occupational levels radiation. Additional health effects that contribute to total impacts include nonfa exposed population and genetic effects in subsequent generations. The combined inc adverse health effects determines the "total detriment."

Risk factors have been provided in Table F-4-4 so that anyone desiring to cal impacts and total detriment from the fatal cancer risk estimates reported in this E example, total detriment from radiation exposures for a given case can be obtained latent cancer fatality estimate by a factor of 1.4 for workers and by 1.46 for the cases, risks expressed as total detriment are only slightly larger than the fatal c

For the calculation of health effects from exposure to airborne radionuclide modeled exposure (in either rem for individuals or person-rem for populations) prov 4.7 and 5.7 of this EIS is multiplied by the appropriate risk factor from Table F-4 of impact used for evaluation of potential radiation exposures in this EIS is risk Population effects are reported as collective radiation dose (in person-rem) and th of fatal cancers in the affected population. The maximum individual effects are rep radiation dose (in rem) and the estimated lifetime probability of fatal cancer.

The concentration of radionuclides in water is reported in Sections 4.8 and To calculate health effects from radionuclide concentrations in water, the total qu ingested must be converted to an effective dose equivalent and then the appropriate applied. This is accomplished by multiplying the concentration of radionuclide in t (microcurie per liter) by the consumption rate (liter per day) and by the consumpti obtain the quantity of radionuclide ingested. This ingested quantity (microcurie) i the appropriate exposure to dose conversion factor (millirem per microcurie) to obt is then multiplied by the appropriate risk factor.

Exposure to dose conversion factors were obtained from Federal Guidance Repor Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Fa Inhalation, Submersion, and Ingestion (EPA 1988). These dose conversion factors wer convert a quantity of intake to an effective dose equivalent for the subsequent app appropriate risk factor obtained in ICRP (1991). The dose-to-conversion factors use have been provided in Table F-4-5.

F-4.2.1.2 Nonradiological Health Effects from Effluent Releases. For public

exposures data concerning the toxicity of carcinogenic and noncarcinogenic constitu from dose-response values approved by the U.S. Environmental Protection Agency. The include slope factors and unit risks for evaluating cancer risks, reference doses, concentrations for evaluating exposure to noncarcinogens, and primary National Ambi

Table F-4-5. Exposure to dose conversion factors.

Isotope	Exposure to dose conversion fa (millirem per microcurie)
Tritium	6.4 x 10^-2
Iodine-129	2.76 x 10^2
Strontium-90	1.42 x 10^2

Standards (CFR 1977) for evaluating criteria pollutants. When possible, all values the Integrated Risk Information System database (EPA 1994). If the information was the Integrated Risk Information System database, other sources were used, primarily Environmental Protection Agency's Health Effects Assessment Summary Tables (EPA 199 National Ambient Air Quality Standards (CFR 1977).

For occupational exposures, data were obtained from occupational standards. T eight-hour time-weighted averages established by either the American Conference of Industrial Hygienists (ACGIH 1993) or Occupational Safety and Health Agency and pro standards for carcinogens from new sources under State of Idaho Rules for the Contr Pollution in the State of Idaho (IDHW 1994).

Per U.S. Environmental Protection Agency's guidance, each contaminant was cat carcinogenic or noncarcinogenic. Exposures to contaminants were then evaluated for effects. The method used was dependent on whether the exposure was to the public or and whether the contaminant was classified as a carcinogen or a noncarcinogen. Heal

reported separately and were not summed where distinctly different types of effects chemical exposures (that is, carcinogenic and noncarcinogenic).

The organization of the following sections is based on the difference in eval used for nonradiological health effects to the public and to workers.

F-4.2.1.2.1 Nonradiological Health Effects to the Public- For carcinogens,

risks are estimated as the incremental probability of an individual developing canc a result of exposure to the potential carcinogen (that is, incremental or excess in cancer risk).

Values for slope factors and unit risk were taken from the Integrated Risk In database (EPA 1994). If the information was not available in the Integrated Risk In database, other sources were used, primarily the Health Effects Assessment Summary 1993).

For carcinogenicity, the probability of an individual developing cancer over estimated by multiplying the slope factor (milligram per kilogram-day) for the subs chronic 70-year average) daily intake. Hence, the slope factor converts estimated d averaged over a lifetime of exposure directly to incremental risk of an individual This risk is considered a conservative estimate because the upper bound estimate fo is used with the "true" risk likely being less.

The unit risk that is calculated from the slope factor is an estimate in term microgram per liter drinking water, or risk per microgram per cubic meter air conce assessing the carcinogenic potential of a chemical, the Human Health Assessment Gro Environmental Protection Agency classifies the chemical into one of the following g to the weight of evidence from epidemiologic and animal studies:

- Group A-Human Carcinogen (sufficient evidence of carcinogenicity in hu
- Group B-Probable Human Carcinogen (B1 - limited evidence of carcinogen humans; B2 - sufficient evidence of carcinogenicity in animals with in lack of evidence in humans)
- Group C-Possible Human Carcinogen (limited evidence of carcinogenicity and inadequate or lack of human data)
- Group D-Not Classifiable as to Human Carcinogenicity (inadequate or no
- Group E-Evidence of Noncarcinogenicity for Humans (no evidence of carcinogenicity in adequate studies).

Quantitative carcinogenic risk assessments are performed for chemicals in Gro and on a case-by-case basis for chemicals in Group C. Cancer slope factors [formerl potency factors in the Superfund Public Health Evaluation Manual (EPA 1989)] are es the use of mathematical extrapolation models, most commonly the linearized multista estimating the largest possible linear slope (within the 95 percent confidence limi extrapolated dose that is consistent with the data. The slope factor or risk is cha upperbound estimate, that is, the true risk to humans, while not identifiable, is n the upper-bound estimate and in fact may be lower.

Unit risk estimates for inhalation and oral exposure can be calculated by div appropriate slope factor by 70 kilograms and multiplying by the inhalation rate (20 day) or the water consumption rate (2 liters per day), respectively, for risk assoc concentration in air or water. Hence,

risk per ug/m^3 (air) = (risk per mg/kg/day) x 1/70 kg X 20 m^3/day x 10^-3 (
risk per ug/L (water) = (risk per mg/kg/day) X 1/70 kg x 2 L/day X 10^-3 (mg/

Ingestion and inhalation slope factors are best estimates (that is, median or values) of the age-averaged, lifetime excess cancer incidence (fatal and nonfatal c of activity inhaled or ingested, expressed as risk per picocurie or risk per becque

In the interest of simplicity, and to ensure a bounding assessment, all U.S. Protection Agency weight-of-evidence classes were pooled and Class C (those with eq of carcinogenicity) were included with Classes A and B.

Noncarcinogenic and criteria pollutant health effects are presented using the in the Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Ma (EPA 1989). This approach presents noncarcinogenic effects in terms of a hazard quo the ratio between the calculated concentrations in air or drinking water and the re reference concentration, respectively. Doses or concentrations for each chemical an pathway are compared with the route-specific reference dose or reference concentrat index (the summed hazard quotients) for all chemicals and pathways exceeds one, the exist for noncarcinogenic health risks. If the hazard quotient is less than one, th effects are expected. In situations where simultaneous exposure to maximum baseline

concentrations is not feasible, the hazard quotients are reported separately and ar

For criteria pollutants (ozone, carbon monoxide, nitrogen dioxide, sulfur dio matter, and lead) that are regulated through the National Ambient Air Quality Stand for health effects was based on a hazard quotient given by the ratio of calculated the appropriate regulatory limit. Because the primary National Ambient Air Quality 1977) and the inhalation reference concentration serve essentially the same functio National Ambient Air Quality Standards have extensive databases rigorously reviewed National Ambient Air Quality Standards with annual averaging times was used in lieu reference concentration. Primary standards are designed to protect public welfare.

The measures used to describe the potential for noncarcinogenic toxicity to o individual are not expressed as the probability of an individual suffering an adver the potential for noncarcinogenic effects is evaluated by comparing an exposure lev time period (for example, lifetime) with a reference dose derived from a similar ex This ratio is called a hazard quotient and is described below.

Noncancer Hazard Quotient = E/RfC

where:

E = exposure level (or intake)

RfC = reference concentration

E and RfC are expressed in the same units and represent the same exposure period (t subchronic, or shorter term).

The noncancer hazard quotient assumes that there is a level of exposure (that concentration) below which it is unlikely for even sensitive populations to experie effects. If the exposure level (E) exceeds this threshold (that is, if E/RfC exceed be concern for potential noncancer effects. As a rule, the greater the value of E/R greater the level of concern. Be sure, however, not to interpret ratios of E/RfC as probabilities; a ratio of 0.001 does not mean that there is a 1 in 1,000 chance of Further, it is important to emphasize that the level of concern does not increase l reference dose is approached or exceeded because reference concentrations do not ha accuracy or precision and are not based on the same severity of toxic effects. Thus dose-response curve in excess of the reference concentration can range widely depen substance.

Where appropriate, to assess the overall potential for off-site (public) nonc posed by more than one chemical, a hazard index (HI) approach was used following th Environmental Protection Agency's Guidelines for Health Risk Assessment of Chemical 1986). This approach assumes that simultaneous subthreshold exposure to several che result in an adverse health effect. It also assumes that the magnitude of the adver proportional to the sum of the ratios of the subthreshold exposures to acceptable e hazard index is equal to the sum of the hazard quotients, as described in the box b exposure level and the reference concentration represent the same exposure period (subchronic, chronic, or shorter-term). When the hazard index exceeds unity, there m for potential health effects. While any single chemical with an exposure level grea value will cause the hazard index to exceed unity, for multiple chemical exposures, can also exceed unity even if no single chemical exposure exceeds its reference con

Noncancer Hazard Index = E1/RfC1 + E2/RfC2 + ... + Ei/RfCi

where:

Ei = exposure level (or intake) for the i^th toxicant

RfCi = reference concentration for the i^th toxicant

E and RfC are expressed in the same units and represent the same exposure period (t subchronic, or shorter-term).

F-4.2.1.2.2 Nonradiological Health Effects to Workers- The primary difference

between health effects evaluation of nonradiological exposures to workers and to th exposure duration. For the public, exposure is assumed to occur, at the given conce individual's lifetime (70 years). For the worker, exposure occurs only in the workp therefore, of a limited duration.

The potential for occupational health effects from exposure to all chemical evaluated using the method outlined for public exposures to noncarcinogens, with th all occupational concentrations were compared with the applicable occupational stan hazard quotient for occupational exposure then becomes the ratio of the chemical co occupational standard.

Table F-4-6 provides the appropriate reference concentrations, unit risk fact Ambient Air Quality Standards, and occupational standards for evaluating exposure t air. To estimate the potential for health effects, these values were applied to the concentrations given in Sections 4.7 and 5.7 of Volume 2, of this EIS. Note that al in this table were obtained from the reference published as of January 1, 1994.

F-4.2.1.3 Additional Assumptions. In addition to the values reported in Tables F-4-4

through F-4-6, the following assumptions were made. Where modeled plume concentrati predicted to impact site drinking water, the following assumptions were made:

- The facility worker consumes 1 liter of water (one-half of the total d from a contaminated onsite well.
- Consumption of the contaminated water is assumed to occur for a sample sample interval is the time between samples plus two weeks). The addit weeks is used to allow sufficient time for the sample to be analyzed a the analysis returned to the appropriate water control personnel.
- All workers at the facility are assumed to obtain water from the same
- The level of drinking water contamination is equal to the modeled grou concentration (no allowance is made for treatment).

Table F-4-6. Chemical Contaminant risk evaluation factors (airborne). -

sample results are obtained.

Where actual facility drinking water data are used, the following assumptions

- The facility worker consumes 1 liter of water (one-half of the total d from the contaminated drinking water distribution system.
- Consumption of the contaminated water occurs 5 days per week for 30 ye

Offsite health effects were calculated assuming:

- The individual would have access to the highest modeled or measured of contaminant concentration.
- The individual's entire water consumption would be from the contaminat supply.
- The consumption would occur for 70 years.

F-4.2.2 Hazards to Workers from Normal Workplace Conditions

The primary impacts to workers at the INEL are not a result of effluent relea from occupational exposure to radioactivity and other workplace hazards. This secti methods used to evaluate these occupational hazards.

F-4.2.2.1 Radiological Exposure and Health Effects. The activities to be performed by

workers under each of the alternatives are similar to those currently performed at Therefore, the potential hazards encountered in the workplace will be similar to th exist. Further, these hazards will be controlled by occupational and radiological s operating under the same regulatory standards and limits that currently apply at DO these reasons, the average collective radiation dose to the INEL workforce is antic proportional to the number of workers employed under each alternative.

The average annual dose rate for INEL workers was derived from the measured d reported over the period 1987 to 1991, as presented in Table F-4-3. The value used doses to the INEL workforce is 27 millirem per worker per year. The number of worke alternative is based on the values reported in this Appendix F, Section F-1, Socioe

F-4.2.2.2 Workplace Hazards Other than Radiation. The measures of impact for

workplace hazards used in this EIS are (a) total reportable injuries and illness, a workforce. Injury and fatality rates for construction workers are considered separa relatively more hazardous nature of construction work. Table F-4-7 gives the rates

injury and illness and for workplace fatalities for DOE and its contractors. The r construction workers include both categories reported by DOE, that is, direct DOE c contractors) and their subcontractors (lump contractors). These rates are applied t workforce under each alternative to evaluate potential occupational health effects. workers under each alternative is based on the values reported in this Appendix F, Socioeconomics.

The average rates for private industry in the United States are also provided While the reporting practices of the DOE and the National Safety Council are not id similar enough to provide a good basis of comparison between DOE and private indust

F-4.2.3 Accidents

For evaluation of accident scenarios, health effects from exposure to radiati using the methodology outlined in Section F-4.2.1.1. However, due to acute exposure under accident scenarios, it is inappropriate to apply either occupational or publi chemical releases. Therefore, the following methods have been used to evaluate chem concentrations under accident scenarios.

F-4.2.3.1 Nonradioactive Releases from Accidents. For accident conditions, possible

impacts to human health are assessed by comparing the airborne concentrations of ea specified downwind locations to standard accident exposure guidelines for chemical

Table F-4-7. Average occupational injury/illness and fatality rates at the Idaho Na Laboratory.^a

	All labor categories		Construction workers
	Total injury/illness	Fatalities	Total injury/illnes
DOE and contractors^b	3.2	0.0032	6.2
Private industry^c	8.4	0.0097	13

a. All incidence rates are given per 100 worker-years.
b. 1988-1992 averages (DOE 1993b).
c. 1983-1992 averages (NSC 1993).

Where available, Emergency Response Planning Guideline values are used for th (Homann 1988). The Emergency Response Planning Guideline values are estimates of ai concentration thresholds above which one can reasonably anticipate observing advers Emergency Response Planning Guideline values are specific for each substance, and a each of three general severity levels:

- Exposure to concentrations greater than Emergency Response Planning Gu values results in an unacceptable likelihood that one would experience adverse health effects, or perception of a clearly defined objectionab
- Exposure to concentrations greater than Emergency Response Planning Gu values results in an unacceptable likelihood that one would experience irreversible or other serious health effects, or symptoms that could i ability to take protective action.
- Exposure to concentrations greater than Emergency Response Planning Gu values results in an unacceptable likelihood that one would experience threatening health effects.

Where Emergency Response Planning Guideline values have not been derived for substance, other chemical toxicity values are substituted, as follows:

- For Emergency Response Planning Guideline-1, Threshold Limit Value, T Weighted Average values (ACGIH 1993) are substituted: The Time-Weight Average is the time-weighted average concentration for a normal eight and a 40-hour workweek, to which nearly all workers may be repeatedly

after day, without adverse effects.

- For Emergency Response Planning Guideline-2, Level of Concern values of Immediately Dangerous to Life or Health) are substituted: Level of defined as the concentration of a hazardous substance in air, above w be serious irreversible health effects or death as a result of a sing relatively short period of time (EPA/FEMA/DOT 1987).
- For Emergency Response Planning Guideline-3, Immediately Dangerous to Health values are substituted: Immediately Dangerous to Life or Healt the maximum concentration from which a person could escape within 30 without a respirator and without experiencing any effects which would ability to escape or irreversible side effects (NIOSH 1990).

Possible health effects associated with exceeding an Emergency Response Pla 2 or -3 are specific for each substance of concern, and must be characterized in th concentrations are found to exceed an Emergency Response Planning Guideline or subs the specific toxicological effects for the chemicals of concern are considered in d health effects associated with exceeding a threshold value.

Emergency Response Planning Guideline values are based upon a one-hour expos member of the general population. In this EIS, exposures resulting from the release chemicals during an accident condition were postulated to occur over a period of 1 allow for a direct comparison to the Emergency Response Planning Guideline values. provides an additional element of conservatism in the evaluation of accidents with much less than one hour.

F-4.3 Data Analysis

The previous subsections describe the methodology used in evaluating the pote impacts to the public and workers for this EIS. The results of these analyses are s Sections 4.12 and 3.12 (Health and Safety) of this EIS and are not repeated here.

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F-5 Facility Accidents

SECTION F-5 CONTENTS

TABLES

#F-5 Facility Accidents

F-5.1 Introduction

Section F-5 provides background information for Volume 2, Section 5.14 (facili the INEL associated with environmental restoration and waste management operations receipt, storage, and handling of spent nuclear fuel). For this EIS, the likelihood been categorized into events that are abnormal (for example, minor spills), design facility was designed to withstand), and beyond design basis (accidents a facility withstand). This section presents analyzed consequences of facility accidents in th member of the public at the nearest INEL site boundary, for the collective populati kilometers (50 miles), and for workers.

An accident is an unplanned sequence of events that results in undesirable co Initiating events for accidents were defined in three broad categories: external in initiators, and natural phenomena initiators. All types of initiators were defined events that cause or may lead to a release of materials and energy by failure or by confinement.

To obtain a perspective on potential accidents involving spent nuclear fuel management and environmental restoration operations at the INEL, the approach was a

- Summarize historical accidents at the INEL
- Review previous accident analyses for spent nuclear fuel, waste manageme environmental restoration activities
- Perform an independent analysis of the accidents with the greatest poten consequences.

This section describes the selection of locations or operations for analysis identify maximum reasonably foreseeable accident scenarios, the basis for evaluatin scenarios, and the selection of computer codes and modeling assumptions used to est effects consequences. The analyses of accidents are intended to be conservative in where uncertainties exist, assumptions that bound the potential for credible enviro consequences are used.

F-5.2 Methodology

F-5.2.1 Accidents with Potential Release of Radioactive Material

Radioactive materials are involved in a wide variety of operations at the INE scientific research and engineering development for both domestic and national defe the past four decades, the INEL has been the world's most notable research and deve for testing of nuclear power reactor concepts, their fuels, their stability, and th accidents, as well as a center for the reprocessing of spent nuclear fuel. Radioact encompass potentially valuable resources, such as spent nuclear fuels and various i include waste products ranging in form from contaminated laboratory equipment and m contaminated trash and liquids. These resources and wastes present a potential for radioactive materials caused by human error, equipment failure, or severe natural p earthquakes.

This section describes the selection of facilities and operations for analysi computer codes used in the analysis. The assumptions concerning atmospheric dispers and generic data used to calculate consequences is presented in Section F-5.3.

F-5.2.1.1 Selection of Facilities and Operations for Radiological Accident

Scenarios.

Radiological accident scenarios were selected and classified as described in sections.

F-5.2.1.1.1 Selection Process- The accident analysis considered all INEL nonreactor

nuclear facilities (accidents at the Naval Reactors Facility are considered in Appe 1). U.S. Department of Energy (DOE) Order 5480.23 (DOE 1994) defines nonreactor nuc facilities as those with activities or operations that involve radioactive and/or f such form and quantity that a nuclear hazard potentially exists to the employees or Excluded from the definition are facilities with generation of radioactive emission x-ray machines, industrial lasers, radiography sources, or electron microscopes).

After excluding offices and facilities without radioactive materials (that is nonreactor nuclear facilities), facilities were screened using preexisting "hazard Contractors operating nonreactor nuclear facilities are required by DOE Order 5480. and DOE guidance (DOE 1992a) to perform a hazard classification of a facility to as consequences of an unmitigated release of radioactive and/or hazardous material in following categories:

- Category 1. The hazard analysis shows the potential for significant offs
- Category 2. The hazard analysis shows the potential for significant onsi
- Category 3. The hazard analysis shows the potential for only significant consequences.

These categories (or the equivalent classifications performed under the previ were used as a screening threshold. Category 3 (low) hazard facilities were exclude in these facilities would be bounded by those in Category 2 (moderate) or Category facilities. Those facilities with a hazard classification of Category 2 or greater further. They were ranked on the basis of their total quantities of radioisotopes, likelihood of an accident occurring, and their relationship with surrounding facili projected inventories by alternative at the various facilities were considered.

F-5.2.1.1.2 Determination of Qualitative Likelihood of "Reasonably

Foreseeable" Accidents- The estimated frequency of each postulated accident was bas identification of the physical basis for the accident and estimates of the frequenc independent events combined with the conditional probability of the dependent event accident to occur. Once the frequency was estimated for each accident, they were cl

frequency range. Descriptions of the accidents and data obtained from a variety of to estimate accident frequency. Once an accident frequency was estimated, it was ca one of the likelihood ranges described below. In addition, a brief description was basis of the frequency determination for each accident.

The three frequency ranges chosen, based on the frequency of an accident per are as follows:

Category	Frequency range (accidents per year)
Abnormal events	frequency > 1 x 10^-3
Design basis events	1 X 10^-3 > frequency >/= 1 X 10^-6
Beyond design basis events	1 X 10^-6 > frequency >/= 1 X 10^-7

Results of the screening process are given in Section F-5.4.

F-5.2.1.2 Computer Modeling to Estimate Radiation Doses. To determine dose from

radioactive material releases using computer codes, factors such as receptor locati uptake parameters, material transport mechanisms, and radionuclide inventory are re variables. This section explains these input parameters, notes the degree of conser describes computer models used to perform dose estimates. Generic input parameters accident analyses are summarized in Section 3.

The Radiological Safety Analysis Computer Program (RSAC-5) (Wenzel 1993) was computer code chosen for estimating radiation doses resulting from the accidental a radionuclides. Two other computer codes, ORIGEN2. 1 (Croff 1983, RSIC 1991), and Mi 3.13 (Grove 1988) are used for some accident scenarios to calculate radionuclide in to RSAC-5.

F-5.2.1.2.1 RSAC-5 Code- The computer code RSAC-5 was developed for the DOE

Idaho Operations Office by Westinghouse Idaho Nuclear Co., Inc. (Wenzel 1993) and i domain.

RSAC-5 simulates potential radiation doses to maximally exposed individuals o groups from accidental airborne releases of radionuclides to the environment. From RSAC-calculated source term users can calculate the environmental transfer, uptake, exposure. Individual doses are determined at specific distances onsite, at the site away from the site via airborne plume immersion, ground surface contamination (shin and ingestion. (The ingestion pathway applies only where food is raised locally and consumed there.) Population doses are the product of individual dose and the number the affected population.

Source Term Calculation. For most accident scenarios, the radioactive so calculated separately by the analyst for input to RSAC-5. Alternatively, for accide involving reactor fuel, the source term can be calculated by RSAC-5 directly. The l useful for calculating fission product inventories. However, activation products an inventories (for example, uranium and plutonium) must be calculated separately and analyst. RSAC-5 includes an option to calculate radioactive decay of the entire rad or selected specific nuclides.

Atmospheric Dispersion Calculations. Because this analysis addresses acc are calculated for discrete releases of specific quantities of radioactive material

The RSAC-5 code uses a two-dimensional Gaussian atmospheric-dispersion model the dispersion of the radioactive-material plume at various distances downwind from release. INEL-specific values of these dispersion coefficients are built into RSAC- dispersion factors (x/Qs).

The user has the option of directly entering x/Q or having the x/Qs calculat Other code options for calculating atmospheric transport include plume depletion by deposition and building wake effects.

Dose Calculations. As recommended by the International Commission on Rad Protection (ICRP 1974, 1979), RSAC-5 uses weighting factors for various body organs committed effective dose equivalent" (CEDE) from radioactivity deposited inside the inhalation or ingestion.

RSAC-5 calculates an effective dose equivalent (EDE) for the external exposur (immersion in plume, from ground surface contamination) and a 50-year CEDE for the exposure pathways (inhalation, ingestion). The sum of the EDE from external pathway CEDE from internal pathways is called the "total effective dose equivalent" (TEDE). summation is performed external to RSAC-5.

Doses may be calculated for an individual at a specified receptor location Ou kilometers (62 miles) or for a population within a 80 kilometer (50-mile) radius of release. Population doses are determined by calculating an average individual TEDE (10-mile) radial intervals of a compass sector and then multiplying by the number o that average TEDE applies.

F-5.2.1.2.2 ORIGEN2.1: Isotope Generation and Depletion Code-ORIGEN

(Croff 1983, RSIC 1991) is a computer code system for calculating the buildup, deca processing of radioactive materials (fission products, actinides, and activation pr two computer codes recommended by the NRC (1977a) for calculating the radioactivity present and later produced in an inadvertent nuclear chain reaction in a fuel repro

ORIGEN2. 1 was used in accident analyses involving significant contribution activation products to the radioactive source term associated with spent fuel and i chain reaction accidents. The radioactivity of each such radionuclide (in curies) i damaged by the accident, as calculated by ORIGEN2.1, was multiplied by the appropri fraction and supplied as input to subsequent RSAC-5 calculations.

F-5.2.1.2.3 Microshield 3.13- Microshield (Grove 1988) is a radiation shielding code

developed for analysis of shielding design, container design, and selection of temp Another use of Microshield, employed in some of the accident analyses performed for calculation of source strength on the basis of radiation measurements from a shield material and dimensions. This calculation is an iterative process of estimating val strength until the measured radiation values are matched by the calculation.

Microshield has solution algorithms for 14 different geometries, including so as points, lines, spheres, disks, cylinders, slabs, and rectangular solids. Microsh library of approximately 500 radionuclides. The user selects the nuclides appropria application and enters the activity in curies for each. A later version of Microshi been issued. The changes from Microshield 3.13 do not affect the validity of the ca in the EIS.

F-5.2.2 Accidents With Potential Release of Hazardous Material

Like radioactive materials, hazardous materials are involved in a variety of opera INEL. As a result of these operations, a potential exists for releases of hazardous human error, failure or malfunctioning of equipment, and serve natural phenomena su This section describes the selection of facilities and operations for analysis and computer codes used in the analysis. The assumption about weather conditions, atmos dispersion, scenarios, and generic data utilized to calculate consequences are pres F-5.3.2.1.

F-5.2.2.1 Selection of Facilities and Operations for Hazardous Material Accident

Scenarios.

F-5.2.2.1.1 Selection of Hazardous Material Accident Scenarios- Starting with a

compilation of INEL hazardous chemicals (Priestley 1992) used in the preparation of Amendments and Reauthorization Act of 1986 (SARA) 112 Report for 1992 (CFR 1993a), was made for those chemical quantities that were (a) in excess of 227 kilograms (50 (b) in excess of reportable quantities (usually one pound) on the U.S. Environmenta Agency (EPA) Title III List of Lists (EPA 1990), which includes hazardous chemicals following lists:

- SARA Section 302 Extremely Hazardous Substances (CFR 1993a)
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Hazardous Substances (CFR 1993b)
- SARA Section 313 Hazardous Chemicals (CFR 1993c)
- Resource Conservation and Recovery Act (RCRA) Hazardous Wastes (CFR 1993d)
- Environmental Protection Agency (EPA) list of 100 extremely hazardous chemicals 1990)
- EPA, 40 CFR Part 9 and 68 (FR 1994) list of regulated substances.

As part of the initial screening, facilities were assigned classifications on chemical inventories provided in the SARA list of Extremely Hazardous Substances. F classifications were based on the reportable chemical quantities within the facilit Protection Act (FR 1994) classifications of chemicals stored at the facilities, and consequences of mixing chemicals during an accident. Reviews of existing safety ana documentation and discussions with plant personnel confirmed that accidents in the would have the potential of producing bounding consequences.

F-5.2.2.1.2 Determination of Qualitative Likelihood of "Reasonably

Foreseeable" Accidents- The method of estimating qualitative likelihoods is the sam described in Section F-5.2.1.1.2 for radiological accidents.

F-5.2.2.2 EPIcode. Like RSAC-5, EPIcode (Homann 1988) uses the well-established

Gaussian Plume Model to calculate the dispersion of airborne hazardous chemicals us receptor locations as used for RSAC-5; that is, facility worker, nearest public acc boundary, and nearby communities. The EPIcode library contains information on over hazardous substances listed in ACGIH.(1988); all substances analyzed for the INEL w the library.

The continuous release models require specifying the source term as an ambien and a release rate. For term releases, the user specifies the release duration and material released.

By specifying a release quantity, release duration, and release area, the use proposes a release rate per unit spill area. EPIcode confirms that the volatility o substance can support such a release rate. If the proposed release rate exceeds the conditions at the release temperature, the EPIcode calculates a more realistic rele corresponding longer release time based on the properties of the spilled materials.

In calculating effective release height, the actual plume height may not be t height, for example, the stack height. Plume rise can occur because of the velocity emission and the temperature differential between the stack effluent and the surrou EPIcode calculates both the momentum plume rise and the buoyant plume rise and choo greater of the two results. In this application, the standard terrain calculation o used. Except as otherwise noted, the established 95 percent meteorological (stabili speed) conditions for INEL are input into EPIcode. The receptor height is always gr (0 meters) and, as in RSAC-5, the mixing layer height is always 400 meters (1,300 f deposition velocities listed in Table F-5-2 in the next section are used.

F-5.3 Generic Input Parameters

F-5.3.1 Accidents with Potential Release of Radioactive Material

Calculation of doses rely upon numerous input parameters. Generic input requi parameters are discussed below.

F-5.3.1.1 Source Term. The source term is expressed as the fraction of the radioactive

material at risk that is released into the immediate environment. The material at r given process in the facility of interest. It is the material the scenario postulat available for release, and is not necessarily the total quantity of material presen is a multiplier applied to material at risk to estimate initial source term.

For airborne releases, the overall release fraction is the product of the dam airborne and respirable fractions, and the leak path factor. The source term (Q) fo therefore developed as follows:

Q = material at risk X damage ratio X airborne release fraction X respirabl x leak path factor.

F-5,3.1.1.1 Damage Ratio- The damage ratio is the fraction of material exposed to

the effects of the energy/force/stress generated by the postulated event. A damage applied for accidents involving 100 percent of the material at risk.

F-5.3.1.1.2 Airborne Release Fraction- The airborne release fraction is the fraction

of the material that is made airborne due to the accident. Values from generic DOE used for the analyses unless more specific information is provided in source docume particular accident scenario. These generic values are summarized in Table F-5-1.

Table F-5-1. Release fractions for various release mechanisms for accidents at the Engineering Laboratory.

Material	Release mechanisms			
	Failed fuel gap	Fire	Explosion	Inadvert nuclear reactio
Gases				1.00
Noble gas	0.10	1.00	1.00	b
Krypton	0.30			
Halogens	0.10	1.00	1.00	0.25^
Iodine-129	0.30			
Solids				(d)
Volatile	0.01	0.01	(e)	
Nonvolatile	0.01^f	0.01	0.01	
Fly ash		0.01	0.01	

a. Source: Elder et al. (1986).
b. - indicates no recommendation or not applicable.
C. Includes release and plateout.
d. Use Regulatory Guide values (NRC 1977a, 1979a,b).
e. 100 mg/m^3 for particulate airborne material.
f. Actually semivolatile (cesium, rubidium, ruthenium, antimony, selenium. techneti review on a case-by-case basis.

F-5.3.1.1.3 Respirable Fraction- The respirable fraction is the fraction of the

material with particle sizes less than 10 microns (DOE 1993) that could be retained system following inhalation. It is applied only to the source term for the inhalati

F-5.3.1.1.4 Leak Path Factor- The leak path factor accounts for the action of

removal mechanisms, such as containment systems, filtration, deposition, etc., to r of airborne radioactivity that is ultimately released to occupied spaces of the fac environment. A leak path factor of one is assigned for a major failure of confineme

F-5.3.1.2 Meteorological/Dispersion Parameters. For accidents initiated within the

INEL site, radiological doses are calculated not only for the general population, b three locations: (a) for facility workers within the originating facility area (for Chemical Processing Plant), at 100 meters (328 feet) from the source, (b) at the ne to the accident location, and (c) at the nearest INEL site boundary. A qualitative representative accidents for workers less than 100 meters (328 feet) from the sourc Slaughterbeck et al. (1995).

Except for releases through operable discharge systems such as the main stack Chemical Processing Plant, most releases of radioactive material are assumed to be The ground-level release assumption is conservative because the slower dispersion c elevated releases results in higher ground-level concentrations and, therefore, hig radiation exposures near the point of release. Credit is taken for plume rise where that due to thermal buoyancy of combustion products from a fire. Release of a plume height above ground level or with an elevated temperature could cause the plume to completely miss nearby receptors.

The assumed mixing height puts a limit on vertical dispersion of the plume. T value of the mixing height of the plume is 400 meters (1,300 feet), considered to b (Clawson et al. 1989). Both conservative and average meteorological conditions were the conservative assessment, meteorological conditions were selected that would be atmospheric dispersion of contaminants, and would not be exceeded more than 5 perce Applicable parameters are listed in Table F-5-2.

Table F-5-2. Meteorological/dispersion parameters used in dosimetry calculations fo Idaho National Engineering Laboratory.^a

Parameter	Facility worker	Nearest public access	Nearest bounda
Receptor distance (m)	100	Specific^c	Specifi^cc
Wind velocity^d (m/s)			
95 percent	0.5	0.5/2.0	2.0
50 percent	0.5	0.5/4.0	4.0
Release elevation^e (m)	0	0	0
Wind stability class			
95 percent	F	F	F
50 percent	Not applicable	Not applicable	D^f
Dry deposition velocity^g (m/s)			
Solids	0.001	0.001	0.001
Halogens	0.01	0.01	0.01
Noble gases	0	0	0
Cesium	0.001	0.001	0.001
Ruthenium	0.001	0.001	0.001
Release duration^c	Specific	Specific	Specific
Release coefficient^e	Linear	Linear	Linear
Diffusion coefficients^e	Markee	Markee	Markee

a. To convert meters to feet, multiply by 3.28.

b. Nearest site boundary values also used in population dose calculations.
c. Specific to accident scenario.
d. 0.5 meters per second for less than 2 kilometers from source; 2.0 meters per se kilometers with 95% meteorological conditions and 4.0 meters per second for 50% me For cases with plume rise, fumigation is employed.
e. Applies to most accident scenarios; deviations identified in specific accident
f. 50% meteorology is used only for the population dose calculations.
g. Applies to materials (element and physical state) included in specific source t Dry deposition, as modeled in RSAC-5, is assumed so no washout factor is specified depletion by dry deposition means that ground surfaces are contaminated during plum particles fall to ground surfaces by gravitational settling. Dry deposition is cons ground surface and biological uptake pathways because radionuclides are made availa It is slightly nonconservative for inhalation and immersion pathways due to the fra activity within the plume.

To model the atmospheric transport of released radioactive materials from the site-specific meteorological data were reviewed to determine the prevailing meteoro Accidents were evaluated for both average and conservative meteorological condition that represent the upper bound on consequences, stable meteorological conditions th minimal dispersion are assumed.

Workers within the facility area and individuals at the nearest public access boundary are assumed directly downwind from the accident location. For population d direction is constrained to the directions with the highest consequences for the ge

F-5.3.1.3 Biological Parameters. Inhalation and ingestion pathway parameters are

discussed below.

F-5.3.1.3.1 Inhalation Pathway Parameters- Inhalation parameters are the same for

all radiological scenarios. Breathing rates are assumed to be 3.33 x 10^-4 cubic me (worker average) for exposures at controlled areas like the Idaho Chemical Processi area {DOE Order 5480.11 (DOE 1992b)] and 2.66 x 10^-4 cubic meters per second (memb public average) for uncontrolled areas like public highways inside the INEL site an INEL site boundary.

RSAC-5 provides options for specifying pulmonary clearance classes for each i inventory, or for using code-selected default clearance classes. Clearance classes basis of conservatism, unless otherwise supported by available data on the chemical For INEL facility accidents, the RSAC-5 default selections are used except for the weekly for plutonium and yearly for strontium.

Another conservatism in RSAC-5 involves tritium as a radioactivity source, th terms for H-3 (tritium) are assumed to be 100 percent tritiated water (HTO).

F-5.3.1.3.2 Ingestion Pathway Parameters- Constants used for calculation of

internal dose from ingestion of agricultural products such as leafy vegetables, sto and milk are default parameters in the RSAC-5 code. They are based on the most curr guidance from the NRC and DOE (NRC 1977b, Moore et al. 1979, DOE 1988). The fractio food consumed locally that is grown locally is assumed to be 10 percent, and this a implemented by multiplying the calculated ingestion dose by 0.1. Consumption rates population are lower than the maximum individual values from the above references. on Rupp (1980). Concentration ratios and transfer coefficients are based on the dat (1984).

F-5.3.1.4 Dose Estimates for Individuals. Underlying assumptions for exposure times,

for purposes of dose estimates are discussed below. The following assumptions apply within the facility area:

- Workers are exposed unprotected to the plume for a limited time (a maxim minutes). An alarm and/or a "Take Cover Alert" is assumed to sound short accident initiation. Workers, as they are trained to do, would immediate inside the nearest building or, particularly in case of an earthquake, e crosswind from the release location.
- After the accident is over and the airborne release is terminated, worke to buses in a nearby parking lot. During transit from buildings to the b exposed to radioactivity deposited on the ground surface for a limited t of 15 minutes).
- Workers are exposed to radioactivity via the inhalation, air immersion, surface pathways only. Ingestion of food plants or animals grown onsite expected for facility workers.

The following assumptions apply to the maximally exposed individual at the n access:

- The nearest public access to the location of an accident is usually a pu example, for the Idaho Chemical Processing Plant, U.S. Highway 20/26 nea Experimental Breeder Reactor I National Historic Monument is approximate kilometers (3.7 miles) from the Chemical Processing Plant area]. This lo the INEL site boundaries and is patrolled by the INEL Security force. In accident with potential impacts outside the complex boundary, public acc highway was assumed to be controlled by INEL Security and State Highway conservatively assumed that a motorist could be on such a highway for up before being evacuated by INEL Security personnel.
- A member of the public on such a public highway directly downwind of an location would be exposed to radioactivity via the inhalation, air immer surface pathways only. Consumption of food plants or animals grown onsit expected for a member of the public temporarily on INEL site. For the in air immersion pathways, exposure time to the plume would be for the enti duration up to a maximum of two hours. Exposure time to radioactivity de ground surface would be a maximum of two hours.

The following assumptions apply to the maximally exposed individual at the ne boundary:

- A hypothetical member of the public resides at the INEL nearest site bou example, for Idaho Chemical Processing Plant, approximately 14 kilometer miles). This individual grows crops and raises animals for personal food The wind is assumed to blow directly toward this person and this person' accident occurs, and this person is assumed to receive no warning of the
- This hypothetical member of the public at the nearest site boundary dire the accident would be exposed to radioactivity via the inhalation, air i ingestion, and ground surface pathways. For the inhalation and air immer exposure time to the plume would be for the entire release duration. Cro land are exposed for the entire duration of plume passage.
- Food contaminated by the accidental release of radioactivity is assumed of the hypothetical individual's diet during the ensuing year. This perc considered consistent with normal practices that would reduce contaminat sprinkler irrigation and washing of vegetables. It does not take credit measures, such as enforced limits on consumption unless exposures reach protective action guidelines are exceeded.
- Exposure time to radioactivity deposited on the ground surface would be 70 percent of the year following the accident, because the individual co expected to spend, on the average, at least 30 percent of each day indoo from ground surface radioactivity.

F-5.3.1.5 Population Dose Estimates. The RSAC-5 option for calculating population

doses (in person-rem) involves determining a total effective dose equivalent (TEDE) average individual at several locations within an 80-kilometer (50-mile) radius and TEDE by the number of persons for whom it applies. The TEDE calculation is similar maximum exposed individual at the nearest site boundary, with some limitations and

- For the population option, RSAC-5 limits the radionuclide inventory to 1 scenarios with more than 100 nuclides, such as those for inadvertent nuc reactions, a screening step is performed. Only those nuclides that produ CEDE greater than one millirem for any one of the four pathways at any o

locations are included.

- In the ingestion pathway, the consumption rates are reduced as described F-5.3.1.3.2.
- The adjustment for respirable fraction in the inhalation pathway is done

The method for calculating population dose effectively assumes that the plume constant velocity (under both 95 percent and 50 percent meteorological conditions) out to 80 kilometers (50 miles) over the sector with the maximum population. This m conservative because changes in actual wind directions and speeds that vary with ti from the accident would cause greater diffusion of the plume and result in lower do

F-5.3.1.6 Health Effects. Health effects expected from the estimated doses are discussed in

the following sections. The risk factors used for calculation of these health effec ICRP Publication 60 (ICRP 1991), NCRP Report No. 80 (NCRP 1985), and NUREG/CR-4214 (Abrahamson et al. 1990) and are presented in Table F-5-3.

Table F-5-3. Risk estimators for health effects from exposure to ionizing radiation the Idaho National Engineering Laboratory.

		Risk factor (probability per rem)	
Effect	Nuclide	Facility worker	General populat
Fatal cancer (all organs)	All	4.0×10^{-4}	5.0×10^{-4}
Fatal, nonfatal, and severe genetic effects (all organs)	All	5.6×10^{-4}	7.3×10^{-4}
Cancer and severe genetic	Iodine-131	1.05×10^{-5}	1.05×10^{-5}
effects (thyroid)	Iodine-132	3.15×10^{-5}	3.15×10^{-5}
Lifetime risk of hypothyroidism	Iodine-131	1.7×10^{-5}	1.7×10^{-5}
	Iodine-132	1.7×10^{-5}	1.7×10^{-5}

F-5.3.2 Accidents with Potential Chemical Exposures

Input parameters for the analyses and the potential health effects of acciden chemical exposures are discussed below.

F-5.3.2.1 Input Parameters. Factors such as receptor locations, terrain, meteorological

conditions, release conditions, and characteristics of the chemical inventory are r parameters for hand calculations or computer codes to determine human exposure from releases of hazardous chemicals. This section discusses these input parameters, not conservatisms, and describes the computer models used to perform exposure estimates parameters used in the accident analyses are given in Table F-5-4.

Table F-5-4. Release and dispersion parameters used for calculating hazardous chemi concentrations resulting from accident scenarios at the Idaho National Engineering

Meteorological/Dispersion parameter	Facility worker	Co-located facilities and nearest public access	Nearest s boundary
Receptor distance (m)	100	Specific^b	Specifi
Wind velocity (m/s)	0.5^c,d	0.5/2.0^c,d,e	2.0^c,
Release elevation^c (m)	0	0	0
Wind stability class^c,d	F	F	F
Deposition velocity ^f (m/s)			

Solids	0.01	0.01	0.01
Gases/vapors/liquids	0.001	0.001	0.001
Unspecified	0.001	0.001	0.001
Release duration^b	Specific	Specific	Specifi
Release area^g	Point	Point	Point

a. To convert from meters to feet, multiply by 3.28.
b. Specific to accident scenario.
c. Applies to most accident scenarios; deviations identified in specific accident d
d. Worst-case meteorological conditions are calculated for some scenarios by option
e. 0.5 meters per second for less than or equal to 2 kilometers from source; 2.0 me greater than 2 kilometers.
f. Applies to materials (element and physical state) included in specific source te
g. Unless area-release calculational option is used.

F-5.3.2.2 Health Effects. Hazardous constituents dispersed during an accident could induce

adverse health effects among exposed individuals. This possible impact is assessed airborne concentrations of each substance at specified downwind receptor locations exposure guidelines for chemical toxicity.

Where available, Emergency Response Planning Guideline (ERPG) values are used comparison. ERPG values are estimates of airborne concentration thresholds above wh reasonably anticipate observing adverse effects (Rusch 1993). ERPG values are speci substance, and are derived for each of three general severity levels:

- Exposure to concentrations greater than ERPG-1 values result in an unacc likelihood that one would experience mild transient adverse health effec of a clearly defined objectionable odor.
- Exposure to concentrations greater than ERPG-2 values result in an unacc likelihood that one would experience or develop irreversible or other se effects, or symptoms that could impair one's ability to take protective
- Exposure to concentrations greater than ERPG-3 values result in an unacc likelihood that one would experience or develop life-threatening health

Where ERPG values have not been derived for a toxic substance (Weitzman 1992) chemical toxicity values are substituted, as follows:

- For ERPG-1, threshold limit value/time-weighted average (TLV-TWA) values 1988) are substituted: The TWA is the time-weighted average concentratio 8-hour workday and a 40-hour workweek, to which nearly all workers may b exposed, day after day, without adverse effect.
- For ERPG-2, level-of-concern values (equal to 0.1 of the immediately dan health value-see below) are substituted: level-of-concern value is defin concentration of a hazardous substance in air, above which there may be irreversible health effects or death as a result of a single exposure fo period of time (EPA/FEMA/DOT 1987).
- For ERPG-3, immediately dangerous to life or health (IDLH) values are su IDLH is defined as the maximum concentration from which a person could e 30 minutes without a respirator and without experiencing any escape impa irreversible side effects (NIOSH 1990).

Possible health effects associated with exceeding an ERPG-2 or -3 are specifi substance of concern and must be characterized in that context. ERPG values are bas hour exposure of a member of the general population. In this EIS, ERPG values are a time-averaged exposures of one hour or less in duration. This approach provides an element of conservatism in the evaluation of accidents with releases that are signi hour.

F-5.4 Accident Screening Methodology

F-5.4.1 Screening and Selection Process

There are many types of postulated events that may lead to accidental release

and/or hazardous material of which only some have the potential to cause consequenc facility or immediate local area. These events could generate consequences to the e workers, and the public at the nearest site boundaries. The screening and selection events with potential to generate consequences to the public at the nearest site bo This screening may not identify maximum consequences to the worker within the facil meters (328 feet) of the accident location. These consequences are addressed qualit analysis of accident consequences in terms of worker injuries, deaths, or exposures perspective.

F-5.4.2 Screening of Locations, Spent Nuclear Fuel, Waste and Activity Types

Sufficient quantities of each material type to cause a potential impact if r accordance with DOE-STD-1027-92, "Hazard Categorization and Accident Analysis Techn Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports" (DOE 1994) for Category 2 hazard. Results by waste stream or material type for the nine major area Volume 2, Section 5.14.

F-5.4.3 Screening of Accident Initiating Event Types

Each INEL facility area was screened for initiating events with the potential consequences to the worker, environment, or public at the nearest site boundary.

F-5.4.4 Estimation of Accident Event Release Frequency Ranges

Most types of accident events considered in this screening have never occurre They are defined as rare events in that the frequency with which these events are e very small. The estimation of the frequency of occurrence is based on analytical an of the occurrence of conditions and contributing events leading to an accident. Fre defined in terms of annual frequency of occurrence.

Annual frequency range estimates are derived from three sources: (a) existing documentation, (b) other accident safety analysis documentation with similar freque information, or (c) best engineering judgment if no other reference or similar info

F-5.4.5 Summary of Accident Event Selection and Categorization

The selected accident events are categorized in Table F-5-5 according to the frequency of occurrence range of the event. Table F-5-5 also summarizes these accid frequency of occurrence, source term, dose at the nearest site boundary, and dose t

F-5.5 References

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ACRONYMS

ALARA	as low as reasonability achievable
CDC	Centers For Disease Control and Prevention
CEDE	committed effective dose equivalent
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CWA	Clean Water Act
D&D	decontamination and decommissioning
DCGs	Derived Concentrations Guidelines
DOE-HQ	U.S. Department of Energy, Headquarters
DOE PEIS	U.S. Department of Energy Programmatic Environmental Impact Statement
DOT	U.S. Department of Transportation
EA	environmental assessment
EBR	Experimental Breeder Reactor
EDE	effective dose equivalent
EPA	U.S. Environmental Protection Agency
ER&WM	environmental restoration and waste management
ESRP	Eastern Snake River Plain
FEMA	Federal Emergency Management Agency
FFA/CO	Federal Facility Agreement and Consent Order

FONSI	finding of no significant impact
FRR	foreigh research reactor
FRR EIS	EIS: Proposed Nuclear Weapons Nonproliferation Policy Concerning Fore
HEPA	high efficiency particular air (filter)
HHS	U.S. Department of Health and Human Services
ICPP	Idaho Chemical Processing Plant
INEL	Idaho National Engineering Laboratory
MCLs	maximum contaminant levels
MTHM	metric tons of heavy metal
NEPA	National Environment Policy Act
NRC	U.S. Nuclear Regulatory commission
NTS	Nevada Test Site
NWPA	Nuclear Waste Policy Act
ORR	Oak Ridge Reservation
OSHA	Occupational Safety and Health Administration
PSD	prevention of signification deterioration
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
RWMC	Radioactive Waste Management Complex
SDWA	Safe Drinking Water Act
SNF	spent nuclear fuel

SRS	Savannah River Site
TEDE	total effective dose equivalent
TRU	transuranic
UBC	Uniform Building Code
USGS	U.S. Geological Survey
VOCs	volatile organic compounds
WERF	Waste Experimental Reduction Facility
WINCO	Westinghouse Idaho Nuclear Company, Inc.
WIPP	Waste Isolation Pilot Plant

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1. PREFERENCE FOR ALTERNATIVES

1.1 Specific Preferences

1.1.1 SNF Management

01.01.01 (002) SNF Management

COMMENT

Commentors prefer alternatives that do not result in foreign spent nuclear fuel bei
managed at a specific location, and cite potential catastrophic impacts from releas
due to accidents.
RESPONSE
A decision regarding the policy to accept spent nuclear fuel (SNF) from foreign res
reached through a process based on a separate EIS entitled Proposed Nuclear Weapons
Policy Concerning Foreign Research Reactor Spent Nuclear Fuel (Draft) (FRR EIS). H
domestic transportation and management of such SNF, if it is returned to the United
this EIS to ensure that all potential impacts of SNF transportation are evaluated.
comment 05.12.07.01 (001) regarding the potential for release of radioactive materi
accidents.

1.1.1.1 Action Alternatives

01.01.01.01 (001) Action Alternatives

COMMENT

The commentor objects to the Port of Oakland being proposed as an entry and/or tran
research reactor spent nuclear fuel.
RESPONSE
The Port of Oakland is considered in the EIS as a potential point of entry for fore
(FRR) SNF. However, the issue of selecting ports of entry for shipments of FRR SNF
scope of this EIS. That issue is being analyzed in the FRR EIS. DOE will not make
acceptance of FRR SNF until the FRR EIS and this EIS are completed.

01.01.01.01 (002) Action Alternatives

COMMENT

The commentor supports the Regionalization by fuel type alternative.
RESPONSE
Volume 1, section 3.1 identifies the preferred alternative for programmatic SNF man
actions DOE would take to the extent required by this alternative. Research and de
would be included. See also the response to comment 04.04 (008).

01.01.01.01 (004) Action Alternatives

COMMENT

Commentors oppose the No Action alternative for one or more of the following reason
High-level waste management under this alternative is unacceptable.
Resources would be wasted.
It is irresponsible and should be redefined as the choice that just meets ex
It is unsafe.
SNF would be difficult to manage.
Some university research reactors would be forced to shut down without prom
unneeded nuclear fuel.
Not permitting shipment of SNF from university reactors will prevent decommi
reactors and force universities to incur significant expenses that could not
K-basin wastes at the Hanford Site are not stabilized.
The increased risk is considered unacceptable.

RESPONSE

Volume 1, section 3.1 of the EIS describes DOE's preferred alternative for SNF mana section 3.4 describes the preferred alternative for SNF management, environmental r management at the Idaho National Engineering Laboratory (INEL). See the responses (008) and 04.04 (011).

01.01.01.01 (005) Action Alternatives

COMMENT

Commentors oppose the Decentralization alternative or the Centralization alternativ

RESPONSE

Volume 1, section 3.1 describes the preferred alternative for SNF management. See comment 04.04 (008).

01.01.01.01 (008) Action Alternatives

COMMENT

The commentor supports the No Action alternative and opposes the Centralization alt

RESPONSE

Volume 1, section 3.1 identifies the preferred alternative for programmatic SNF man actions that would be undertaken by DOE to the extent required by this alternative. development activities would be included. See also the response to comment 04.04 (

01.01.01.01 (010) Action Alternatives

COMMENT

The commentor objects to bringing additional spent nuclear fuel to the Oak Ridge Re rainfall and percolation rates are perceived to be too high, and suggests a drier,

RESPONSE

Analyses performed for this EIS and summarized in Volume 1, Chapter 5 and Appendix section 5.8 indicate that the environmental consequences of the five SNF management be small at any of the sites, including the Oak Ridge Reservation. Therefore, brin this site is not likely to add to environmental or health hazards that may already

01.01.01.01 (013) Action Alternatives

COMMENT

The commentor supports the No Action alternative, with the opinion that all other a
"move the problem around," placing it "out of sight, out of mind."
RESPONSE
Volume 1, section 1.1 of the EIS has a comprehensive discussion of the options ava SNF, including storage, stabilization, transportation, and preparation for final di technologies to accomplish these options are discussed in Volume 1, Appendix J. Th incorporated to varying extends in all of the alternatives, as described in Volume alternatives have definite purposes for relocating SNF, such as storing similar fue secure facility. In this way, the alternatives attempt to balance transportation c considerations, including nonproliferation, worker safety, and cost effectiveness. disposition, such as burial, are outside the scope of this EIS.

01.01.01.01 (015) Action Alternatives

COMMENT

Commentors state that transportation risks and the need to avoid such risks prior t spent nuclear fuel to a permanent storage site must be considered. Commentors also for a Decentralization alternative with no transportation, and/or allude to a "shel unnecessary movements of spent nuclear fuel are being made.
RESPONSE
Transportation risks were analyzed for all the alternatives and no significant impa evaluated the alternatives not only from the standpoint of environmental impacts, b of deciding on an appropriate programmatic strategy for managing DOE SNF until deci regarding its ultimate disposition. Such decisions are anticipated within the next programmatic strategy must not only address currently identified vulnerabilities in but ensure safe, environmentally sound, and cost-effective SNF management in the fu transportation, and its costs and impacts, is a factor in making these decisions an programmatic decisions. There have not been, nor will there be, unnecessary movem

01.01.01.01 (019) Action Alternatives

COMMENT

The commentor expresses a preference for the No Action alternative because DOE will evaluate the necessity for generating radioactive waste and minimize the waste stre possible.
RESPONSE
In general, DOE has adopted a policy emphasizing waste minimization and avoidance, Volume 2, Chapters 1 and 2 of the EIS. Most new radioactive waste will be created cleanup activities and decommissioning of contaminated facilities that no longer se missions. However, DOE does not officially consider SNF a waste material. Continu sources of SNF is, therefore, not part of DOE's waste minimization objectives and i this EIS.

01.01.01.01 (022) Action Alternatives

COMMENT

The commentor prefers an alternative that manages spent nuclear fuel at its current generation without polluting the environment, and states that if spent nuclear fuel safety reasons, transportation should be minimized.
RESPONSE
Several alternatives in this EIS evaluate leaving all or most SNF where it is now s addition, other EIS alternatives were evaluated to consider providing and maintaini safely, efficiently, and responsibly manage SNF until final disposition decisions c

technologies for managing SNF are discussed in Volume 1, section 1.1.3 and Appendix
Volume 1, Figure 3-7 compares estimated shipments among all of the alternatives. T
shipment numbers reflects DOE's desire to consider all realistic transportation pos
stakeholder concerns. See also the response to comment 04.04 (008).

01.01.01.01 (026) Action Alternatives

COMMENT

The commentor states that radioactive wastes should remain at their current locatio
of final solutions, and states that a nationwide EIS on a broad-based, solution-ori
to be prepared.
RESPONSE
DOE is preparing the Waste Management Programmatic Environmental Impact Statement,
comments will be solicited on the waste policies to be addressed in that document.

01.01.01.01 (029) Action Alternatives

COMMENT

Commentors favor the Decentralization alternative, a modified Decentralization alte
including the Decentralization alternative because decentralization of spent nuclea
requires generators to assume responsibility for their spent nuclear fuel and requi
transportation. Recommended modifications include Decentralization with limited ex
the Idaho National Engineering Laboratory. Storage preferences include dry cask st
spent nuclear fuel over processing.
RESPONSE
Volume 1, section 3.1 describes DOE's preferred alternative for SNF management; Vol
describes the preferred alternative for SNF management, environmental restoration,
at INEL. See the responses to comments 04.04 (008) and 04.04 (011).

01.01.01.01 (033) Action Alternatives

COMMENT

The commentor supports centralization or regionalization of existing nuclear fuel i
RESPONSE
Volume 1, section 3.1 identifies the preferred alternative for programmatic SNF man
actions that DOE would take to the extent required by this alternative. Research a
activities would be included.

II COMMENT

The commentor prefers the Regionalization by fuel type alternative for handling Nav
and some foreign research reactor spent nuclear fuel at Idaho National Engineering
remainder going to the Savannah River Site and, for the INEL-specific recommendatio
the Ten-Year Plan and Maximum Treatment, Storage, and Disposal alternatives that wo
with Regionalization by fuel type and the Navy's preferred alternative. In additio
that reprocessing these materials at the Idaho Chemical Processing Plant be conside
the EIS, and the debate on reprocessing should not be because of politics.
RESPONSE
Volume 1, Chapter 3, and Volume 2, Chapter 3 show the actions DOE would take to the
by this alternative. Activities related to SNF management, including processing an
development, are covered. See also the response to comment 06.05 (001).

II COMMENT

The commentor opposes the Centralization alternative because it would require exten
interim storage sites and to ultimate disposal sites.
RESPONSE
The commentor is correct in anticipating the need for further SNF shipments after a
regarding ultimate disposition of DOE SNF in a permanent repository. However, asse
of these shipments is outside the scope of this EIS. The scope of Volume 1 of this
and related transportation of DOE SNF until 2035. It may take that long to make an
decision on ultimate disposition of DOE SNF. Because space in a permanent reposito
available for 40 years, DOE evaluated EIS a range of reasonable alternatives to saf
the interim.

II COMMENT

The commentor recommends that the three existing primarily spent nuclear fuel DOE l
storage be maintained in the preferred alternative.
RESPONSE
The preferred alternative for programmatic SNF management is discussed in Volume 1,

II COMMENT

The commentor prefers the programmatic No Action alternative because the existing D
fuel storage sites have vulnerabilities, as delineated in the Spent Fuel Working Gr
RESPONSE
The need to correct existing SNF storage vulnerabilities was a factor in determinin
alternative for programmatic SNF management, as described in Volume 1, section 3.1.

II COMMENT

The commentor supports the 1992/1993 Planning Basis alternative because of the urge
Hanford K-basin problems, and because the alternative is less costly, less risky, a
than most other alternatives.
RESPONSE
The factors mentioned are covered in the preferred alternative for programmatic SNF
described in Volume 1, Chapter 3.

II COMMENT

The commentor asserts that it is environmentally more attractive to manage spent nu
of origin.
RESPONSE
Volume 1, section 3.1, and Volume 2, section 3.4 describe the preferred alternative
The impacts of all of the alternatives are given in Volume 1, Chapter 5 and Appendi
show that, for all of the alternatives analyzed in this EIS, the impacts would be s

II COMMENT

The commentor notes that there is only a small difference between the analyses for
and the 1992/1993 Planning Basis alternatives.
RESPONSE

The commentor is correct. Actions taken under the Decentralization alternative wou
that would occur under the 1992/1993 Planning Basis alternative.
DOE believes that the range of alternatives analyzed in the EIS is inclusive and in
philosophy of considering a full range of reasonable alternatives, as required by t
National Environmental Policy Act (NEPA) and Council on Environmental Quality (CEQ)

II COMMENT

The commentor opposes the Regionalization and Centralization alternatives based on
high-level and transuranic wastes due to spent nuclear fuel stabilization activitie
alternatives.
RESPONSE
Volume 1, Chapter 5 and Appendix K, and Volume 2, Chapter 5 summarize the environme
all the alternatives considered in this EIS. The analyses show that the impacts of
small. Volume 1, section 3.1 describes DOE's preferred alternative for programmati
Volume 2, section 3.4 describes the preferred alternative for SNF management, envir
and waste management at INEL. See also the response to
comment 01.01.01.01 (022)

II 1.1.1.2 Siting Alternatives

II COMMENT

The commentor states that it is inappropriate to store spent nuclear fuel at the Oa
because of that area's high rainfall.
RESPONSE
Rainfall, like all other environmental parameters, such as high winds and seismic a
factors in the design of SNF storage facilities for a given site. Rainfall is expl
analysis of the potential dispersal of radioactive materials, be it by air, surface
analyses are used to design SNF storage facilities to prevent the dispersal of radi
means. Thus, DOE considers that the amount of rainfall, in and of itself, is not a
eliminate a site from consideration as a reasonable alternative for managing SNF.

II COMMENT

The commentor opposes spent nuclear fuel storage at the Idaho National Engineering
of wind patterns.
RESPONSE
DOE's policy is to operate its facilities in compliance with all applicable Federal
standards and DOE Orders, and to protect human health and the environment. To dete
DOE must take winds into account.
Volume 1, Chapter 5 and Appendix K, and Volume 2, Chapter 5 summarize the environme
all the alternatives considered in this EIS. The analyses of public exposure to ai
materials show that impacts would be small for all alternatives considered.

II COMMENT

The commentor expresses the opinion that the Hanford Site is unsuitable for storing
reactor spent nuclear fuel due to current conditions in the K-basins and the potent
additional activities on those basins if the foreign research reactor spent nuclear
RESPONSE
Volume 1, Appendix A, section 2.3 discusses the SNF management program at the Hanfo
includes a description of near-term activities to correct problems at existing faci
A, section 3.1 discusses facilities and options for SNF management to be analyzed u
proposed alternatives. Volume 1, Chapter 5 and Appendix K, and Volume 2, Chapter 5

environmental impacts of all the alternatives considered in this EIS. The analyses all alternatives would be small.

II COMMENT

The commentor states that DOE should consider several regional facilities that acce manner for disposal, spent nuclear fuel, weapons, and waste generated in their regi Nevada Test Site for such disposal.
RESPONSE
In response to public comments raised during the scoping process, DOE identified tw alternative sites: the Oak Ridge Reservation in Tennessee and the Nevada Test Site is summarized in the May 9, 1994, amendment to the Implementation Plan for the Depa Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laborator Environmental Restoration and Waste Management Programs EIS. It is treated in deta Alternative Site Selection Decision Process Report.
The documents identified above state that the Nevada Test Site is not a preferred s (SNF) management because of the State of Nevada's current role as the host site for Site Characterization Project. See also the response to comment 04.04 (008) on DOE alternative.
The ultimate disposition of DOE SNF, waste, and weapons is outside the scope of thi be decided by Congress.

II COMMENT

The commentor does not want commercial spent nuclear fuel ending up at Bremerton.
RESPONSE
The EIS does not consider management of commercial SNF. Neither DOE nor the Navy i action.

II COMMENT

Commentors prefer alternatives that do not result in additional nuclear waste or sp managed in various locations (the Idaho National Engineering Laboratory, the Nevada Savannah River Site, the Hanford Site, and the Puget Sound Naval Shipyard). In add express opinions, including:

- That they have enough waste and/or problems at the site
- That it is irrational to add more nuclear waste to what is there
- That past practices, safety, transportation, and/or mission conflict with pr site
- That temporary storage may become permanent
- That permanent disposal/disposition is needed
- That better sites that present less risk are available
- That low population density, lack of government action, profit motivation, i lack of visibility is a poor justification
- That there is a risk to water resources, fragile ecosystems, or the environm
- That increased spent nuclear fuel management activity will be detrimental to the site mission and local economy
- That spent nuclear fuel should be managed at its current site
- That Pit 9 Project waste should not be reburied at the Idaho National Engine

RESPONSE
Volume 1, Chapter 5 and Appendix K, and Volume 2, Chapter 5 summarize the environme all the alternatives considered in this EIS. The analyses show that the impacts of small. Volume 1, section 3.1 and Volume 2, section 3.4 describe the preferred alte programmatic SNF management and SNF management, environmental restoration, and wast at the INEL respectively. See the response to comment 07.02.01 (003) for informati Project. See the responses to comments 04.04 (008) and 04.04 (011) for DOE's prefe

II COMMENT

Commentors express a preference for alternatives that do not result in additional n nuclear fuel being managed in South Carolina. In addition, commentors express one following opinions:

- That they have enough waste and/or problems at the site
- That such material be stored in areas of low population density rather than population density
- That past practices, safety, transportation, and/or mission conflict with pr site
- That temporary storage may become permanent
- That permanent disposal/disposition is needed
- That better sites that present less risk are available
- That low population density, lack of government action, profit motivation, i lack of visibility is a poor justification
- That there is a risk to water resources, fragile ecosystems, or environment
- That increased spent nuclear fuel management activity will be detrimental to the site mission and local economy
- That spent nuclear fuel should be managed at its current site or where it is generated/received

RESPONSE

Volume 1, Chapter 5 and Appendix K, and Volume 2, Chapter 5 summarize the environme all the alternatives considered in this EIS. The analyses show that the impacts of small.

Volume 1, section 3.1, and Volume 2, section 3.4 describe the preferred alternative management. See the responses to comments 04.04 (008) and 04.04 (011).

II COMMENT

The commentor states that 40 years of temporary storage of spent nuclear fuel at th Engineering Laboratory is hardly temporary. In addition, the commentor states that interest to create storage solutions for existing wastes, and that additional waste Idaho.

RESPONSE

Volume 1 of this EIS considers alternative approaches to safely, efficiently, and r existing and projected quantities of SNF until 2035. This amount of time may be re implement a decision on the ultimate disposition of SNF. This EIS provides the env to support decisions that will facilitate a transition from DOE's current practices SNF. The Navy and DOE intend to make the transition from fuel management under the considered in this EIS to ultimate disposition as quickly as practicable.

For more information on interim storage, see the response to comment 06.06 (003).

II COMMENT

Commentors express a preference for alternatives that do not result in additional n nuclear fuel being managed in Tennessee. In addition, commentors express one or mo opinions:

- That they have enough waste and/or problems at the site
- That thousands of shipments of spent nuclear fuel to the Oak Ridge Reservati Regionalization alternative are not justified given that 98 percent of the s inventory now is stored at the Hanford Site, the Idaho National Engineering the Savannah River Site
- That the Centralization alternative for the Oak Ridge Reservation makes no s large number of shipments required that pose risks to persons in urban and s populations
- That such material be stored in areas of low population density rather than population density
- That past practices, safety, transportation, and/or mission conflict with pr

site
That temporary storage may become permanent
That permanent disposal/disposition is needed
That better sites that present a lower risk are available
That low population density, lack of government action, profit motivation, i
lack of visibility is a poor justification
That there is a risk to water resources, fragile ecosystems, or environment
That increased spent nuclear fuel management activity will be detrimental to
the site mission and local economy
That spent nuclear fuel should be managed at its current site or where it is
generated/received

RESPONSE

Volume 1, Chapter 5 and Appendix K, and Volume 2, Chapter 5 summarize the environme all the alternatives considered in this EIS. The analyses show that the impacts of small. Volume 1, section 3.1, and Volume 2, section 3.4 describe the preferred al nuclear fuel management. See also the responses to comments 04.04 (008) and 04.04

II COMMENT

The commentor states that the Idaho National Engineering Laboratory is not a suitab store additional spent nuclear fuel, citing seismic risk, groundwater hydrology, lo and likely repositories, and present site facility problems.

RESPONSE

Volume 1, Appendix D, and Volume 2, Chapter 5 discuss the impacts of SNF and waste INEL. These impacts would be small under all the alternatives considered in this E

II COMMENT

The commentor expresses a preference for alternatives that do not result in additio managed at the site. The commentor objects to waste being "reburied" in Idaho.

RESPONSE

The commentor's objection to Pit 9 activities at the Radioactive Waste Management C INEL is noted. Although Volume 2 of this EIS bounds all environmental restoration during the period 1995 through 2005, specific decisions regarding Pit 9 are governe Comprehensive Environmental Response, Compensation, and Liability Act, which has as involvement processes through which to obtain public input.

II COMMENT

The commentor expresses a general preference for siting spent nuclear fuel manageme Oak Ridge Reservation. The commentor further notes that the capability exists at t Reservation to manage spent nuclear fuel and that the jobs would be welcome.

RESPONSE

The commentor's preference and opinion are noted.

II COMMENT

The commentor prefers alternatives that do not result in foreign spent nuclear fuel through or managed at the Hanford Site.

RESPONSE

Potential acceptance of FRR SNF is being analyzed in a separate EIS entitled Propos Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel (Dra DOE will not make a decision on the acceptance of FRR SNF until both this EIS and t completed.

II COMMENT

The commentor prefers alternatives that do not result in additional nuclear waste b Idaho National Engineering Laboratory in Idaho and suggests that existing waste at soon as possible.

RESPONSE

General solutions for managing SNF are discussed in Volume 1, section 1.1.3 and App Therein it is noted that technologies for final disposition of SNF cannot be specif repository acceptance requirements. These requirements are several years from comp but a combination of the technologies described in Volume 1, Appendix J may satisfy acceptance criteria. Furthermore, consideration is given by the alternatives analy providing or maintaining processing flexibility that may prove necessary to meeting requirements. Consequently, although the ultimate disposition of SNF is a high pri details of disposition activities have not been finalized and are beyond the scope responses to comments 04.04 (008) and 04.04 (011).

II COMMENT

The commentor opposes Idaho becoming a nuclear waste dump and states the Idaho Nati Laboratory is not the place for a repository. The commentor adds that this is not in the Draft EIS.

RESPONSE

DOE agrees that the possibility of Idaho becoming a nuclear waste "dump" or the INE repository is not the proposed action under consideration in this EIS.
On October 22, 1990, DOE published a Notice of Intent in the Federal Register annou prepare a programmatic EIS (DOE PEIS) addressing environmental restoration and wast (ER&WM) (including SNF management) activities across the entire DOE complex. DOE t public to submit written comments on the scope of the Department of Energy Programm Environmental Restoration and Waste Management EIS, which is now titled the Waste M Programmatic EIS, held 23 scoping meetings in Idaho and across the country, and pre Implementation Plan for the DOE PEIS reflecting the comments provided. DOE held ad meetings on the draft Implementation Plan and recorded public comments given at the intent of the DOE PEIS was to support complex-wide decisions regarding management o programs, including management of SNF.
On October 5, 1992, DOE published a Notice of Intent in the Federal Register announ prepare an EIS addressing environmental restoration and waste management and SNF ac

DOE held five scoping meetings in Idaho to solicit comments on the proposed scope a comments provided at those meetings. The purpose of this INEL EIS, which tiered fr accordance with NEPA regulations, was to support site-specific decisions on INEL ER including SNF management at INEL.

On June 28, 1993, as an outgrowth of civil lawsuits involving DOE, the Public Servi Colorado (owner of the Fort St. Vrain Nuclear Generating Station) and the State of Court for the District of Idaho ordered DOE to include in its EIS considerations of involving transporting, receiving, processing, and storing SNF. Accordingly, the s ER&WM EIS was expanded to include a programmatic EIS for SNF management. All of th along with extensive public comments on each, defined the scope of the EIS. DOE's companion EIS evaluations satisfy the procedural requirements of NEPA and should pr consideration of the important impacts.

Volume 1, section 1.2 of the EIS describes actions related to this EIS. Volume 1 o environmental impacts of the plans for managing DOE SNF. Volume 1, Appendix B defi impact of this management program in Idaho. Volume 2 of this EIS was coordinated w with both the Waste Management Programmatic EIS and Volume 1 of this EIS for SNF ma because the alternatives evaluated relate to site-specific INEL activities. The Wa Programmatic EIS is expected to summarize and consider the impacts of the alternati EIS regarding SNF and waste management as part of its analysis of cumulative enviro DOE considers the evaluation of cumulative impacts in Volume 1, Chapter 5 and site- A through F of this EIS to adequately encompass all reasonably foreseeable actions the 10 sites evaluated for the management of SNF between 1995 and 2035. The cumula proposed environmental restoration and waste management at INEL between 1995 and 20 in Volume 2, Chapter 5, including the management of SNF at INEL. The integration o management of SNF into this EIS allows reviewers and decisionmakers to evaluate the impacts of programmatic management alternatives as they relate to the site-specific SNF under each alternative being considered.

Pertinent environmental assessments and other EISs were reviewed and considered in this EIS, as appropriate, to ensure consistency of information and evaluation of cu

II COMMENT

The commentor states that the Idaho National Engineering Laboratory does not have a infrastructure to support any but the No Action alternative.

RESPONSE

The EIS demonstrates that INEL would be able to support SNF management under any of Under some alternatives, additional construction is needed. Volume 1, Appendix B, the SNF management program at INEL. Volume 2, Appendix C discusses the projects an required to successfully implement this program. This detailed information is summ Chapters 1 and 2. Volume 1, Chapter 5 and Appendix K, and Volume 2, Chapter 5 summ environmental impacts of all the alternatives considered in this EIS. The analyses all alternatives would be small.

II COMMENT

The commentor opposes transporting nuclear waste to the Idaho National Engineering supports storing waste at production sites.

RESPONSE

Volume 1, section 3.1, and Volume 2, section 3.4 identify the preferred alternative and discuss the actions DOE would take to the extent required by these alternatives development activities would be included.

II COMMENT

The commentor suggests that the use of the language "not a preferred site" when ref Test Site implies that the Oak Ridge Reservation is by definition a "preferred site

RESPONSE

DOE believes this language is appropriate, because it accurately characterizes the Test Site (NTS) for the purpose of analyzing a site that lacks SNF infrastructure a seen in the EIS, the NTS "nonpreferred" status still allows for full consideration alternative sites. See also the response to comment 04.04 (008) on DOE's preferred programmatic SNF management, and the responses to comments 04.03.01 (028 and 032).

II COMMENT

The commentor opposes any form of the Regionalization or Centralization alternative Reservation.

RESPONSE

Volume 1, Chapter 5 and Appendix K, and Volume 2, Chapter 5 summarize the environme all the alternatives considered in this EIS. The analyses show that the impacts of small. Volume 1, section 3.1 describes DOE's preferred alternative for programmat Volume 2, section 3.4 describes the preferred alternative for SNF management, envir and waste management at INEL.

II 1.1.2 INEL ER&WM Programs

II COMMENT

Commentors favor a hybrid of the Volume 2 Ten-Year Plan and Maximum Treatment, Stor Disposal alternatives.

RESPONSE

The DOE preferred alternative for SNF management, environmental restoration, and wa programs at INEL is identified in Volume 2, section 3.4. The preferred alternative hybrid of the alternatives described in the Draft EIS. See the response to comment

II COMMENT

The commentor expresses a preference for the Ten-Year Plan alternative with some st opposition to the incineration process and more options for low-, high-, and mixed- incineration. The commentor further states that a separate EIS should be developed incinerators at the Idaho National Engineering Laboratory and assumes an EIS has be incinerators.

RESPONSE

Treatment options, including options other than incineration, for low-level, high-l radioactive and hazardous wastes are evaluated in the EIS and are described in Vol More detail on specific treatment technologies is provided in Volume 2, Appendix C. treatment technologies have not been selected for many of the waste streams, combin technologies may be required for effective treatment of some waste streams. Site t developed for waste streams will be reviewed and approved by the State of Idaho. C treatment technologies, or hybrids, are considered bounded by the analyses in this Low-level waste has been treated at INEL through incineration at the Waste Experime Facility (WERF). As described in Volume 2, section 2.2.7, operation of WERF was su upgrade the facility. During the shutdown, the Environmental Assessment, Idaho Nat Laboratory Low-Level and Mixed Waste Processing was prepared, which resulted in a f significant impact (FONSI). DOE is currently undertaking supplemental volume reduc WERF with off-site incineration commercial facilities. This EIS includes environme operation of WERF, including the incineration activity. Decisions on resumption of which will supersede the previous NEPA documentation. Any new specific projects in will undergo NEPA review, and the need for any additional NEPA documentation, inclu be determined. Incineration of high-level waste is not currently under considerati

II COMMENT

The commentor states that the continued receipt of transuranic waste on a case-by-c Decentralization alternative is not "no action."

RESPONSE

The purpose of the No Action alternative is to provide a baseline against which the be measured. The baseline range of existing ongoing activities for a site such as of actions. Termination of a certain set of these activities would be more of a "s which would complicate defining the baseline.

II COMMENT

The commentor objects to waste being reburied at the Idaho National Engineering Lab Project. The commentor expresses a preference for alternatives that do not result waste or spent nuclear fuel being managed at the Idaho National Engineering Laborat

RESPONSE

Volume 1, section 3.1 identifies the preferred alternative for programmatic SNF man actions that would be undertaken by DOE to the extent required by this alternative. development activities would be included.

Specific cleanup decisions, such as the one made for the Pit 9 interim action clean Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) base Federal Facility Act/Consent Order (FFA/CO) between DOE, the Environmental Protecti Region X, and the State of Idaho and are not within the scope of this EIS. The obj decisions under CERCLA and the FFA/CO, such as for Pit 9, is to reduce the potentia contamination to ensure that human health and the environment are adequately protec establishing cleanup objectives and standards specifically to ensure adequate prote with applicable environmental standards and guidance. Approximately half of the so in Pit 9 is estimated to contain less than 10 nanocuries per gram of transuranic el excavation, this material would be returned to the pit following assay commensurate practices for low-level radioactive wastes at the RWMC, as regulated by DOE Order 5 Waste Management. The remaining half would be removed and treated, both to reduce concentrations to less than 10 nanocuries per gram and to satisfy risk-based cleanu

the ROD. Following treatment, this soil and other materials meeting the criteria w low-level radioactive waste. The treated concentrate will be in a stable vitrified because the waste would be stored in an untreated and potentially unstable form for period of time until an appropriate treatment method could be found.
To minimize airborne releases, projects involving radioactive particulates at INEL within a double-confinement structure. Conservative assumptions normally are used the atmosphere, such as modeling only two filters in series when at least three are operations. See also the response to comment 01.01.01.02 (006).

II COMMENTS

The commentor supports the Volume 2 Minimum Treatment, Storage, and Disposal altern development, and supports technology resulting in less, rather than more, waste bei

RESPONSE

Volume 1, section 3.1 and Volume 2, section 3.4 describe the preferred alternatives management. See the response to comments 04.04 (008) and 04.04 (011).

II COMMENT

Commentors support the Volume 2, Maximum Treatment, Storage, and Disposal alternati

RESPONSE

Volume 2, section 3.4, describes the preferred alternative for INEL environmental r management activities, including SNF management. See also the response to comment

II 1.1.3 Others

II COMMENT

Commentors support finding a safe area in which to store spent nuclear fuel.

RESPONSE

DOE agrees with the comment.

II 1.2 General Preferences

II COMMENT

Commentors favor the options that would require the least amount of transportation, transportation of radioactive material, and a particular option.

RESPONSE

DOE complies with U.S. Department of Transportation regulations for transporting ra
These regulations are designed to protect workers and the public by minimizing the
transporting radioactive material.
In addition, the EIS evaluates a range of reasonable alternatives, from no action,
transport of radioactive materials, to centralization, which involves extensive tra
material. The analysis in the EIS shows that the potential risks from transportati
the alternatives. Nevertheless, the public comment to minimize transportation is o
considered in the DOE decision-making process that will lead to a ROD. Public oppo
that would involve more, versus less, transportation is also a factor that has been
decision-making process.
A discussion of SNF highway and rail transportation impacts and potential accident
1, Chapter 5 and Appendices A through F. DOE follows the U.S. Department of Transp
requirements for off-site transportation of SNF, including the use of licensed ship
U.S. Department of Transportation and Nuclear Regulatory Commission performance req
result, the potential for exposing the public to radiation hazards is extremely low
accident risks by following training and route-selection guidelines and uses other
hazardous and radioactive shipments. In the unlikely event of an accident, emergen
will be taken by DOE and local governmental authorities. As described in the EIS S
and Worker Health Effects, the overall risk from transportation would be small.

II II COMMENT

The commentor favors upgrading existing temporary storage facilities and expediting
over developing a centralized, temporary storage site.

RESPONSE

Volume 1, section 3.1 summarizes the alternatives for managing SNF. These alternat
number of sites to a single centralized site. NTS, which is close to the Yucca Mou
the evaluation. Yucca Mountain is being studied as the potential site for the firs
the site is found suitable, acceptance of commercial SNF is expected to begin in 20
waste acceptance is planned for 2015; the date for acceptance of DOE SNF at the rep
finalized.

II COMMENT

The commentor opposes sending N-Reactor spent nuclear fuel or other weapons-grade s
to Britain for reprocessing.

RESPONSE

A discussion of potential foreign reprocessing of N-Reactor SNF is in Volume 1, App
B.

II COMMENT

Commentors find it "frightening" and "absurd" that DOE, the Department of Defense,
been unable to come up with a feasible and workable alternative.

RESPONSE

DOE believes it has evaluated a full range of reasonable alternatives. Volume 1, s
preferred alternative for programmatic SNF management. See also the response to co
The programmatic action that DOE ultimately selects is not necessarily limited to o
For example, the ROD could incorporate actions from one or more of the five alterna
Moreover, the programmatic decisions will not identify all site-specific SNF manage
appropriate, the decisions or implementation would be made after additional site-sp
evaluation.

II II COMMENT

The commentor prefers that spent nuclear fuel be managed at the nearest good site a

RESPONSE

The EIS evaluates 10 sites as reasonable alternatives for some level of SNF managem
analysis in the EIS considers a number of factors, including risk to the public fro
reasonably foreseeable accident conditions. Discussions on public health and safet
Occupational and Public Health and Safety sections in Volume 1 and its site-specifi
through F, and in Volume 2, section 5.12. The EIS concludes that there would be no
the public or the environment due to SNF management activities at any of the 10 sit

II COMMENT

The commentor prefers alternatives that manage spent nuclear fuel at its current si
generated or received, which will help keep pressure on waste reduction and disposa

RESPONSE

See the response to comment 04.04 (008).

II COMMENT

The commentor states that this EIS addresses nothing new in establishing a viable w
moving nuclear wastes around only delays the problem to the next generation.

RESPONSE

DOE is committed not only to developing Federal geologic repositories for permanent
to providing safe interim storage pending availability of permanent disposal facili
necessary to varying degrees under the alternatives DOE is analyzing for providing
management of SNF. The alternatives have definite purposes for relocating SNF, suc
fuel types within a single secure facility. Thus, the alternatives attempt to bala
with other worthy considerations, including nonproliferation, worker safety, and co
The potential impacts of storing radioactive materials associated with SNF are disc
Chapter 5 of the EIS. Environmental consequences of programmatic SNF management ar
all alternatives in Volume 1, section 5.1, and mitigation measures are discussed in
DOE has a program for safely managing and storing SNF and other radioactive materia
considered in the EIS. DOE's policy is to design, construct, and operate its facil
safety and safety assurance that meets applicable Federal, state, and local require
DOE Orders. DOE will manage SNF in a manner that ensures protection of the environ
health and safety of the public and site employees.

II COMMENT

The commentor supports alternatives that commit DOE to accept spent nuclear fuel fr reactors, specifically the Decentralization, Regionalization, and Centralization al annual shipments.

RESPONSE

Volume 1, section 3.1 describes the preferred alternative for programmatic SNF mana section 3.4 describes the preferred alternative for SNF management, environmental r management at INEL. See the responses to comments 04.04 (008) and 04.04 (011).

II COMMENT

The commentor states that under the No Action alternative, universities will have t fuel without the infrastructure of an operating reactor.

RESPONSE

Volume 1, section 3.1 identifies the preferred alternative for programmatic SNF man actions that would be undertaken by DOE to the extent required by this alternative. development activities would be included.

II COMMENT

The commentor objects to the No Action alternative because of the increased potenti exposures and the reduction of safety margins related to degrading spent nuclear fu notes that there are indirect impacts associated with no research on appropriate te stabilization under the No Action alternative.

RESPONSE

DOE formed a No Action alternative that would provide for minimum safe management o as a basis for comparison so that bounding impacts could be obtained through analys alternatives. This analysis is consistent with CEQ regulations and guidance for th

II II COMMENT

Commentors express the opinion that spent nuclear fuel storage at a particular site there is already too much present.

RESPONSE

Potential sites were based in part on land ownership and whether current or former activities were conducted. These sites then were evaluated by using statutory and environmental factors, socioeconomic and transportation issues, and implementation sites discussed in the EIS are possible alternative sites for siting SNF storage fa

used for SNF or waste storage are to be identified in the ROD. The NEPA process re
range of reasonable alternatives, including alternative sites, be considered and ev
the response to comment 03.07 (003).

II COMMENT

The commentor is skeptical of DOE's assertions that it can store spent nuclear fuel
environmental impacts and that its entire inventory can be stored on a site only te

RESPONSE

The Alternative Site Selection Process Report reasonably assumes that "for the scop
newly generated spent nuclear fuel (SNF), the minimum site size is on the order of
the current interim storage of Naval, test reactor, and Fort St. Vrain SNF. Howeve
scope of interim storage of currently stored and newly generated SNF, under the Reg
Centralization alternatives, the minimum site size is on the order of hundreds of a
retrievable storage siting requirements for commercial SNF. The minimum site size
thousands of acres if large-scale stabilization activities were undertaken in addit
based on the nature and complexity of the processes involved and associated infrast

II COMMENT

The commentor strongly opposes considering the Nevada Test Site as a potential site
management, stating that the Western Shoshone National Council must approve such ac
1863 Treaty of Ruby Valley.

RESPONSE

The issue of Western Shoshone claims of ownership of a large portion of Nevada, inc
owned and administered lands comprising the NTS and the potential repository site a
has been a matter of contention and extensive litigation for many years. In that l
Court held that the Western Shoshone had received "payment" in 1979 for the lands t
claimed, thus extinguishing any rights or title the Tribe may have had at that poin
vs. Dann, 470 U.S. 39, 105 S. Ct. 1058 (1985). In January 1989, the Ninth Circuit
Appeals, citing the Supreme Court decision, emphatically reiterated that Western Sh
lands had been extinguished, and further ruled that the extinguishment took place i
vs. Dann, 873 F. 2d 1189 (9th Cir. 1989). In October 1989, the Supreme Court decli
on appeal, thus leaving to stand as law the Ninth Circuit opinion concerning the ex
Shoshone Tribal rights. In view of these legal precedents, DOE disagrees with the
Western Shoshone ownership of NTS or the potential Yucca Mountain repository site.

II COMMENT

The commentor prefers alternatives that do not result in additional nuclear waste b
Ridge Reservation in Tennessee, and specifically references spent nuclear fuel comi
Washington.

RESPONSE

See the response to comment 04.04 (008).

II COMMENT

Commentors express the opinion that spent nuclear fuel should be stored in areas of density to minimize potential health risks.

RESPONSE

One purpose of this EIS is to evaluate a number of alternatives to aid decisionmake interim storage site(s). The sites have been evaluated based on a number of factor risks to the public. As stated in the EIS, the Atomic Energy Act of 1954 authorize standards to protect health or minimize dangers to life or property. Radiation pro based on controlling radioactive releases to levels as low as reasonably achievable potential health risk from radiation exposure.
Analyses in the Health and Safety sections of both volumes of the EIS evaluate pote proximity to the sites considered. For all alternatives, impacts would be small.

II COMMENT

The commentor states that production of "nuclear waste" must stop and is opposed to in the great Northwest so that the port cities and the Snake and Columbia Rivers ar commentor prefers alternatives that do not result in additional nuclear waste being commentor also generally questions the need to risk water resources, fragile ecosys etc.

RESPONSE

This EIS addresses management of DOE SNF pending ultimate disposition. Most SNF to the next 40 years exists today, and ceasing activities that generate SNF would not actions considered in this document. Specific environmental consequences of SNF m presented for all alternatives in Volume 1, section 5.1. Most of DOE's SNF was gen production and experimental reactors that have ceased to operate. Additional info prevention practices is in Volume 2, section 2.2.7.

II COMMENT

Commentors express the opinion that spent nuclear fuel management activities should areas of high population density.

RESPONSE

Although SNF management activities can safely coincide with high-population or othe it is prudent to strive to avoid such areas where feasible in siting new activities present some risk to the public, however slight. However, public perceptions of ri Navy activities tend to significantly exceed the actual risks. Some individuals opp alternatives identified by DOE and the Navy for transporting, receiving, processing nuclear fuel. Nevertheless, some alternative must be selected, because DOE has a c SNF. To select an alternative, the Navy is cooperating with DOE in this comprehens management, including Naval SNF. This EIS evaluates alternatives for managing SNF disposition. The December 22, 1993, Court Order requires the EIS to be completed a 30, 1995, and a ROD to be issued by June 1, 1995.

II COMMENT

The commentor prefers alternatives that do not result in additional nuclear waste b in their state. The commentor questions how DOE originally chose the Idaho Nationa Laboratory, the Hanford Reservation, and the Savannah River Site for its activities commentor further points out that the National Environmental Policy Act process did commentor states that no scientific process was used years ago in choosing Idaho Na Laboratory for waste storage, and the EIS fails to analyze different storage types impact of, processing.

RESPONSE

The commentor is correct that the National Environmental Policy Act of 1969 did not predecessors began activities at the three sites mentioned by the commentor. The b Federal Government to select these locations for siting various activities is beyon The commentor is referred to the public information officer at each of these and ot historical information pertaining to the sites.
Volume 1, section 1.1.3 and Appendix J discuss wet and dry storage. Within alterna impacts of the particular storage type were included as input to modeling used to d alternative's impact; therefore, the consequences related to a particular storage t believes that assuming a potential need for processing is justified because it repr condition for potential impacts from SNF management, and because some processing ma prepare some SNF for interim storage. The repository criteria, while not specifica expected to contain certain criteria that, for some fuels, can be met only by some Processing and reprocessing are addressed as an option under the Volume 2 Maximum T and Disposal alternative at INEL. Refer to Project Summary SNF6 in Volume 2, Appen Additionally, information on historic emissions from reprocessing was used as input modeling because it considered bounding for any potential future processing, includ existing or new facilities or processes. The models are considered bounding becaus facilities and control operations to ensure that emissions are within the regulator emissions are not exceeded. In 1992, DOE instituted a policy that phased out repro production. That policy remains in effect.

II COMMENT

The commentor opposes a nuclear repository in Idaho.

RESPONSE

Volume 1, section 3 describes the alternatives for managing SNF considered in this None of the alternatives considered in this EIS would create a nuclear waste dump o or at any of the other sites considered during the period of this EIS.

II COMMENT

One commentor cites a quotation that states it is unrealistic to dump fuel into Sav that were never designed to store nuclear waste. Another commentor expresses the o spent nuclear fuel at the Savannah River Site is an inappropriate mission for that

RESPONSE

Volume 1, Appendix C, sections 2.3 and 2.5 describe the SNF management program at t

Site (SRS) and identify facilities that could be used to manage SNF under the alter
this programmatic EIS. Analyses of the alternatives and facilities in this EIS sho
of the alternatives considered would be small.

II COMMENT

The commentor expresses the opinion that DOE is continuing to bring SNF into the st
should consider other areas for storing spent nuclear fuel, instead of further affe

RESPONSE

Several DOE sites do manage a significant percentage of DOE SNF and waste. This is
established capability to safely manage such materials (for example, safeguards and
force, facilities, and historic mission) and associated support infrastructure (for
management, emergency response, and stakeholder involvement programs). Decisions a
and conduct such programs also are influenced by a system of checks and balances de
DOE's control, such as Congressional funding allocations, state and local permittin
potential judicial scrutiny.
Additionally, NEPA provides opportunities to involve the public in and promote info
regarding major Federal decisions. Accordingly, this EIS objectively evaluates 10
alternatives for some level of SNF management. The EIS analyses include environmen
socioeconomic impacts, and potential risks to the public from both operations and r
accidents for a number of options for managing SNF. The EIS concludes that there w
risks to the public or to the environment due to SNF management activities at any o
considered.
Public comments were considered in the preparation of this EIS, upon which a decisi
Although the EIS provides decisionmakers with an informed basis for making a decisi
perspective of environmental impacts and public comments, decisions also will be ba
considerations as cost, programmatic needs of DOE and the Navy, and implementabilit
develop and implement a national SNF management strategy that best serves the natio
See also the response to comment 04.04 (008).

II COMMENT

Commentors express fear about Idaho or Tennessee becoming a dumping ground for nucl

RESPONSE

The above concern is not appropriate for consideration in the NEPA process. The U.
held, in Metropolitan Edison v. People Against Nuclear Energy, 103 S. Ct. 1556 (198
psychological effects caused by risk are not within the scope of the NEPA process.
moral, emotional, and psychological (including fear, dread, mental anguish, hatred,
included in the EIS. However, public perceptions of risk from DOE and/or Navy acti
significantly exceed the actual risks.

II COMMENT

The commentor expresses an opinion about delays in determining the manner of ultima
takes a position against long-term storage of spent nuclear fuel at the Puget Sound
the Hanford Site or the Idaho National Engineering Laboratory.

RESPONSE

Volume 1, section 3.1 identifies the preferred alternative for programmatic SNF man actions that DOE would take to the extent required by this alternative. Research a activities would be included.

II II COMMENT

Commentors state that converting high-level liquid waste to more stable calcine, fo for final disposal, must be an integral part of any alternative selected for managi

RESPONSE

Volume 2, section 3.1 discusses DOE's plans for handling high-level waste at INEL. C identifies specific projects for managing high-level waste and calcine. All alte liquid high-level waste include activities to convert it to calcine.

II COMMENT

The commentor prefers a nonnuclear role for Idaho National Engineering Laboratory.

RESPONSE

A change in the current mission of INEL is not considered as an alternative because decide the future mission of INEL. The purposes of this EIS are to determine the m and the Navy will manage SNF during the next 40 years pending ultimate disposition, environmental impacts to INEL from environmental restoration and waste management a was prepared consistent with those purposes.

II COMMENT

The commentor supports cleaning up the Idaho National Engineering Laboratory and op waste disposal.

RESPONSE

The purposes of this EIS are to determine the manner in which DOE and the Navy wil during the next 40 years pending ultimate disposition, and to assess the environmen from environmental restoration and waste management activities. The EIS was prepar those purposes.

II COMMENT

The commentor proposes a number of actions for waste management and environmental r Idaho National Engineering Laboratory.

RESPONSE

Some of the actions suggested by the commentor fall within the various alternatives Volume 2 of the EIS, and constitute a hybrid alternative covered by the existing an environmental impacts. Other suggested actions are outside the scope of the propos either because they are outside the subject or are the proposed action or are outsi (1995 to 2005) for the INEL site-specific portion covered in Volume 2 of the EIS. to comment 07.02.01 (003).

II COMMENT

The commentor opposes the construction of the Mixed/Low Level Waste Disposal Facili sole-source aquifer in a floodplain.

RESPONSE

This project is a part of the Ten-Year Plan and Maximum Treatment, Storage, and Dis The INEL accident assessment summarized in Volume 2, section 4.15 considers floodin phenomena as potential initiators of facility accidents. Some potential accident i detailed analysis because they were comparatively likely, and some initiators were analysis because of their potentially large consequences. The consequence of a sei inventory in the high-level waste tanks has a greater potential for consequences to flood. The analyses showed that the risks to the aquifer and all other risks would The Mixed/Low Level Waste Disposal Facility would be designed, constructed, and ope accordance with all applicable regulations. DOE recently constructed new flood and features at the RWMC. This new construction will reduce the possibility of floodin well as minimize any impacts that could occur should the area receive a large volum runoff or snow melt.

II II COMMENT

Commentors suggest that nuclear waste be managed on one of the Marshall Islands.

RESPONSE

The NEPA process requires that a full range of reasonable alternatives, including a considered and evaluated in an EIS. Potential sites were selected based in part on whether current or former SNF management activities were conducted. The potential evaluated by using statutory and regulatory restrictions, environmental factors, so transportation issues, and implementation considerations. The Marshall Islands wer reasonable siting alternative and, therefore, were not included in this EIS.

II COMMENT

Commentors favor managing spent nuclear fuel at a specific DOE site or sites.

RESPONSE

Volume 1, section 3.1 of the EIS describes DOE's preferred alternative for programm Volume 2, section 3.4 describes the preferred alternative for SNF management, envir and waste management at INEL. See the responses to comments 04.04 (008) and 04.04

II COMMENT

The commentor states that a reasonable alternative is to leave Fort St. Vrain fuel

RESPONSE

The EIS does analyze alternatives that leave Fort St. Vrain fuel in Colorado. Volu EIS describes DOE's preferred alternative for programmatic SNF management; Volume 2 describes the preferred alternative for SNF management, environmental restoration, at INEL. See the responses to comments 04.04 (008) and 04.04 (011).

II 1.3 Miscellaneous

II COMMENT

The commentor states that DOE is emphasizing transportation of spent nuclear fuel w goals and consequences of doing so. The commentor respectfully asks what DOE will additional inventory at the Idaho National Engineering Laboratory. The commentor s does not adequately address correction of problems at existing sites and at receivi

RESPONSE

DOE is committed not only to developing Federal geologic repositories for permanent to providing safe interim storage pending availability of permanent disposal facili necessary to varying degrees under the alternatives DOE is analyzing for providing and management. The alternatives have definite purposes for relocating SNF such as types within a single secure facility. Thus, the alternatives attempt to balance t other worthy considerations, including nonproliferation, worker safety, and cost ef recognizes that some alternatives increase the inventory at some locations, but bel consolidation may improve SNF management. The environmental impacts of such manage are the subject of this EIS.
The potential impacts of storing radioactive materials associated with SNF are disc Chapter 5 of the EIS. The environmental consequences of managing SNF are presented in Volume 1, section 5.1, and mitigation measures are discussed in Volume 1, sectio program to safely manage and store SNF and other radioactive materials at each of t the EIS. DOE's policy is to design, construct, and operate its facilities in a way safety and safety assurance that complies with applicable Federal, state, and local regulations and DOE Orders. DOE will manage SNF to ensure protection of the enviro health and safety of the public and site employees. See also the response to comme

II COMMENT

The commentor states that the Waste Experimental Reduction Facility and the Process Plant operated without an EIS to incinerate waste and were in violation of the Reso Recovery Act.

RESPONSE

Environmental assessments were prepared for both WERF and the Process Experimental Process Experimental Pilot Plant operated only in a trial burn mode, and DOE discon Volume 2 of this EIS analyzes the cumulative impacts of operating the WERF incinera mixed low-level waste. Incineration is a best demonstrated available technology fo wastes that could be treated at WERF.
Mixed low-level waste has been incinerated at WERF only for trial burns. WERF is a

facility under RCRA. The permit status of WERF is discussed in Volume 2, Chapter 7

PAGE TOC FIGURES TABLES PAGE

2. NEPA-RELATED COMMENTS

02 (001) NEPA-Related Comments

COMMENT

Commentors state that decisions have already been made; that the [EIS] process is a and officially make the Idaho National Engineering Laboratory a de facto atomic dum was designed to support this previously arrived-at official decision.

RESPONSE

Council on Environmental Quality (CEQ) regulations at 40 CFR 1506.1(a) state that u a Record of Decision, no action shall be taken that would either have an adverse im environment, or limit the choice of reasonable alternatives.
No final decisions within the scope of this EIS have been made or will be made unti (ROD) for the EIS is issued.

2.1 EIS Presentation and Distribution

02.01 (002) EIS Presentation and Distribution

COMMENT

Commentors express opinions about the writing and organization of the EIS Summary, summary is confusing, seems to obscure rather than clarify information, and contain contradictions. Commentors recommend a different format for the Summary.

RESPONSE

The EIS follows the format specified by CEQ regulations at 40 CFR 1502.10. The Sum most significant aspects of the EIS and is written and organized in a manner and fo EIS for the purpose of providing a relatively brief overview.
Because summaries must be short, they cannot provide all supporting information. V and Volume 2, Chapter 3 provide substantially more information on the alternatives. more extensive description of the alternatives explains why all high-level waste ca Idaho National Engineering Laboratory (INEL).
The statements identified as contradictory by the commentors are that the document choices of technologies for ultimate disposition of spent nuclear fuel (SNF) but wi between current management practices and ultimate disposition. These statements ar contradictory. As pointed out in Volume 1, Chapter 1, technologies and facilities extent on waste acceptance criteria for the ultimate disposition site. Thus, the f determined until some uncertainties are resolved.

02.01 (003) EIS Presentation and Distribution

COMMENT

Commentors state that the Spent Fuel Working Group Report is not referenced in the report was taken into account in the EIS.

RESPONSE

The Spent Fuel Working Group Report on Inventory and Storage of the Department's Sp Fuel and other Reactor Irradiated Nuclear Materials and Their Environmental, Safety Vulnerabilities and its corresponding action plans are referenced in Volume 1, Chap Chapter 9. The report, also called the spent nuclear fuel vulnerability assessment this EIS are discussed in Volume 1, Chapter 1 and Volume 2 section 2.2.5. Volumes 1 and 2, Chapter 3 have been modified to describe how the information in th vulnerability assessment was used in the preferred alternative decision process.

02.01 (004) EIS Presentation and Distribution

COMMENT

The commentor suggests that a statement regarding fuel for Naval and DOE reactors s "highly" enriched uranium.

RESPONSE

The statement in Volume 1, section 3.2.1 has been revised to read "... the fuel for reactors utilizes highly enriched uranium..."

02.01 (005) EIS Presentation and Distribution

COMMENT

The commentor states that Volume 1, Table 1-4 should list the EIS on a Proposed Nuc Nonproliferation Policy Concerning Foreign Research Spent Nuclear Fuel.

RESPONSE

Volume 1, Table 1-4 does list that EIS. It is the fourth entry under the DOE Headq

02.01 (006) EIS Presentation and Distribution

COMMENT

The commentor requests that the EIS use suitable names instead of letters to design
would make it easier to read and understand the comparisons of alternatives.

RESPONSE

DOE uses names in addition to letters when appropriate to describe or discuss alter
the Summary and main volumes of the document. Regarding readability, appendices pr
data to support the main volumes and contain more detailed technical information.
alternatives are also provided in Volume 1 and the Summary. The Summary provides g
comparison of alternatives.

02.01 (007) EIS Presentation and Distribution

COMMENT

The commentor states that the EIS inappropriately uses cubic meters instead of metr
as a measure of spent nuclear fuel and requests a conversion table between metric t
cubic meters.

RESPONSE

The commentor is incorrect that cubic meters is the measurement scale the EIS uses
consistent with Nuclear Regulatory Commission and commercial-sector conventions, th
measurements of SNF in terms of metric tons of heavy metal.

02.01 (008) EIS Presentation and Distribution

COMMENT

The commentor asks that the EIS include a clear explanation of the weightings appli
to make a conclusion.

RESPONSE

The EIS identifies all impacts, as required by the National Environmental Policy Ac
decisionmakers must consider the environmental impacts in making their final decisi
Volume 1, Chapter 5 and Appendix K, and Volume 2, Chapter 5 summarize the environme
all the alternatives considered in this EIS. The analyses show that the impacts of
small. While there are differences in the impacts among the alternatives, these di
are not sufficient to distinguish between the alternatives. Therefore, the final d
consideration of other relevant factors, including economic and technical considera
agency statutory mission. The ROD will identify and discuss all such factors, whic

DOE in making its decision, and will state how those considerations entered into it

02.01 (009) EIS Presentation and Distribution

COMMENT

The commentor states that the EIS does not address specific scientific questions; cannot really comment.

RESPONSE

The EIS addresses environmental and scientific issues that are relevant to the prop alternatives. DOE believes that it has provided accurate scientific analyses and h and responsibilities in accordance with NEPA.

02.01 (010) EIS Presentation and Distribution

COMMENT

The commentor states that the Department of Transportation and the Nuclear Regulato transportation regulations are not discussed.

RESPONSE

The commentor is referred to Volume 1, section 7.2.4 for a discussion of hazardous materials transportation regulations. This section discusses both Department of Tr Nuclear Regulatory Commission (NRC) regulations. In Volume 2, DOT and NRC transpo regulations are discussed in section 7.2.5. Volume 1, Appendix I contains addition transportation regulations.

02.01 (011) EIS Presentation and Distribution

COMMENT

The commentor states that the notification dates for Oak Ridge Reservation and Neva in the EIS should be added to the EIS, if those dates differ from the dates the two spent nuclear fuel management EIS.

RESPONSE

The Oak Ridge Reservation and the Nevada Test Site were added to the Implementation Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Laboratory EIS on May 9, 1994. This information is provided in Volume 1, section 1

02.01 (012) EIS Presentation and Distribution

COMMENT

The commentor asks that a glossary be included in the EIS.

RESPONSE

In Volume 1, the glossary is in Appendix H, and in Volume 2, the glossary is in App

02.01 (013) EIS Presentation and Distribution

COMMENT

The commentor is unclear what the term "rolled up" means.

RESPONSE

The term describes the process of taking data or text from one or more areas of the information into a summary section.

02.01 (014) EIS Presentation and Distribution

COMMENT

The commentor states that different formats for tables, figures, and charts and dif were used for each site, which makes comparing the alternatives difficult.

RESPONSE

The site-specific appendices to Volume 1 were prepared by contributors at the indiv Calculational methods were defined by a set of technical guidelines that provided c site contributors. Volume 1, Chapter 5 compares the alternatives by using figures summarize all the data for each alternative. These charts use the same format and commentor should be able to compare one alternative with another by comparing the r pages.

02.01 (015) EIS Presentation and Distribution

COMMENT

The commentor states that the EIS numbering system used is confusing and suggests a numbering system that distinguishes between volumes.

RESPONSE

The EIS is divided into two separate volumes, one dealing a with programmatic propo 1), and one dealing with a INEL site-specific proposed action (Volume 2). Each pag Volume 1 or Volume 2 and, if appropriate, an appendix designation. The front of ea reader's guide that describes the organization of this complex document. Additiona user's guide as a road map for reviewing the documents.

02.01 (016) EIS Presentation and Distribution

COMMENT

The commentor states that the results of the Waste Management Programmatic EIS and Reconfiguration EIS have not been included in this EIS, thereby precluding accurate environmental impacts.

RESPONSE

Volume 2, section 2.1.3 discusses DOE EISs that are related to this EIS; the two i commentor are included in the discussion. Writers and analysts coordinated with th other EISs to ensure consistency. This EIS bounds the potential impacts of nationw and SNF management, environmental restoration, and waste management programs at INE considered the environmental impacts of past, present, and reasonably foreseeable f EIS's cumulative impact analysis.

II 02.01 (017) EIS Presentation and Distribution

COMMENT

The commentor notes that the Idaho National Engineering Laboratory has an entire vo to give it special status, and that a better balance should be achieved.

RESPONSE

This EIS is comprised of two separate evaluations: one programmatic and one site-sp Volume 1 covers the proposed action for DOE complex-wide programmatic SNF managemen site-specific and covers INEL environmental restoration and waste management progra proposed action involving site-specific spent nuclear fuel management). Although a pending at INEL, as reflected in Volume 2, this does not give INEL special status.

II 02.01 (018) EIS Presentation and Distribution

COMMENT

The commentor states that in Volume 1, Appendix C, there are detailed inventory tab chemicals, but none for radionuclides, and that the radionuclide inventories should

RESPONSE

The necessary information concerning radionuclides related to SNF management is ava C, Tables 4-9, 5-7, and 5-9. DOE reviewed the tables in Appendix C, and decided th was warranted. The information comes from annual environmental monitoring reports reports. The information should remain consistent with previously published report

II 02.01 (019) EIS Presentation and Distribution

COMMENT

The commentor requests a full accounting of all the spent nuclear fuel in America t commentor also requests a graphic showing a football field of fuel.

RESPONSE

As noted in Volume 1, management of commercial SNF is outside the scope of this EIS of fuel is not tabulated. A full inventory of DOE SNF is in Volume 1, section 1.1 DOE believes that it is more appropriate in the EIS to show the locations of SNF an each site, rather than to display the total amount graphically, as was done in a fa general public.

II 02.01 (020) EIS Presentation and Distribution

COMMENT

The commentor states that a paragraph in Appendix F describing the Y-12 Plant missi that a replacement should be found.

RESPONSE

Additional discussion of the Y-12 Plant mission is provided in Volume 1, Appendix F throughout Chapter 2.

II 02.01 (021) EIS Presentation and Distribution

COMMENT

The commentor states that the EIS could be improved by providing additional specifi including comparative cost analyses, tribal and treaty issues, site hydrology, and planning.

RESPONSE

NEPA does not require the preparation of a comparative cost analysis. However, for purposes, some of which are beyond the scope of this EIS, DOE prepared a cost evalu is summarized in Volume 1, Chapter 3.
Tribal and treaty issues, site hydrology, and strategic land-use planning are all i in Volume 2, sections 4.4.2, 4.8, and 4.2.1, respectively. Potential impacts from actions can be found in sections 5.4, 5.8, and 5.2, respectively.
Assumptions for future land uses at INEL will be made to determine the appropriate the Federal Facility Agreement/Consent Order (FFA/CO), and the Comprehensive Enviro Operations Office issued for public comment the Idaho National Engineering Laborato Land Use Future Scenarios (Draft). This document set forth various land-use scenar assumed for short-term and long-term activities at INEL. Public comments on the do and are currently being reviewed and incorporated as appropriate. A final Long-Ter Scenarios document will be issued by DOE after the INEL Site-Specific Advisory Boar document and submits comments. The Board expects to provide comments in the spring

II 02.01 (022) EIS Presentation and Distribution

COMMENT

The commentor states that the EIS should present the effectiveness of mitigation me distinction between alternatives in terms of groundwater impacts, and describe moni staffing requirements, to ensure measures will be carried out.

RESPONSE

DOE revised the EIS to better describe the types of measures that could be implemen minimize any impacts from proposed actions, although under all of the alternatives environmental impacts would be small. The proposed measures and a qualitative disc effectiveness in protecting water resources are described in Volume 2, section 5.19 apply to all alternatives. The potential impacts of each proposed alternative on g quantified in Volume 2, section 5.8 and Appendix F-2. Groundwater monitoring and t monitoring data are described in Volume 2, Appendix F, section 2.2.2. If necessary plan will be prepared that will address issues raised by the comment.

II 02.01 (023) EIS Presentation and Distribution

COMMENT

The commentor states that the word "negligible" does not accurately describe the en
discussed in the EIS.

RESPONSE

Based on the best information available, this EIS concludes that environmental impa
under all the alternatives. Analyses in this EIS were prepared and reviewed by tec
discipline. Analyses and conclusions are supported by studies, reports and literat
are provided. DOE revised the EIS to eliminate the use of the word "negligible."

II 02.01 (024) EIS Presentation and Distribution

COMMENT

Commentors request that detailed discussions of the various sites' Federal Facility
Orders and the effects of the EIS alternatives on the agreements and orders be prov

RESPONSE

DOE's policy is to comply with all applicable Federal and state laws and regulation
Executive Orders, and DOE Orders, as stated in Volume 1, section 2.2. This policy
Facility Agreements and Consent Orders. The No Action alternative in this EIS, whi
for comparing of the environmental impacts of the other alternatives, would not mee
requirements. DOE considered regulatory compliance, and compliance with existing a
consent orders in its process to identify the preferred alternatives. Detailed dis
regulatory frameworks, sufficient to aid the EIS decision-making process, are provi
Appendices A through F, sections 2.2.

II 02.01 (025) EIS Presentation and Distribution

COMMENT

The commentor states that the spent nuclear fuel EIS does not explicitly indicate h
concerns or values are accounted for as alternatives are compared. The commentor s
information condensed in tables and charts would be more helpful if immediately pre
discussion of the values underlying the comparisons.

RESPONSE

Public concerns, among other considerations, are important to the decision-making p
Volume 1, section 1.4 and Volume 2, section 2.1 both describe how public involvemen
continue to be used in making these decisions.
Tables and charts are included to make this document more informative. Where neces
charts are discussed to provide additional information.

II 02.01 (026) EIS Presentation and Distribution

COMMENT

Commentors express the opinion that the EIS is too long, too bulky, and too hard to They consider length and wordiness to detract from the document's message or to mak people to comment meaningfully. Some commentors suggest that the EIS cost too much

RESPONSE

While the EIS contains a large amount of technical information, an effort was made that the public could easily read and understand.

The EIS was prepared in a layered fashion with respect to the technical depth of th Summary is intended to summarize the information, in a concise format that would be understandable by nontechnical persons. The first three chapters of each volume pr information with more technical detail, but are still in summary form. The remaini volume summarize the technical information needed to support a decision. The appen detailed and provide sufficient information for a thorough technical review.

The size and cost of preparing this EIS were caused by a number of factors. The EI of proposed actions and alternatives. Volume 1 considers reasonable programmatic D alternative approaches to safely, efficiently, and responsibly manage existing and SNF until 2035, as well as the No Action alternative. Volume 2 addresses reasonabl approaches for managing DOE's environmental restoration, waste management, and SNF activities over the next 10 years at INEL, as well as the No Action alternative. T the environmental factors potentially impacting the wide range of related decisions large document.

II 02.01 (027) EIS Presentation and Distribution

COMMENT

The commentor states that the Draft EIS fails to identify a proposed action and to analysis of the environmental impacts of that action.

RESPONSE

The proposed action for Volume 1 of this EIS is the safe management of SNF pending The proposed action for Volume 2 of this EIS is to develop appropriate facilities a waste and SNF management at INEL and to effectively manage wastes resulting from en restoration, SNF management, and other activities at INEL.

In response to public comments, Volume 1, Chapter 2 and Volume 2, Chapter 1 were re clearly identify the proposed action.

II 02.01 (028) EIS Presentation and Distribution

COMMENT

The commentor recommends a different format for the EIS, including supplementing it
information.

RESPONSE

The EIS follows the format established by CEQ at 40 CFR 1502.10 which state that an the purpose and need for agency actions; alternatives, including no action; the aff the environmental consequences associated with the proposed action and alternatives this EIS meet these requirements. In each volume, Chapter 2 describes the purpose proposed action; Chapter 3 describes the alternatives being considered; Chapter 4 d environment; and Chapter 5 describes the environmental consequences.
In response to comments from the public, the EIS was modified to provide informatio decisionmaker or to make necessary editorial changes.

II 02.01 (029) EIS Presentation and Distribution

COMMENT

The commentor states that the EIS Summary does not explain why the scope of the EIS

RESPONSE

The commentor is correct. However, an explanation of the evolution of the EIS is i section 2.1.4.

II 02.01 (030) EIS Presentation and Distribution

COMMENT

The commentor states that, with respect to spent nuclear fuel management, the EIS p cursory, disjointed presentation that undermines the rational, informed decision-ma by the National Environmental Policy Act.

RESPONSE

NEPA, 42 USC Section 4321 et seq., and CEQ regulations at 40 CFR Part 1500 et seq. describe the purpose and need for agency action; alternatives, including no action environment; and environmental consequences associated with the proposed action and Volumes 1 and 2 of this EIS meet these requirements. In each volume, Chapter 2 des and need for the proposed action; Chapter 3 describes the alternatives being consid describes the affected environment; and Chapter 5 describes the environmental conse CEQ regulations at 40 CFR 1500.1(b) state that environmental information presented NEPA documents must concentrate on the issues that are truly significant to the act than amassing needless detail. To achieve this, 40 CFR 1502.21 states that the age

materials into an EIS by reference when the effect will be to cut down on the bulk
mechanism for incorporation by reference is discussed in the regulation on "tiering
which encourages agencies to eliminate repetitive discussion of the same issues and
issues ready for discussion at each level of environmental review.
In consideration of the volume of information presented in the Draft EIS, DOE exten
comment period to 90 days, which is twice that required under NEPA, and conducted 3
20 locations across the nation, 8 of which were held in Idaho. In addition, DOE ac
comments in writing, via hearing exhibit, and via a toll-free telephone line well p
comment period. DOE is confident that it has considered all public comments receiv
responded in Volume 3, Response to Public Comments, and issued a Final EIS that inc
meaningful comments, as appropriate.

II 02.01 (031) EIS Presentation and Distribution

COMMENT

The commentor suggests that DOE include a "reference guide" in the EIS, including d
accidents as well as complete historical monitoring records, to depict the totality
Engineering Laboratory's past and current impact on the environment.

RESPONSE

Documents relating to past accidents and reports of monitoring at INEL and in neigh
are available to the public by request and in reading rooms. In many cases they ar
this EIS.
Because the purpose of this EIS is to examine the environmental impacts of various
activities, a baseline of present-day activities and their impacts was established
between alternatives. Documentation used to arrive at the baseline is listed as re

II 02.01 (032) EIS Presentation and Distribution

COMMENT

The commentor suggests the EIS requires wider distribution.

RESPONSE

The Draft and Final EISs were distributed to more than 100 libraries and DOE readin
information locations. All members of the public who commented on the Implementati
EIS were contacted to ask if they wanted a copy of the Final EIS.

II 02.01 (033) EIS Presentation and Distribution

COMMENT

The commentor indicates that Attachments A through F were not included in Volume 1, the EIS, thus precluding proper review.

RESPONSE

Attachments A through F were included in Appendix D, Part B of the Draft EIS. Appe two volumes (Part A and Part B) due to its length. Part B was sent on request, and public reading rooms and information locations.

II 2.2 Segmentation

II COMMENT

The commentor states that the spent nuclear fuel EIS does not consider connected ac CFR 1508.25(a), with regard to this and other construction projects slated to begin Reservation in calendar year 1994-1995.

RESPONSE

The actions mentioned by the commentor do not qualify as "connected actions," as de 1508.25(a), because they are not connected to the programmatic decision on SNF and to proceed before the time period addressed in the EIS. The projects mentioned are cumulative actions. Foreseeable construction projects were considered in the asses impacts for the Oak Ridge Reservation (ORR) in Appendix F, Part Three, section 5.16 cumulative impacts in this EIS is sufficient to satisfy the requirements at 40 CFR specific references to construction projects slated to begin at ORR in 1994-1995 ar the baseline characterization. Reasonably foreseeable future construction projects qualitatively assess potential programmatic cumulative environmental consequences. and quantification of individual construction projects would be analyzed in a site- considered as a candidate site for SNF management.

II COMMENT

The commentor states that DOE has segmented the environmental evaluations of severa including receipt of foreign research reactor fuel, in a manner that will cause sig impacts to not be evident. The commentor notes that the National Environmental Pol state that "connected actions" and cumulative actions must be analyzed, and that si addressed in one EIS when it is the best way to adequately address the impacts.

RESPONSE

This EIS is designed to provide information for a decision or decisions on where to existing and reasonably foreseeable SNF inventory. As such, the programmatic docum independent of the proposal analyzed in the EIS entitled Proposed Nuclear Weapons N Policy Concerning Foreign Research Reactor Spent Nuclear Fuel (Draft) (FRR EIS). on a contingency basis where to manage its SNF inventory without deciding whether a foreign research reactor fuel. However, while a decision on whether and how to man reactor fuel containing uranium of United States origin has not been and will not b completion of the FRR EIS, the potential impacts of the proposal are included in th document to ensure that the potential impacts of implementing the proposed policy a programmatic SNF management decision.
The purpose of the FRR EIS is to analyze the impacts of a proposed United States po

research reactor (FRR) SNF containing uranium of United States origin. Analyzing t a separate EIS allows members of the public to focus their attention on the thresho to accept FRR SNF as part of the DOE inventory. Analyzing the policy imperatives u proposed policy as part of this programmatic EIS would add significantly to the len document, which is already very lengthy and complex. The SNF analyzed in the FRR E percent of the SNF covered in this EIS. If under the FRR EIS the decision is made containing uranium of United States origin, the effect would not be significant to this EIS.

The DOE Waste Management Programmatic Environmental Impact Statement will evaluate action of formulating and implementing waste management alternatives. The principa to evaluate potential configurations for waste management capabilities. Although D consider the storage of SNF in the Waste Management Programmatic Environmental Impa on June 28, 1993, the United States District Court for the District of Idaho ordere comprehensive, site-wide EIS on the environmental effects of all major Federal acti receiving, processing, and storing SNF at sites other than INEL. In view of the br DOE proposed on September 3, 1993, to expand the scope of the Idaho National Engine Environmental Restoration and Waste Management Environmental Impact Statement to i of SNF management that was being prepared for the Waste Management Programmatic Env Impact Statement.

II COMMENT

Commentors question how this EIS fits in with and is connected to the other DOE sit prepared.

RESPONSE

DOE is or will be preparing a number of programmatic and site-specific EISs. The l programmatic and site-specific EISs is discussed in Volume 1, section 1.2 and Volum this EIS. Other DOE EISs being prepared, including the DOE Waste Management Progra this EIS as a basis for assessing cumulative impacts.

II COMMENT

The commentor opposes Idaho becoming a nuclear waste dump and states that the Idaho Engineering Laboratory is not the place for a repository. The commentor adds that made in the Draft EIS.

RESPONSE

DOE agrees that the possibility of Idaho becoming a nuclear waste "dump" or INEL be is not the proposed action being considered in this EIS. See the response to comment 01.01.01.02 (025).

II 2.3 Scope

II COMMENT

Commentors want cost evaluation to be part of this EIS.

RESPONSE

DOE prepared a spent nuclear fuel cost evaluation report for long-term planning pur are beyond the scope of this EIS. Volume 1, section 3.3 summarizes the costs for i under each alternative considered in this EIS.

II COMMENT

Several commentors suggest that spent nuclear fuel from the Navy program and from f reactors needs to be addressed in separate EISs.

RESPONSE

As DOE is responsible for managing SNF from research and Naval reactors, it is appr potential environmental impacts in this programmatic EIS. DOE is preparing a separ Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reacto Nuclear Fuel (Draft). See also the response to comment 02.02 (002).

II COMMENT

Commentors are of the opinion that the EIS is not comprehensive enough.

RESPONSE

NEPA, 42 USC Section 4321 et seq., and CEQ regulations at 40 CFR Part 1500 et seq. describe the purpose and need for the proposed action; alternatives, including no a environment; and the environmental consequences associated with the proposed action Volumes 1 and 2 of this EIS meet these requirements. In each volume, Chapter 2 des and need for the proposed action; Chapter 3 describes the alternatives being consid describes the affected environment; and Chapter 5 describes the environmental conse Input on the scope of the EIS was solicited from the public during the scoping peri Management Programmatic EIS and the Idaho National Engineering Laboratory Environme Restoration and Waste Management EIS. Input was also solicited from the public dur comment period, which allowed commentors to send written comments, give oral commen facsimile comments over a toll-free telephone line, or attend one or more of the 33 20 locations around the United States.
All supporting documents referenced in this EIS are on file and are available to th

II COMMENT

The commentor states that discussions of spent nuclear fuel should not have the con being combined with discussions of environmental restoration and waste management a Engineering Laboratory.

RESPONSE

As discussed in Volume 2, section 2.1, DOE did not originally intend to include the continued receipt of SNF in its Idaho National Engineering Laboratory Environmental Waste Management EIS. However, on June 28, 1993, as an outgrowth of civil lawsuits State of Idaho, and other parties, the U.S. District Court for the District of Idah an EIS that examines alternatives to transporting, receiving, processing and storin Andrus vs. Public Service Co., 824 F. Supp. 1483 (D. Idaho 1993). Because of the q fuel currently at INEL, a thorough analysis of these activities required assessing

throughout the DOE complex. Thus, DOE decided to expand its site-specific EIS for the programmatic decision regarding the management of SNF within the DOE complex, p DOE's Waste Management Programmatic EIS. The expanded document is this EIS.

II COMMENT

The commentor cites a DOE statement that cost and public opinion will be two key fa make its spent nuclear fuel management decisions, and states that a programmatic E good vehicle for analyzing or developing these determinants."

RESPONSE

The analysis in the EIS show that, for all environmental factors considered, the im would be small. CEQ regulations allow an agency to make decisions based not only o factors, but also on technical or practical considerations and agency mission, as w This is true whether the EIS is a programmatic study, or is more specific to a loca spent nuclear fuel cost evaluation report for long-term planning purposes, some of scope of this EIS. Volume 1, section 3.3 summarizes the cost of implementing actio alternative.

II COMMENT

The commentor states that the EIS fails to be conducted within the context of DOE's programmatic EIS, Environmental Restoration and Waste Management Programmatic EIS, implementation plan for compliance with the Federal Facilities Compliance Act.

RESPONSE

The relationship between this EIS and other DOE NEPA documents is addressed in Volu of this EIS, which was updated and enhanced to better describe the interrelationsh documents. DOE is coordinating the preparation of the Waste Management Programmati Environmental Impact Statement with the development of individual site treatment pl Federal Facilities Compliance Act.

II COMMENT

The commentor states that the failure to deal with generation of spent nuclear fuel that is not being safely stored, temporarily or permanently, is not adequate under Environmental Policy Act, because the planning component is left out of the EIS.

RESPONSE

This EIS considers management of DOE SNF pending ultimate disposition. Most SNF to the next 40 years exists today, and ceasing activities that generate SNF would not actions considered in this document. The EIS and analyses determined that the envi consequences of interim storage of SNF would be small.

II COMMENT

The commentor states that DOE has targeted Idaho National Engineering Laboratory as

storing spent nuclear fuel because only it has been analyzed in detail, and that n nuclear fuel can be made until each potential site has completed a site-specific Na Policy Act review.

RESPONSE

To ensure that DOE took a thorough look at alternatives for managing SNF at sites o Volume 1 of this EIS assesses, at a programmatic level, the environmental impacts o management activities at five DOE sites and at five Naval sites for Navy SNF. The in Volume 1, Chapter 5, indicate that conducting SNF management activities at any o would result in small environmental impacts over 40 years. The level and depth of sufficient to provide the necessary information to allow an informed programmatic d with other decision factors such as mission impact, cost, and schedule. Volume 2 p management. Volume 1, section 3.1 describes the preferred alternative for programm SNF.

II COMMENT

The commentor raises issues about the impact of storing long half-life materials an on quality of life.

RESPONSE

Volume 1, Chapter 5 and Appendix K, and Volume 2, Chapter 5 summarize the environme all the alternatives considered in this EIS. The analyses show that the impacts of small. See also the response to comment 01.02.01.02 (017).
Volume 1, Chapter 4 addresses discrete resource categories that incorporate aspects issues, such as air and water quality, noise, socioeconomic, and transportation. T of life is related to environmental impacts, these concerns are discussed in the EI

II COMMENT

The commentor states that because waste processing is not considered in this EIS, i discuss waste management and spent nuclear fuel management within the same document true for the environmental restoration of past activities.

RESPONSE

CEQ requires that the cumulative impacts of all connected and related activities be segregate environmental restoration from other waste management activities would pr analysis. Volume 1 analyzes the programmatic management of SNF nationwide, whereas analyzes site-wide environmental and restoration, waste management (including waste management programs at INEL for the next 10 years. Volume 1, Chapter 5 and Appendi 2, Chapter 5, summarize the environmental impacts of all the alternatives considere analyses show that the environmental impacts of all alternatives considered would b

II COMMENT

The commentor expresses the opinion that the scope of the EIS, with regard to the s processing project [Volume 2, Appendix C, section SNF6], fails to fully bound impac Engineering Laboratory waste management operations and the environment because DOE estimate the amount of high-level liquid waste generated by the project.

RESPONSE

The volume of high-level liquid waste cited by the commentor from the Idaho Nationa Laboratory Conceptual Site Treatment Plan results from operations (such as cleanout processing at the Idaho Chemical Processing Plant. The waste generated from such o in the estimates of high-level liquid waste at INEL under the various alternatives 3.1, Figure 3.1-11).

As the commentor states, the EIS does not provide throughput characterization of th Immobilization Facility. Rather, the EIS presents the Waste Immobilization Facilit bounding analysis of the potential range of technologies that have been identified and calcine high-level waste. The specific technology to be further developed is s in conjunction with the ROD for this EIS. Following further development and analys technologies, a facility-specific NEPA review would be required for facility const

II COMMENT

The commentor states that the EIS scope is so broad that it fails to focus on Idaho and on the intent of the Court Order; i.e., whether the Idaho National Engineering site for continued receipt of Navy and Fort St. Vrain spent nuclear fuel.

RESPONSE

Because of the wide-ranging types and significant quantity of SNF managed by DOE at determined that the court-ordered examination of alternatives for SNF at INEL requi capabilities across the entire DOE complex. Therefore, on September 3, 1993, DOE i Opportunity in the Federal Register announcing its intent to expand the scope of th include a DOE complex-wide review of the alternatives for managing SNF, including N notice also announced the public's opportunity to comment on the expanded scope. P received in response to the Notice of Opportunity, as well as public comments provi and Waste Management Programmatic EIS, were considered in developing the Implementa this EIS.

The EIS supports two sets of decisions: Volume 1, programmatic actions for SNF mana restoration, waste management activities at INEL. This structure satisfies the req Order.

II COMMENT

The commentor states that both foreign research reactor and commercial spent nuclea included in the scope of this EIS.

RESPONSE

Foreign research reactor spent nuclear fuel (FRR SNF) is included in the analyses i the potential environmental impacts of implementing the proposed policy regarding F based on the EIS entitled Proposed Nuclear Weapons Nonproliferation Policy Concerni Research Reactor Spent Nuclear Fuel (Draft) (FRR EIS) are considered in any progra management decision. A discussion of the relationship between this EIS and the FRR section 1.2.4. See also the response to comment 02.02 (002).

Regarding commercial SNF, DOE manages only a small quantity of special-case commer is addressed in this EIS. It is inappropriate to consider commercial SNF, in gener this material is not managed by DOE. Under the Nuclear Waste Policy Act, as amende responsible for managing the program for development of geologic repositories for p SNF and high-level radioactive waste. A separate EIS is required under Nuclear Was

amended, to accompany the recommendation of a repository site to the President.

II COMMENT

The commentor states that the EIS has no discussion of how DOE will manage environm waste management, and spent nuclear fuel beyond 10 years.

RESPONSE

The EIS supports two sets of decisions: Volume 1, programmatic actions for SNF man 40-year planning horizon; and Volume 2, specific decisions for environmental restor that are reasonably foreseeable and may fall within a 10-year period. DOE expects the next 40 years, additional projects for managing waste and spent nuclear fuel wi need for appropriate NEPA reviews will be evaluated as the projects are defined. B will be evaluated and updated when new projects are planned or as additional inform available.

II COMMENT

The commentor states that the EIS should evaluate all of DOE's special materials, s rods, in a similar manner to spent nuclear fuel.

RESPONSE

Managing wastes, such as radioactive or contaminated components from SNF management considered in Volume 1 and its site-specific Appendices A through F. Volume 1, Cha K, and Volume 2, Chapter 5 summarize the environmental impacts of all the alternati EIS. The analyses show that the environmental impacts of all alternatives consider For example, the ends of the fuel modules removed from Naval SNF modules at the Exp Facility in Idaho are structural materials that support and direct the flow of cool This structural material is removed by cutting through portions of the fuel modules The material removed from the ends of the fuel modules does not contain any fuel or fuel, and therefore, cannot be considered SNF. They do not contain transuranic ele products; thus, they cannot be considered high-level waste or transuranic waste. T radioactivity in the end boxes cause them to be classified as low-level waste or tr Consequently the material removed from the ends of the modules at the Expended Core categorized as low-level waste due to the amount of radioactivity present in it. T structural material at the Radioactive Waste Management Complex at INEL is accompli with all applicable regulations.

Management of DOE radioactive materials and waste such as those cited by the commen under the Waste Management Programmatic EIS, that is currently being developed.

II COMMENT

The commentor states that a permanent repository for spent nuclear fuel is not like and recommends that the maximum storage interval and the time span covered by the E 60 to 80 years.

RESPONSE

This EIS considers management of DOE SNF pending ultimate disposition. DOE believe ultimate disposition will be made and implemented within 40 years; however, DOE is

managing DOE SNF for whatever time interval is necessary. DOE will review this EIS update it as appropriate during this period.

II COMMENT

The commentor references the problems identified in the Spent Fuel Working Group Re DOE has an obligation to address non-Navy spent nuclear fuel types and associated e The results should be considered in the EIS and the Record of Decision.

RESPONSE

This EIS deals with non-Navy fuel, such as production reactor fuel at the Hanford S River Site, and university research reactor fuel. In response to the report referr DOE issued action plans to correct vulnerabilities. The relationship of this EIS t vulnerability assessment and its action plans is discussed in the appropriate site Discussions for the Oak Ridge Reservation, the Savannah River Site, and the Hanford in the Final EIS based on public comments.

II COMMENT

The commentor states that the focus of the EIS is on shipping, instead of the impac on the environment.

RESPONSE

As stated in Volume 1, Chapter 2, the evaluations in Volume 1 focus on strategies f SNF management activities. These activities may, of necessity, involve moving SNF to management locations. Shipping is described in the Summary to highlight a major public and the decisionmakers. Volume 1, Chapter 5 and Appendix K, and Volume 2, C summarize the environmental impacts of all the alternatives considered in this EIS. the environmental impacts of all proposed alternatives would be small.

II COMMENT

Some commentors state that the EIS does not provide details for foreign research re and some request additional detail be included in Volume 1, Appendix E.

RESPONSE

This EIS provides information for a decision or decisions on where to manage all of reasonably foreseeable SNF inventory. Therefore, this programmatic document is sub independent from the proposal analyzed in the EIS entitled Proposed Nuclear Weapons Policy Concerning Foreign Research Reactor Spent Nuclear Fuel (Draft) (FRR EIS). D on a contingency basis where to manage its SNF inventory without deciding whether t research reactor (FRR) SNF. However, while a decision on acceptance of FRR SNF co of United States origin has not and will not be made until the completion of the FR impacts of the proposal are included in this programmatic document to ensure that t implementing the proposed policy are considered in any programmatic SNF management The purpose of the FRR EIS is to analyze the various alternatives and impacts of a United States to manage FRR SNF containing uranium of United States origin. Analyz policy in a separate EIS allows members of the public to focus on the specific ques should be managed, including the alternative of transporting it to the United State

DOE.
Volume 1, section 1.2 and Appendix E were expanded to provide additional informatio
FRR inventory; however, much of the characterization detail requested is in the FRR

II COMMENT

Commentors express the opinion that all current and planned non-Idaho National Engi
activities on which the Idaho National Engineering Laboratory depends, i.e., Waste
Yucca Mountain, and high-level waste repositories, have to be fully characterized.

RESPONSE

DOE believes the EIS is complete and accurately reflects the potential environmenta
reasonable range of alternatives. Sufficient information is included (e.g., method
to allow an independent review of results.
The purpose of this EIS is to evaluate alternatives for managing DOE SNF pending ul
DOE believes the analyses in this EIS are adequate to support a decision on this su

II COMMENT

The commentor indicates the need for public education to offset negative media cove
activists, and that spent nuclear fuel and nuclear wastes are a reality that must b

RESPONSE

It is DOE's policy to promote public and stakeholder awareness of its proposed acti
purpose and need for the proposed actions and potential environmental impacts. DOE
in public outreach programs and related activities above and beyond public involvem
associated with NEPA to increase awareness of its activities and related issues. S
comment 03.03 (008).

II II COMMENT

The commentor states that preparing the EIS in a hurry does not allow time to do ca
the sources or do site-specific work, which results in a product that is not useful
and that lacks public confidence.

RESPONSE

DOE believes the EIS is complete and accurately reflects the potential environmenta
reasonable range of alternatives. DOE had adequate time to fully evaluate the alte
and development of this EIS is in Volume 1, section 1.3.
This EIS was prepared using existing information that is available to the public an
This information and the methodologies used to analyze environmental impacts in the
thoroughly reviewed, and commented on by numerous well-informed citizens, state and
local and Tribal officials, and public interest organizations. A great effort was
collect comments from the public nationwide and to use these comments to prepare th
appropriate.

II COMMENT

The commentor states that during the scoping hearings for this EIS, a number of tec asked that the EIS does not answer. The commentor also raises questions about comp

RESPONSE

A total of 970 comments raising 4,321 issues were received during four comment peri scoping phase of this EIS. Of these, 464 were technical issues. Because the prima to identify the issues to be addressed in the EIS, DOE did not intend, nor would it to respond to each technical question raised. The comments in each issue category responses were prepared for each category, to explain how the concerns would be add the air quality category, for example, the following topics discussed in the Implem concerns raised by the commentor: airborne pollution and contamination; effectiven particulate air filters; and impacts and dispersion of airborne pollution and conta A specific commitment was made in the Implementation Plan to consider "filter effic emission control systems, and other air pollution contamination and monitoring equi commitments were kept in Volume 1, section 5.2.5 and in Volume 2, section 5.7. Fo further to specific technical issues, the commentor would have had to identify what remain.

To minimize airborne releases, projects involving radioactive particulates at INEL a double-confinement structure. Conservative assumptions normally are used to esti atmosphere, such as modeling only two filters in series when at least three are pla operations. Also, although high-efficiency particulate air (HEPA) filters have est removal efficiencies of 99.97 percent (down to diameters of 0.3 micrometers), a con factor of only 99 percent typically is used for operational safety and accident ana capable of removing particles as small as 0.001 micrometers from an airstream, but performs the rating calibration at 0.3 micrometers using a standard aerosol-generat are tested annually and inspected daily to ensure that their efficiency is maintain Safety analyses for forthcoming INEL facility operations will not presume perfect H Additional precautions will be taken to minimize airborne releases. The pressure d filter is measured continuously to detect formation of any holes or insecure filter temperature will be measured to promptly detect a filter fire. Finally, radiation downstream of the filters to continuously monitor atmospheric releases. Detection particulates above the natural background levels would result in a prompt shutdown See also the response to comment 05.11.03 (009).

II COMMENT

The commentor states that only two sites out of an extensive list were added during

RESPONSE

Volume 1, section 1.3.1 summarizes the considerations of the suitability of the sit details on these considerations are provided in Alternative Site Selection Decision is provided as a reference in this EIS. This reference describes selection of agen large number of possible alternative sites based on relevant factors, including eco considerations and agency statutory missions.

II COMMENT

The commentor expresses the opinion that the scoping for Oak Ridge Reservation was

RESPONSE

On October 22, 1990, DOE published a Notice of Intent in the Federal Register annou prepare a programmatic EIS addressing environmental restoration and waste managemen management activities across the entire DOE complex. DOE invited the public to sub on the scope of that EIS and held 23 scoping meetings across the country, including Tennessee, on December 11, 1990. Two-hundred thirty-seven comments were received a meeting. DOE issued a draft Implementation Plan in January 1992, reflecting the co DOE held six regional public workshops on the draft Implementation Plan and recorde given at these workshops. The Implementation Plan for the SNF and Idaho National E Laboratory EIS, issued in October, 1993, addressed the comments received from scopi regional workshops. DOE conducted four public scoping periods during the evolution response to public comments raised during the scoping process, DOE initiated a proc possible additional alternative sites. The result of the selection process was the two additional sites, including Oak Ridge Reservation. The process of including Oa an additional, reasonable alternative site is summarized in the May 9, 1994, amendment to the EIS Implementation Plan. DOE believes it conscientiously fulfilled its responsibilities to use available avenues for public awareness and fo input during all stages of the EIS process and that it has fulfilled its obligation accordance with NEPA.

II 2.4 Adequacy of the DRAFT EIS

II COMMENT

Commentors state that the process followed for the preparation of the EIS does not of the National Environmental Policy Act and Council on Environmental Quality regul the EIS is flawed and inadequate, and the process should be terminated.

RESPONSE

NEPA, 42 USC Section 4321 et seq., and CEQ regulations at 40 CFR Part 1500 et seq. describe the purpose and need for the proposed action; list alternatives, including the affected environment and the environmental consequences associated with the pro alternatives. Volumes 1 and 2 of this EIS meet these requirements. In each volum Chapter 2 describes the purpose and need for the proposed action; Chapter 3 describ being considered; Chapter 4 describes the affected environment; and Chapter 5 descr environmental consequences.

Input was solicited from the public during a 90-day public comment period on the Dr allowed commentors to send written comments, give oral comments and facsimile comme States.

All supporting documents referenced in the EIS are on file and are available to the also considered issues of concern raised during public meetings and hearings.

II COMMENT

Commentors state that the EIS contains inaccurate and outdated data; that available information were not included; that statistical evaluations may not have been prope the only documents declassified and used were those that supported the outcome that

RESPONSE

The analyses in this EIS were performed using unclassified information contained in EIS, which are available in public reading rooms and information locations around t an independent reviewer to corroborate the results, the EIS contains a full descrip methodologies, assumptions, and data used. While classified information relevant t

EIS exists, it is consistent with the unclassified information used for the analyse results.

II COMMENT

The commentor suggests that none of the options offered with regard to spent nuclea Environmental Policy Act requirements.

RESPONSE

CEQ regulations at 1502.14(a) state that agencies shall "Rigorously explore and obj reasonable alternatives, and for alternatives, which were eliminated from detailed reasons for their having been eliminated." DOE believes it has evaluated a reasona Alternatives eliminated from detailed study and the reasons for they were eliminate Volumes 1 and 2, section 3.2.

II COMMENT

The commentor expresses the opinion that the EIS fails to assess an inclusive range dismisses some of the alternatives without a rigorous exploration, as required by C Quality regulations.

RESPONSE

DOE believes the range of alternatives analyzed in this EIS is inclusive and in acc philosophy of considering a range of reasonable alternatives as required by the pro CEQ regulations. Alternatives range from the No Action alternative to an alternati consolidating of all SNF at a single site. Alternatives dismissed are discussed in Volume 2, section 3.2. DOE believes the discussion of the basis for dismissing oth is adequate.

II COMMENT

Commentors state that the Nevada Test Site and the Oak Ridge Reservation were not e extent as the other sites, question why the Savannah River Site documentation was d suggest that the EIS effort stop until preparers get more training on how to manage

RESPONSE

In response to public comments raised during the scoping process, DOE undertook a p possible additional alternative sites. [See also the response to comment 04.03.01 (selection process, the Nevada Test Site (NTS) and the Oak Ridge Reservation (ORR) w the analyses for these two sites are given in Volume 1, Appendix F. Volume 1, Appe evaluates the impacts for the Savannah River Site (SRS) was written in South Caroli was reviewed and approved by DOE site managers. DOE believes the depth of analysis programmatic EIS and is commensurate with the analyses of the other alternative sit considers the expertise and training of the preparers to be adequate, and they are 2, Chapter 6.

II COMMENT

The commentor states that the EIS inadequately compares alternative sites.

RESPONSE

DOE believes that it has adequately compared the alternative sites. Volumes 1 and the potential environmental consequences of the proposed alternatives at each site. what evaluations were conducted and their results. The potential consequences of t alternatives are then summarized and compared in section 3.3 of each volume. Suppo reference material provide increasing levels of detail on the scientific investigat DOE prepared this EIS to (1) provide a programmatic look forward for the next 40 ye management, and (2) provide site-specific NEPA evaluations for reasonably foreseeab environmental restoration, and waste management activities at INEL. Other site-spe may be completed as additional specific proposals emerge. Those reviews can tier f

II COMMENT

The commentor states that the EIS does not focus on solving the problems; there are development projects and no environmental restoration projects, and the EIS does no development activities to render spent nuclear fuel to an environmentally benign fo

RESPONSE

Numerous technologies are already available for managing radioactive materials, and actively developed for this purpose. Technological options for managing SNF are de section 1.1.3 and Appendix J.
As stated in Volume 2, section 2.1.2, potential impacts at INEL for environmental r addressed at the site-wide level. In those instances where project-specific impact specifically quantified at this time, conservative "bounding" estimates of their en made. Project-specific impacts of these activities at INEL may be quantified and e appropriate, as part of the CERCLA process. Volume 2, Appendix C describes environ and waste management projects planned or currently being implemented at INEL.
Technology development activities are often done at a bench-scale level, and DOE ha these activities, individually or cumulatively, do not have the potential to have a human environment. Environmental restoration/waste management technology developme program that is managed through the DOE-Headquarters (HQ) Office of Technology Deve Industry and academic partners are used to find solutions to environmental challeng related to SNF management are evolving as the final form of the SNF is defined. Se comment 07.02.01 (001).

II COMMENT

The commentor states that it is unacceptable to leave all technical decisions to fu analysis should be adequate to support a Record of Decision.

RESPONSE

The purpose of this EIS is to consider management of DOE SNF pending ultimate dispo believes the analyses in this EIS are adequate to support a decision on this subjec General solutions for managing SNF are discussed in Volume 1, section 1.1.3 and App Technologies for final disposition of SNF cannot be selected in advance of reposito requirements. These requirements are several years from completion and approval, b the technologies described in Appendix J may satisfy the eventual acceptance criter consideration is given by the alternatives analyzed in the EIS to providing or main

flexibility that may prove necessary to meeting the acceptance requirements. The i interim storage and transition to ultimate disposition, coupled with the ability to (waste forms) represents the solution that DOE seeks to define with this EIS. Cons ultimate disposition of SNF is a high priority for DOE, the details of disposition finalized and are beyond the scope of this EIS.

Other major NEPA reviews related to Volume 1 of this EIS as of March 1995 are shown Table 1-4.

II COMMENT

Commentors state that the EIS does not focus on solving the problem of spent nuclea that the best solution to the problem needs to be determined.

RESPONSE

Volume 1, section 3.1 describes DOE's preferred alternative for programmatic SNF ma 2, section 3.4 describes DOE's preferred alternative for SNF management, environmen waste management at INEL. See also the responses to comments 04.04 (008) and 04.04 The programmatic action that DOE ultimately selects is not necessarily limited to o For example, a hybrid alternative could be developed that would incorporate actions the five alternatives analyzed. Moreover, the programmatic decisions will not iden management options. If appropriate, specific proposals will be subjected to additi evaluation.

Ultimate disposition of SNF managed by DOE is a high priority. For planning purpos that the SNF managed by DOE that is not otherwise dispositioned (e.g., chemically s high-level waste being converted into a vitrified glass for repository disposal) is the first repository. This authorization is subject to the physical and statutory repository, DOE SNF meeting repository acceptance criteria, and payment of fees. A management program, DOE would (1) stabilize the SNF as needed to ensure safe interi characterize the existing SNF inventory to assess compliance with the first reposit and (3) determine what processing, if any, is required to meet the criteria. Decis disposition of DOE SNF would follow appropriate review under NEPA and be subject to NRC. This path forward would be implemented so as to minimize impacts on the first

II COMMENT

The commentor states that the EIS does not discuss the release of radioactivity and Idaho National Engineering Laboratory.

RESPONSE

Volume 2, Chapter 4 describes the existing environment at INEL, including the relea Volume 2, Chapter 2 discusses the current activities, facilities, and missions at I

II COMMENT

The commentor states that the focus and depth of analysis contained in the EIS are decisions.

RESPONSE

This EIS considers management of DOE SNF pending ultimate disposition. DOE believe

this EIS are adequate to support a decision on this subject.
NEPA, 42 USC Section 4321 et seq., and CEQ regulations at 40 CFR Part 1500 et seq. describe the purpose and need for the proposed action; alternatives, including no a environment; and environmental consequences associated with the proposed action and Volumes 1 and 2 of this EIS meet these requirements. In each volume, Chapter 2 de and need for the proposed action; Chapter 3 describes the alternatives being consid describes the affected environment; and Chapter 5 describes the environmental conse Input was solicited from the public during a 90-day public comment period, which al send written comments, give oral comments and facsimile comments over a toll-free t attend one or more of the 33 public hearings held in 20 locations around the United All supporting documents referenced in the EIS are on file and are available to the considers issues of concern raised during public meetings and hearings.

II COMMENT

The commentor is of the opinion that, despite the size of the EIS, the document is

RESPONSE

This EIS considers management of DOE SNF pending ultimate disposition. DOE believe this EIS are adequate to support a decision on this subject.
NEPA, 42 USC Section 4321 et seq., and CEQ regulations at 40 CFR Part 1500 et seq. describe the purpose and need for the proposed action; alternatives, including no a environment; and the environmental consequences associated with the proposed action Volumes 1 and 2 of this EIS meet these requirements. In each volume, Chapter 2 de and need for the proposed action; Chapter 3 describes the alternatives being consid describes the affected environment; and Chapter 5 describes the environmental conse Input was solicited from the public during a 90-day public comment period for the D allowed commentors to send written comments, give oral comments and facsimile comme States.
All supporting documents referenced in the EIS are on file and are available to the considers issues of concern raised during public meetings and hearings.

II COMMENT

The commentor states that the EIS is not adequate.

RESPONSE

This EIS considers management of DOE SNF pending ultimate disposition. DOE believe this EIS are adequate to support a decision on this subject.
NEPA, 42 USC Section 4321 et seq., and CEQ regulations at 40 CFR Part 1500 et seq. describe the purpose and need for the proposed action; alternatives, including no a environment; and the environmental consequences associated with the proposed action Volumes 1 and 2 of this EIS meet these requirements. In each volume, Chapter 2 de and need for the proposed action; Chapter 3 describes the alternatives being consid describes the affected environment; and Chapter 5 describes the environmental conse Input was solicited from the public during a 90-day public comment period for the D allowed commentors to send written comments, give oral comments and facsimile comme States.
All supporting documents referenced in the EIS are on file and are available to the considers issues of concern raised during public meetings and hearings.

II COMMENT

The commentor states that the information provided is insufficient to evaluate the stream initiatives. The commentor refers to the statement in Volume 2, section TRU the analysis in the EIS would cover all private-sector waste treatment initiatives.

RESPONSE

The analysis in this EIS is not intended to cover all private-sector waste treatmen statement was deleted from the EIS.

II COMMENT

The commentor states that land use, air and water quality, and geologic and ecologi adequately considered in the EIS.

RESPONSE

Volume 1, Chapters 4 and 5, and Volume 2, Chapters 4 and 5, as well as the site-spe specific appendices, consider environmental impacts, including those mentioned by t Volume 1, Chapter 5 discusses impacts in a number of scientific disciplines. Secti several disciplines which, although important, are not likely to affect the decisio similar impacts for all alternatives. This approach is deemed sufficient for a pro Volume 1, Appendix F provides specific information on the disciplines questioned by analyses show that under all of the disciplines analyzed, for all of the alternativ environmental impacts of the proposed actions would be small.

II COMMENT

The commentor observes that the EIS states that "the level of analysis in this EIS selection of a particular option." The commentor also asks how the selection will information will be considered.

RESPONSE

This EIS considers management of DOE SNF pending ultimate disposition. DOE believe this EIS are adequate to support a decision on this subject. Some site-specific ac programmatic decisions may require additional site-specific NEPA documentation.
In addition to public comments, DOE will consider environmental impacts, which woul the alternatives analyzed, as well as technical and practical considerations, econo missions and cost.

II COMMENT

The commentor states that the EIS is very expensive and has failed to address its p environmental impacts of the proposed actions.

RESPONSE

DOE believes that environmental impacts have been analyzed for all alternatives con and would be small. NEPA, 42 USC Section 4321 et seq., and CEQ regulations at 40 C

et seq. require that an EIS describe the purpose and need for the proposed action; no action; the affected environment; and the environmental consequences associated action and alternatives. Volumes 1 and 2 of this EIS meet these requirements. In describes the purpose and need for the proposed action; Chapter 3 describes the alt considered; Chapter 4 describes the affected environment; and Chapter 5 describes t consequences.
Input was solicited from the public during a 90-day public comment period, which a send written comments, give oral comments and facsimile comments over a toll-free t attend one or more of the 33 public hearings held in 20 locations around the United All supporting documents referenced in the EIS are on file and are available to the considers issues of concern raised during public meetings and hearings.

II COMMENT

The commentor states that the comparisons of alternatives is inadequate and cost is

RESPONSE

NEPA, 42 USC Section 4321 et seq., and CEQ regulations at 40 CFR Section 1500 et se EIS describe the purpose and need for the proposed action; alternatives, including environment; and the environmental consequences associated with the proposed action Volumes 1 and 2 of this EIS meet these requirements. In each volume, Chapter 2 de and need for the proposed action; Chapter 3 describes the alternatives being consid describes the affected environment; and Chapter 5 describes the environmental conse Input was solicited from the public during a 90-day public comment period on the Dr allowed commentors to send written comments, give oral comments and facsimile comme States.
All supporting documents referenced in the EIS are on file and are available to the considers issues of concern raised during public meetings and hearings.
DOE prepared a spent nuclear fuel cost evaluation report for long-term planning pur are beyond the scope of this EIS. Volume 1, section 3.3 summarizes the costs for i under each alternative.

II COMMENT

The commentor states that the EIS is flawed because it ignores many of the fundamen the storage of spent nuclear fuel at the Idaho National Engineering Laboratory.

RESPONSE

This EIS considers management of DOE SNF pending ultimate disposition. DOE believe this EIS are adequate to support a decision on this subject.
NEPA, 42 USC Section 4321 et seq., and CEQ regulations at 40 CFR Section 1500 et se EIS describe the purpose and need for the proposed action; alternatives, including environment; and the environmental consequences associated with the proposed action Volumes 1 and 2 of this EIS meet these requirements. In each volume, Chapter 2 de describes the affected environment; and Chapter 5 describes the environmental conse Input was solicited from the public during a 90-day public comment period, which a send written comments, give oral comments and facsimile comments over a toll-free t attend one or more of the 33 public hearings held in 20 locations around the United All supporting documents referenced in the EIS are on file and are available to the considers issues of concern raised during public meetings and hearings.

II COMMENT

The commentor states that the focus and depth of analysis is not adequate to make a the environment at the Idaho National Engineering Laboratory. The commentor also s document focuses on shipping spent nuclear fuel without comprehensively treating al environmental restoration and waste management at the Idaho National Engineering La

RESPONSE

Volume 2 concentrates on the alternatives affecting INEL. Chapter 3 explains the a chapter is subdivided to emphasize what the alternatives are for both environmental management. The impacts of these alternatives are discussed in Chapter 5 and summa DOE believes it has prepared a document with the appropriate focus and depth of ana the document follows recommendations for EISs in CEQ regulations implementing NEPA. also factors in topics of concern raised during public scoping meetings. The analy and the supporting conclusions have been prepared and reviewed by qualified profess presents and compares, for the decisionmakers, the environmental consequences that implementing the various alternatives. The site-specific details of environmental handled, and the public informed, through processes under CERCLA and the FFA/CO for

II COMMENT

The commentor states that a more complete analysis of the impacts of past releases includes assessing the adequacy of each facility's "emission system" generating the

RESPONSE

The adequacy of each existing facility's emission system is not assessed in this EI of emissions are considered in the analysis of environmental impacts. Volume 1, Ch K, and Volume 2, Chapter 5 summarize the environmental impacts of all the alternati EIS. The analyses show that the impacts of all alternatives would be small.

II COMMENT

The commentor states that the EIS fails to address any spent nuclear fuel managemen transportation.

RESPONSE

The EIS evaluates potential environmental impacts of transporting, receiving, proce SNF. SNF risks to site workers and the general public from site operations, transp accidents are discussed in Volume 1, section 5.1 for all alternatives analyzed. Es graphically contrasted among these alternatives in Volume 1, section 3.3. Cumulati force from all of these sources are provided in Volume 1, section 5.3. On-site tra described in Volume 1, site-specific Appendices A through F. Shipping casks and of impacts are described in Volume 1, Appendices D and I.

II COMMENT

The commentor states that an EIS should be properly prepared rather than hurried af

RESPONSE

DOE believes this EIS is complete and accurately reflects the potential environment reasonable range of alternatives. DOE had adequate time to fully evaluate the alte and development of this EIS is in Volume 1, section 1.3.
This EIS was prepared using existing information that is available to the public an This information and the methodologies used to analyze environmental impacts in the thoroughly reviewed, and commented on by numerous well-informed citizens, state and local and Tribal officials, and public interest organizations. A great effort was collect comments from the public nationwide and to use these comments in the EIS, a

II COMMENT

The commentor states that DOE failed to consider truly decentralized management of sites closest to its point of origin despite the identification of numerous suitabl across the country, thus decreasing transportation cost and radiological risk. The opinion that the EIS fails to fully evaluate a No Action alternative and cites some benefits of this alternative.

RESPONSE

Based on consideration of the Alternative Site Selection Decision Process Report, t Energy added the Nevada Test Site (NTS) and the Oak Ridge Reservation (ORR) to the considered for SNF management. Department of Defense sites are not considered reas potential conflicts in missions as per consultation with the Department of Defense. NEPA requires the alternatives analysis in an EIS to "include the alternative of no distinct interpretations of no action that must be considered, depending on the nat evaluated. The first situation might involve an action such as SNF management wher initiated under existing legislation and regulations will continue, even as new pla cases "no action" is "no change" from current management direction or level of mana construct an alternative that is based on no management at all would be a useless e No Action alternative may be thought of in terms of continuing with the present cou action is changed. Consequently, projected impacts of alternative management schem compared in the EIS to impacts projected for the existing plans. In this case, alt management plans of both greater and lesser intensity, especially greater and lesse management activities.
The second interpretation of no action is illustrated in instances involving Federa for projects. No action in such cases would mean the proposed activity would not t resulting environmental effects from no action would be compared with the effects o proposed activity or an alternative activity to go forward.
Where a choice of no action by the agency would result in predictable actions by ot of the No Action alternative should be included in the analysis. For example, if d ship fuel to a facility would lead to construction of additional on-site storage an inventories, the EIS should analyze this consequence of the No Action alternative. feels should be analyzed in the EIS. As stated in the EIS, DOE may not be able to with environmental laws and regulations under the No Action alternative due to the these management facilities, as described in the Spent Fuel Working Group Report on Storage of the Department's Spent Nuclear Fuel and Other Reactor Irradiated Nuclear their Environmental, Safety, and Health Vulnerabilities (the spent nuclear fuel vul No change to the EIS is necessary to analyze the equivalent of the commentor's opin "truly decentralized" alternative.
The EIS fully analyzes the No Action alternative, per the provisions of NEPA and CE Transportation and costs are addressed comparably under all alternatives evaluated considered by decisionmakers along with environmental impacts and all other pertine public comments, to arrive at a ROD.
Volume 1, Chapter 5 and Appendix K, and Volume 2, Chapter 5 summarize the environme all the alternatives considered in the EIS, including decentralization and no actio the impacts of all alternatives would be small. While there are differences in the

alternatives, these differences by themselves are not sufficient to clearly identif environmentally preferable.

II COMMENT

The commentor states that the EIS evaluation of the Idaho National Engineering Labo because specific analyses of the impacts of proposed actions are deferred, even tho define, disclose, and evaluate the environmental effects of sitewide activities ove beyond.

RESPONSE

DOE prepared this EIS and evaluated the proposed actions in accordance with NEPA. document follows recommendations for the content of EISs in CEQ and DOE regulations NEPA, including factoring in topics of concern raised during the public scoping mee and data in the EIS and the supporting conclusions have been extensively reviewed. potential environmental consequences of implementing alternative actions for the pr management of SNF and INEL sitewide environmental restoration and waste management alternatives. DOE believes that it has fulfilled its obligations and responsibilit NEPA.

II COMMENT

The commentor states that the EIS is flawed because it does not include all Idaho N Laboratory operations, including reactor operations such as the Integral Fast React

RESPONSE

Volume 2, Chapter 1 explains that DOE needs to make site-specific decisions that wo major goals: support research and development missions at INEL; comply with legal r governing SNF, waste management, and environmental restoration; and treat, store an manage SNF, and conduct environmental restoration activities at INEL in an environm manner. Reactor operations are beyond the scope of this EIS. However, impacts of SNF from reactors at INEL are assessed in Volume 2, Chapter 5.

II COMMENT

The commentor indicates that one and one-half pages of Volume 1, Appendix I-7 on th selecting ports of entry for foreign shipments is inadequate. The commentor also s not study or document the addition of new ports of entry for foreign shipments.

RESPONSE

The issue of selecting ports of entry for foreign shipments is not within the scope commentor's concern is directed to the issue of FRR SNF of United States origin, wh in a separate EIS. DOE will not make a final decision on the acceptance of that fu Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reacto Nuclear Fuel (Draft) and this EIS are completed. Potential port sites of concern a to bound the analysis of transportation within the United States should a decision material to this country for management.

II COMMENT

Commentors state that the document is general and suggest changes to the Summary to the impacts are of transportation, cost, schedule, safety and health, waste, etc., , advantages and disadvantages of all the alternatives.

RESPONSE

The Environmental Consequences section of the Summary presents, in summary form, th including shipments, public and worker health effects, employment, generation of ra impact on agency missions and cost. NEPA allows other information such as cost to decisionmaker. DOE prepared a cost evaluation of proposed alternatives that is ava rooms. This cost evaluation is summarized in Volume 1, section 3.3.

II COMMENT

The commentor states that the EIS violates the National Environmental Policy Act in information is provided on projects or facilities that are in preliminary planning Idaho Waste Processing Facility.

RESPONSE

A stand-alone Idaho Waste Processing Facility located near the Radioactive Waste Ma is postulated for planning purposes and analysis of environmental impacts. The pro Volume 2, Appendix C is used for analysis of potential consequences, as discussed i 5. Even though construction of the Idaho Waste Processing Facility is beyond the t Volume 2, proposed projects are included in the EIS to give readers as comprehensiv forthcoming projects as is currently possible. These projects or facilities may re under NEPA. At such time, additional information on secondary waste generation wil NEPA status of all environmental restoration and waste management projects contempl discussed in the EIS Summary and in Volume 2, Table 3.1-1.

II COMMENT

The commentor is of the opinion that the EIS provides an inadequate review of futur management, both programmatically and at the Idaho National Engineering Laboratory.

RESPONSE

This EIS considers the management of DOE SNF pending ultimate disposition. DOE bel in this EIS are adequate to support a decision on this subject.
The problems at existing storage facilities are identified in the Spent Fuel Workin Inventory and Storage of the Department's Spent Nuclear Fuel and Other Reactor Irra Materials and their Environmental, Safety, and Health Vulnerabilities. This report the spent nuclear fuel vulnerability assessment, and associated action plans to res information is in Volume 1, Appendices A through F. Environmental consequences of are presented for all alternatives in Volume 1, section 5.1, and mitigation measure 5.7. For all alternatives analyzed, DOE is committed to complying with applicable local regulations and DOE Orders to ensure protection of the environment and the he public and site employees.
Decisions as to the ultimate disposition of SNF and high-level nuclear wastes have outside the scope of this EIS. However, ultimate disposition of SNF managed by DOE

For planning purposes, DOE determined that the SNF managed by DOE that is not other (e.g., chemically separated, with the high-level waste being converted into a vitri disposal) is authorized for disposal in the first repository. This authorization i and statutory limits of the first repository, DOE SNF meeting repository acceptance payment of fees. As part of its SNF management program, DOE would (1) stabilize th ensure safe interim storage, (2) characterize the existing SNF inventory to assess repository's acceptance criteria, and (3) determine what processing, if any, is req Decisions regarding the actual disposition of DOE SNF would follow appropriate revi be subject to licensing by NRC. This path forward would be implemented so as to mi the first repository schedule.

General solutions proposed for managing nuclear waste are discussed in Volume 2, Ch respectively. More specific descriptions of how SNF and specific wastes would be m alternative actions are in Volume 2, section 3.1.

DOE believes that the range of alternatives analyzed in this EIS is reasonable and requirements of NEPA and CEQ regulations. Analysis and discussion of all alternativ postulated is an impossibly large task and is not required by existing regulations. public and the decisionmakers with a programmatic view of the proposed action and a alternatives. The proposed action is to develop a path forward for the safe and ef DOE SNF. The alternatives are discussed at a level appropriate for a programmatic alternative has been selected, actions within the selected alternative may require at the site-specific level to satisfy NEPA requirements. Volume 2 is a site-specif assessment of SNF management, environmental restoration, and waste management alter which includes project-specific analyses for implementing these programs. Therefor discussed in Volume 2 are more specific than those in Volume 1.

II COMMENT

The commentor asserts that the EIS is deficient because it contains no analysis of impacts, including cumulative impacts from the future management of spent nuclear f Idaho National Engineering Laboratory.

RESPONSE

DOE believes the EIS is complete and accurately reflects the potential environmenta reasonable range of alternatives.

The site-specific impacts, including cumulative impacts, of managing SNF at INEL ar 2, Chapter 5 and Appendix F. Volume 1, Chapter 5 and Appendix K, and Volume 2, Cha summarize the environmental impacts of all the alternatives considered in this EIS. is specific to SNF management at INEL. The analyses show that the environmental imp alternatives would be small.

II COMMENT

The commentor states that the EIS does not provide documentation on exposure, dose, sufficient to support the results presented.

RESPONSE

The level of supporting documentation provided for various impact assessment models the tiered structure of the EIS. Every effort was made in the preparation of this and understandable by members of the public. The EIS was prepared in a layered fas the depth of technical information. The summary is intended to present the informa would be generally understandable by nontechnical persons. The appendices are tech provide sufficient information for a thorough technical review by specialists. The references that provide more information on the methods and the technical analyses. material is available in reading rooms and information locations, which are listed

who wishes further technical detail. Volume 2, Appendix F provides detailed inform methodologies, key data, and assumptions used and additional information necessary to substantiate the content and conclusions provided in Volume 2, Chapter Appendix F includes the exposure/dose and risk models and attendant assumptions.
The environmental impact analyses, including risk analysis, are designed to produce projection of the upper bound of potential environmental consequences. This requir conservative assumptions and analytical approaches. In this context "conservative" assumption or analysis would tend to overpredict, rather than underpredict, any adv However, overly conservative analyses do not provide a useful basis for comparing a alternative has been analyzed using identical methods and levels of conservatism so impacts of alternatives can be accurately assessed.
The nature of the input data for each analysis is slightly different. Socioeconomi projected budgets, for example, where as air resources analyses are based on estima pollutants. The analytical models are also fundamentally different for similar rea where conservative assumptions were required, generally accepted engineering and sc were used to ensure that these assumptions are not outside the range of uncertainty the data.
Detailed uncertainty analyses can sometimes be useful in evaluating environmental i particularly valuable when projected impacts are large and it is important to know projections are. However, quantitative estimates of uncertainty in impacts for hyp are difficult to determine. When appropriately conservative estimates of impacts a exact degree of uncertainty diminishes in importance. The estimated impacts in the that detailed quantitative uncertainty analyses are not appropriate to meet the obj

II COMMENT

The commentor contends that the EIS is cumbersome as a result of the dual purpose a examination of issues pertaining to proposed Oak Ridge Reservation sites.

RESPONSE

The EIS Summary and Volume 1, Chapter 1 clearly state the options being evaluated b that DOE is evaluating programmatic (DOE complex-wide) approaches to managing DOE S INEL.
In response to public comments raised during the scoping process, DOE undertook a p additional alternative sites. As a result, NTS and ORR were selected for analysis as alternative sites. DOE believes that the depth of analysis for ORR and programmatic EIS and is commensurate with the analyses of the other alternative sit

II COMMENT

The commentor questions the adequacy of the technical analysis and the associated q environmental impacts of the various alternatives.

RESPONSE

The environmental impact analyses are designed to produce a reasonable projection o potential environmental consequences. This requires the use of appropriately conse and analytical approaches. In this context "conservative" means that an assumption to overestimate, rather than underestimate, any adverse impacts. However, unnecess analyses may make it more difficult to compare alternatives. Therefore, where avai impact analyses are based on realistic, site-specific information. Each alternativ consistent methodology and levels of conservatism so that the relative impacts of a accurately assessed and compared.
The analyses of the impacts of operations and reasonably foreseeable accident condi

calculations that require two elements: 1) input data, and 2) a model or analytica potential impacts. The nature of the input data for each analysis is slightly diff analyses are based on projected budgets, for example, while air resources analyses releases of pollutants. The analytical models are also fundamentally different for analyses where conservative assumptions were required, generally accepted engineeri approaches were used to ensure that these assumptions are not outside the range of associated with the data.

Detailed uncertainty analyses can sometimes be useful in evaluating environmental i particularly valuable when projected impacts are large and it is important to know projections are. However, quantitative estimates of uncertainty in impacts for hyp are difficult to determine. When appropriately conservative estimates of impacts a be small, the exact degree of uncertainty diminishes in importance. The estimated small enough that detailed quantitative uncertainty analyses are not appropriate to an EIS.

II COMMENT

Commentor express the opinion that the Draft EIS requires substantive revision to m the National Environmental Policy Act and the Court Order. Commentor consider the compilation of existing data that will jeopardize the decision-making process for t Engineering Laboratory-specific actions if not revised. Commentors further indicat compromises adherence to Federal and state laws, although it dismisses alternatives DOE Orders or contractual agreements.

RESPONSE

In accordance with the requirements of NEPA (42 USC Section 4321 et seq.), this EI draft for public and agency review on June 30, 1994. Great effort was required to available an adequate Draft EIS for public review on or before June 30, 1994, to me to between the State of Idaho, DOE, and the Navy, and adopted by the Court. Though the integration of significant resources with a disciplined project management appr without sacrificing quality. Because of the volume of information presented in the extended the public comment period to 90 days, which is twice that required under N 33 public hearings at 20 locations across the nation, 8 of which were held in Idaho accepted public comments in writing, via hearing exhibits, and via a toll-free tele throughout the comment period. DOE is confident that it has considered all public the Draft EIS, responded to the comments, and issued a Final EIS that incorporates comments, as appropriate.

This EIS was prepared using existing information that is available to the public an This information and the methodologies used to analyze environmental impacts in the thoroughly reviewed and commented on by numerous well-informed citizens, state and local and Tribal officials, and public interest organizations. A great effort was collect comments from the public nationwide and to use these comments in the EIS, a See also the responses to comments 04.04 (008) and 04.04 (011), as well as Volume Volume 2, section 3.4 for DOE's preferred alternatives. DOE and the Navy consulted and be responsive to EPA comments on the Draft EIS, and to ensure that areas of ins were clarified and/or enhanced in the Final EIS. In addition, DOE contacted other providing comments on the draft to fully understand and consider their comments, wi the State of Idaho, which declined DOE's requests to schedule a meeting.

The U.S. Department of the Interior (DOI) submitted comments on the Draft EIS sever close of the extended comment period. DOE is responding to DOI's concerns in separ While commentors raised a number of specific issues and concerns on the Draft EIS, concerns identified new reasonable alternatives requiring assessment or resulted in the analysis of the potential environmental consequences. DOE believes that it has commensurate with the requirements of NEPA for the preparation of an EIS.

II COMMENT

The commentor states that the EIS does not constitute an adequate, comprehensive, s
Idaho National Engineering Laboratory.

RESPONSE

Volume 2, Chapters 1 and 5 discuss current and planned activities and cumulative im
INEL. Environmental restoration and waste management activities and impacts, as di
cover a 10-year period. SNF management activities at INEL, as discussed in Volume
Chapters 2 and 5, cover a 40-year period. These time periods are appropriate for a
actions required for safe conduct of these activities. Some of the alternatives an
assume that waste and SNF remain at INEL.
The scope of the EIS is in accordance with the needs of DOE and the requirements of
The EIS was reviewed during an extended public comment period. While a number of s
concerns were raised on the EIS, none of the issues or concerns identified new reas
requiring assessment or resulted in a significant change in the analysis of or the
consequences of the alternatives considered. DOE believes that it has fulfilled it
commensurate with the requirements of the National Environmental Policy Act for the
See also response to comment 03.04.01 (007).

II COMMENT

The commentor states that the EIS discusses alternatives at the Idaho National Engi
contingent on national spent nuclear fuel and waste management decisions. The comm
that this disjointed approach led to an undue influence toward Idaho National Engin
spent nuclear fuel management, and that comments on the Implementation Plan did not
in this approach.

RESPONSE

CEQ regulations regarding the preparation of NEPA documents require that when major
to other reasonably foreseeable agency actions, the environmental consequences must
EIS. DOE's analysis of proposed SNF activities at INEL complies with NEPA and the
regulations.
Accordingly, this EIS integrates national programmatic SNF management alternatives
INEL sitewide environmental restoration and waste management alternatives, includin
SNF. The SNF management connection between the Volume 1 programmatic evaluation an
2 INEL alternatives for the management of SNF is Appendix B to Volume 1, which addr
management alternatives as they would impact INEL. Recognizing the complexity and
DOE prepared an easy to read, volume-specific Summary to the EIS. DOE also made av
Guide, which leads the reviewers to EIS sections of particular interest.
Volume 1, Appendix B, Chapter 5 considers the impacts on INEL environment of the im
various DOE complex-wide SNF management alternatives. Volume 1, Appendix B, Chapte
INEL's SNF facility, the regulatory framework for SNF management at INEL, and the I
management program. Chapter 3 describes the DOE complex-wide SNF management altern
proposes to implement them, including potential environmental consequences for each
Chapter 4 describes the potentially affected environment, and Chapter 5 considers t
consequences. Transportation impacts are considered in sections 4.11, 5.11 and 5.2
receiving, processing and storing SNF at INEL are included in Chapters 4 and 5. Si
were performed for other sites being considered for SNF management, including the S
the Hanford Site, the Oak Ridge Reservation, and the Nevada Test Site.

II COMMENT

The commentor states that the EIS does not properly define the proposed action, but
"kaleidoscope" of potential spent nuclear fuel storage and waste management facilit

National Engineering Laboratory. The commentor is also of the opinion that the pro
the EIS does not provide the site-specific details required by the Court, thereby v

RESPONSE

Volume 2, Chapter 1 describes the proposed action (see the response to comment 02.0
involves making a number of decisions within the range of reasonable alternatives a
DOE did not have a preferred alternative at the time of the Draft EIS, and has cons
along with other factors such as program needs, in defining its preferred alternati
the response to comment 04.04 (011) for information on DOE's preferred alternative
environmental restoration and waste management programs for 1995 to 2005. See also
comment 04.02 (001).

The Court Order addresses five types of SNF: Fort St. Vrain fuel, Navy SNF, univer
reactor fuel, fuel from other DOE facilities, and fuel from foreign research reacto
SNF are discussed relative to the proposed management alternatives and the related
activities associated with these fuels. These discussions can be found in a number
including Volume 1, Chapters 4 and 5; Volume 1, Appendix B (INEL specific), Chapter
and Volume 2, section 2.2.7. DOE factored the INEL site-specific SNF impacts of Vo
into the environmental restoration and waste management program alternative actions
2. DOE is confident that the analysis of the proposed action and alternatives for
environmental restoration, and waste management at INEL is in full compliance with
and intent of NEPA and the Court Order. See also the response to
comment 04.02 (001).

II COMMENT

The commentor states that the Draft EIS fails to identify the proposed action for e
and waste management at the Idaho National Engineering Laboratory, and proposed env
restoration activities are limited to decontamination and decommissioning projects.
that only 2 of the 47 proposed activities are related to technology development, an
environmental restoration.

RESPONSE

The proposed action for environmental restoration and waste management programs at
appropriate facilities and technologies to manage waste and SNFs expected during th
more fully integrate all environmental restoration and waste management activities
and operational efficiencies; and to minimize environmental impacts from environmen
management activities. In response to public comments, this proposed action will b
key decisions listed at the end of Volume 2, Chapter 1, including emphasis on waste
activities. The EIS has been revised to more clearly identify that portion of Volu
constitutes the proposed action.

The environmental restoration program at INEL is specifically discussed in Volume 2
3.1.2. Volume 2, Appendix C addresses environmental restoration activities that ha
through agreement with the State of Idaho and EPA. Volume 2, Table 3.1-3 lists the
environmental restoration projects that would be completed under each alternative.
many of these projects are not available at this time. However, summaries of some
Volume 2, Appendix C.

The evaluation in Volume 2 of this EIS bounds environmental impacts from environmen
cleanup) activities at INEL. For purposes of this EIS, environmental restoration a
the extent that they generate wastes which must be managed by DOE waste management
However, specific decisions related to cleanup at INEL are generally addressed unde
agreement executed by DOE, EPA Region X, and the State of Idaho on December 9, 1991
agreement, distinct from the EIS, is the FFA/CO. The FFA/CO establishes a comprehe
integrates the remediation requirements of CERCLA, and the corrective action requir
the State of Idaho's Hazardous Waste Management Act. Cleanup activities are conduc
under the process and schedule established in the FFA/CO. RODs under the FFA/CO pr
by all three agencies and represent a joint determination that protectiveness will

implementation of the selected remedy.
Environmental restoration efforts at INEL have progressed substantially since the F of November 1994, 10 of the 25 scheduled RODs have been successfully negotiated and EPA, and the State of Idaho. These RODs resulted in the implementation and/or comp interim and final actions designed to reduce or eliminate hazards to human health a date, all enforceable milestones set in accordance with the FFA/CO have been met, e schedule. Additional work will continue over the next several years, as detailed i FFA/CO Action Plan. For instance, the draft ROD for the Waste Area Group 10 Compre River Plain Aquifer Remedial Investigation feasibility Study, scheduled for May 200 decisions regarding the cleanup of the Snake River Plain aquifer. This EIS cannot those decisions. Therefore, analyses performed in support of this EIS must address anticipated cleanup in general terms.

II COMMENT

The commentor states that DOE still does not understand its national responsibiliti safety and should consider all impacts of its proposed actions. The commentor is o Draft EIS has the same failings as DOE's environmental assessment, which was ruled Court. The commentor considers the presentation of information in the EIS to be cu so as to undermine rational decisionmaking. The commentor considers the treatment National Engineering Laboratory projects to be "superficial."

RESPONSE

DOE takes its national obligation to make informed decisions that protect the healt the public, and the environment seriously. This is evidenced by the coupling of th programmatic SNF management alternatives with the corresponding INEL site-specific management alternatives for implementation.
CEQ regulations at 40 CFR 1500.1(b) state that an EIS must concentrate on the issu significant to the action in question, instead of amassing needless detail. 40 CFR agency incorporate materials into an EIS by reference when the effect will be to re document. One specific mechanism for incorporation by reference is discussed in th "tiering" at 40 CFR 1502.20, which encourages agencies to eliminate repetitive disc issues and to focus on the actual issues ready for a decision at each level of envi The 12 project descriptions referred to by the commentor are interim actions at INE pursuant to 40 CFR 1506.1(c). The cumulative impacts of these interim actions are Action alternative in Volume 2 to provide a baseline from which the impacts of the could be assessed. In addition, although the proposed projects are summarized in V the impacts of each of the proposed actions are fully assessed in the main volume (the INEL-specific portion of the EIS, to the extent that such proposed actions are See also the responses to comments 02.04 (043) and 02.04 (045).

II COMMENT

The commentor states that the EIS is inadequate because it fails to completely addr that was the subject of the lawsuit: the shipment and storage of spent nuclear fue reactor. The commentor suggests several reasons why the project summary on the For inadequate, including the fact that it fails to address specifics related to transp and certified shipping casks exist and analysis of rail versus truck transport by s location.

RESPONSE

The EIS has a summary description of the shipment and storage of the SNF from Fort summary is in Volume 2, Appendix C, section C-4.1.5. For instance, this summary sp Vrain SNF would be shipped in the TN-FSV cask designed by GA Technologies and certi

Nuclear Regulatory Commission for truck transport (certificate of Compliance No. 92 each cask holding six SNF blocks.
Volume 2, Appendix C, section C-4.1.5 summarizes information found elsewhere in the of shipping and storing Fort St. Vrain fuel. All of the environmental impacts of S are described in Volume 1, Chapter 5 and Appendix B. Fort St. Vrain fuel is just o SNF analyzed in the EIS under the various programmatic alternatives. For example, Appendices D and I present transportation impacts under all alternatives evaluated including methodologies and route-specific data. With respect to Fort St. Vrain S is not currently available, although one is being designed by Pacific Nuclear Corpo and final destination sites.
The EIS presents a complete and comprehensive description of the impacts associated management, including the fuel from the Fort St. Vrain reactor. See also the respo (046).

II COMMENT

The commentor states that the EIS is inadequate in its analysis of the impacts of l spent nuclear fuel because it fails to analyze where and how the fuel will be store reprocessing might occur, impacts of waste management activities, and what steps an taken to prepare the fuel for ultimate disposition.

RESPONSE

The EIS analyzes the impacts of SNF management until 2035, by which time DOE expec implement decisions regarding the ultimate disposition of SNF. Evaluating the pote consequences of SNF management over the full 40-year interim period is anticipated estimate any impacts that are reasonably foreseeable, including impacts from proces environments and environmental impacts that are reasonably foreseeable during this studied in detail in the EIS for a range of reasonable action and siting alternativ This information is in Volume 1, Chapters 4 and 5 and each of the site-specific App Appendix J describes storage, processing, and steps and technologies available to e for storage and/or prepare it for ultimate disposition. The discussion in the EIS of the impacts, yet it remains flexible on the discussion of technologies due to th acceptance criteria for potential geologic disposal, as well as development of pote not yet available. Decisions on ultimate disposition of SNF are beyond the scope o response to comment 05.09 (03).

II COMMENT

The commentor states that the EIS is inadequate because it fails to fully analyze t of waste disposal and waste treatment technologies at the Idaho National Engineerin

RESPONSE

The EIS considers waste treatment impacts, either onsite or offsite, under a range in Volume 2. These alternatives range from no action to maximum treatment, storage activities. Under the Maximum Treatment, Storage and Disposal alternative, activit upper limit of the reasonably foreseeable environmental impacts, including developm implementation of necessary technologies. Volume 2, section 3.1 describes these ac stream is analyzed in detail, which includes a description of maximum treatment for (Table 3.1-5), transuranic waste (Table 3.1-6), low-level waste (Table 3.1-7), mixe (Table 3.1-8), and hazardous waste (Table 3.1-9). For reasonably foreseeable techn environmental impacts are presented in Volume 2, section 3.3, and consequences of m storage and disposal are analyzed in Volume 2, Chapter 5. These impacts then are s 2, sections 5.1 through 5.20. The analysis in the EIS is adequate for evaluating w treatment impacts, and considers a range of alternatives with respect to sitewide

waste stream management activities. Additional NEPA reviews for those projects tha decision may be conducted as necessary as the waste treatment technologies are furt also the response to comment 07.02.02 (001).

II COMMENT

The commentor states that the EIS is inadequate because it fails to provide suffici conclusions, including risk models and assumptions that must be available for publi information on waste management projects. The commentor indicates local informatio such as transportation statistics from Idaho, with regard to potential impacts. Th DOE is obligated to ensure that the scientific basis and uncertainty of its environ available.

RESPONSE

The EIS complies with CEQ regulations at 40 CFR 1502.24, which require that DOE ens professional and scientific integrity of the discussions and analyses in the docume and other sources were relied on for conclusions made in the EIS, references are ci appear at the end of each chapter and each appendix. All references cited in the E public review in information locations and DOE reading rooms throughout the United the Summary. For example, transportation accident risks and the underlying models described in Volume 1, Appendix I. The reference list for these discussions is fou Similarly, the methodology and models used to calculate impacts from facility accid Volumes 1 and 2, Chapter 5 with appropriate references. See the response to commen respect to information on waste management projects.
Regarding impacts from transportation, Volume 1, Appendices D and I present transpo all alternatives evaluated for SNF management, including methodologies, route-speci analyses for both incident-free transportation and accident risk transportation are generic route, which includes types of routes that may exist in Idaho for those shi through, originate, or terminate in Idaho. These evaluations include state-specifi the consequences of a transportation accident in a suburban area such as Pocatello, reviewer would look up the consequences calculated for a suburban area.
In response to public comments, DOE has provided a discussion on uncertainty and co Volumes 1 and 2, section 5.1.

II COMMENT

The commentor states that the EIS is inadequate because it does not incorporate imp after 2035 if a permanent geologic repository does not become available as planned. cumulative impacts of waste management activities as another example of cursory ana defined only in waste volumes rather than in terms of past, present, and reasonably disposal actions and repository proposals.

RESPONSE

This EIS considers management of DOE SNF pending ultimate disposition. DOE believe ultimate disposition will be made and implemented within 40 years; however, DOE is managing SNF for the necessary time interval. DOE will review this EIS periodicall appropriate during this period.
Regarding cumulative waste management impacts in the EIS, past actions are factored For instance, impacts to the aquifer due to past activities are reflected in result modeling. Current waste inventories reflect the accumulation of waste from past ac section 5.15 presents cumulative impacts by waste stream under each of the alternat transportation, over the reasonably foreseeable period of the proposed action. As portion of the EIS, the INEL sitewide environmental restoration and waste managemen is subject to review and updating at least every 5 years. In that time period, DOE

whether to prepare a new programmatic or sitewide EIS or to supplement the existing
See also the responses to comments 05.09 (006) and 05.09 (011).

II COMMENT

The commentor expresses the opinion that the Draft EIS fails to meet the requiremen
and the National Environmental Policy Act because alternatives are assessed program
site-specifically in the EIS. As examples, the commentor specifically references D
dismissal" of leaving Fort St. Vrain fuel at the existing Fort St. Vrain facility,
Fort St. Vrain fuel at a new facility at the Idaho National Engineering Laboratory.

RESPONSE

The EIS includes an alternative of leaving fuel at Fort St. Vrain, Colorado. The i
alternatives when considering proposed actions is subject to the rule of reason. A
consider a reasonable range of alternatives, what constitutes a reasonable range de
the proposed action and the facts in each case. The rule of reason is important be
infinite variety of alternatives might be considered possible. As the courts have
unexplored and undiscussed alternatives that inventive minds might suggest, without
would be technically impossible to prepare a literally correct EIS" [Fayetteville A
Commerce vs. Volpe, 515 F.2d 1021 (4th Cir. 1975)]. As an example, this EIS addres
truck or by rail, or not transporting at all, which constitutes a reasonable range
reason. This EIS addresses a reasonable range of alternatives in both Volumes 1 an
alternatives have been adequately integrated to address a reasonable range of SNF a
Regarding the commentor's examples, the option of leaving Fort St. Vrain SNF at the
Vrain storage facility was considered under the No Action alternative. The stateme
leaving the fuel at the facility would violate the existing contract did not lessen
was a statement to advise the public of the consequences of such an alternative. D
summary in this EIS to provide more information on the Fort St. Vrain fuel. With r
of storing Fort St. Vrain fuel at a new facility at INEL, this is considered within
Storage Facility Project Summary. See Volume 2, Appendix C, SNF-4.

II COMMENT

Commentors state that the EIS was prepared without significant consultation with th
Tribes.

RESPONSE

DOE and the Navy consulted regularly with the Shoshone-Bannock Tribes, both with re
and in other contexts. Specifically with respect to this EIS, DOE and the Navy rev
been consultations between Tribal officials and appropriate INEL and Navy officials
addressing specific comments on the EIS, these ongoing consultations are designed t
understanding of INEL-related issues important to the Tribes, both within and beyon
EIS. To date, these consultations have resulted in an increased awareness of Triba
nature, ties to the land, religious beliefs, and other areas of special interest to
response to comment 03.07 (008).

II COMMENT

The commentor states that regardless of which port of entry is considered, there ar
environmental review which need to be addressed.

RESPONSE

DOE believes the analytical approaches and technical information used in the EIS to scientifically valid. The document was prepared using all appropriate and publicly DOE placed much technical detail in the appendices and references. The references and 2 include current information on the existing environment and applicable enviro for all sites evaluated. These original studies are referenced in Chapter 9 of bot in public reading rooms for review.
DOE made every effort to verify and check all data and statistics. All information evaluations in the EIS was subjected to technical and interdisciplinary reviews to error.
DOE did not omit critical information, and believes that the public review process information by critics as well as proponents.

II COMMENT

The commentor states that the EIS neither describes ongoing activities nor analyzes association with past and future activities, and is therefore not comprehensive.

RESPONSE

Volume 2, Chapter 4 describes the existing environment at INEL. Volume 2, Chapter current activities, facilities, and missions at INEL. Site-specific impacts, inclu presented in Volume 2, Chapter 5 and Appendix F. Volume 1, Chapter 5 and Appendix Chapter 5 summarize all of the alternatives considered in this EIS. The analysis s environmental impacts of all proposed alternatives would be small.

II COMMENT

The commentor states that the EIS process is flawed because the focus is flawed, th flawed, and the review of environmental consequences is inadequate.

RESPONSE

For each of the alternatives considered, environmental impacts were analyzed and pr comparisons between the alternatives. DOE believes the technical analyses provided appendices, and references accurately and adequately scope potential environmental proposed action.

II COMMENT

The commentor asserts that the facility-specific environmental impacts of spent nuc activities must be performed prior to selecting a location for that activity.

RESPONSE

Specific information is not available on facilities that have not been fully design data are also not available for future activities, such as decontamination projects treatment of waste streams, the treatment plans for which have not been finalized. included in the EIS to present readers with as comprehensive a range of forthcoming

possible. These projects or facilities may require additional analysis under NEPA. projects at the various alternative sites, DOE can reasonably compare the impacts o programmatic level.

II COMMENT

Commentors state that the EIS treatment is too broad, and details about specific fa sketchy to serve as adequate National Environmental Policy Act documentation. One what information other than public comments will be considered in EIS decisionmakin commentors indicate that the EIS is not specific enough for adequate assessment of impacts to the environment. One commentor states that the EIS does not discuss pro

RESPONSE

This EIS was prepared as a programmatic document dealing with the nationwide manage Volume 1, and sitewide environmental restoration and waste management and SNF manag at INEL in Volume 2.

Because of the wide-ranging types and quantity of DOE SNF, DOE determined it prude alternatives for SNF management across the entire DOE complex; thus, a programmatic determination was based, in part, on avoiding possible "improper segmentation," as implementing regulations at 40 CFR 1508.25 (a). Each proposed action contemplated i and other relevant information, as necessary, to assess all impacts, including cumu for this EIS will be based on the environmental analyses, public comments, the Spen Nuclear Fuel Management Cost Evaluation Report (Draft), and any other information d by decisionmakers, including technical and practical considerations.

Volume 2, Appendix C discusses 49 potential projects to implement INEL SNF manageme environmental restoration programs. Volume 2, Appendix F, and Volume 1, Appendices impacts from processing SNF at INEL.

Volume 1, Chapter 5 and Appendix K, and Volume 2, Chapter 5 summarize the environme all the alternatives considered in this EIS. The analyses show that the environmen proposed alternatives would be small.

II COMMENT

The commentor states that the EIS inadequately addresses alternatives by dismissing locations and seismicity as "Issues Not Discussed in Detail."

RESPONSE

The commentor refers to Volume 1, section 5.2, which is a high-level summation of t analyses in the associated appendices. The section presents environmental conseque alternatives, focusing on the disciplines that may differentiate among sites, have significant impact, or are of general interest to the public. The disciplines not Volume 1 are considered to be issues that are small and do not distinguish among al Nevertheless, these issues are discussed in detail in the appendices and reference responses to comments 02.04 (014) and 02.04 (021) regarding the adequacy of analysi

II COMMENT

The commentor states that the EIS is inadequate and unsatisfactory because it ignor existing deficiencies at the Savannah River Site.

RESPONSE

Environmental impacts associated with past accidents or releases and existing defic
River Site are not within the scope of this EIS except to provide baseline data for
cumulative impacts. However, DOE acknowledges that environmental releases have occ
past activities. DOE's Environmental Management Program is responsible for appropr
releases in accordance with applicable regulations and standards.

II 2.5 Record of Decision

II COMMENT

The commentor states that the burial of radioactive waste, including Navy waste, an
waste percolation ponds must be suspended until the Record of Decision for this EIS

RESPONSE

The EIS process established by NEPA is directed at appropriately considering the en
consequences of proposals for new activities or for alterations of existing activit
current operations may have a bearing on the environmental impacts of proposed new
not require that current operations be shut down until decisions on proposed new ac
published in a ROD.
At present, only low-level radioactive wastes are being buried (disposed of below g
low-level wastes must satisfy waste acceptance criteria specific to the Radioactive
Complex. In addition, the burial of low-level radioactive wastes is an ongoing act
Liquid effluent discharges from INEL site activities are monitored for the presence
constituents and determined suitable for release pursuant to applicable Federal and
As discussed in Volume 2, section 5.8, radiological discharges are no longer made t
Past discharges of radioactivity did not result in exceedance of EPA Primary Drinki
offsite. Also, owing to radioactive decay, the low concentrations of such radionuc
past discharges continue to diminish with time.

II 2.6 Out-of-Scope Issues

II COMMENT

A number of commentors provided input at public hearings, in writing, via exhibits,
telephone line that were not related to either the programmatic management of DOE s
environmental restoration and waste management activities at the Idaho National Eng
or issues considered in this EIS. Some of the comments dealt with such topics as:

- Siting of a bombing range in Idaho or elsewhere
- Movement of "nuclear specialist" trucks to a facility in Hartsville, Tenn
- An unspecified General Electric contract related to uses of nuclear power
- George Orwell's novel "1984" as it relates to safety and ethics
- Right to Work law impacts on trade unions
- United States arms exports to foreign countries
- Rights to peace and worldwide peace
- Maintaining a strong industrial base in Hawaii
- Operations of specific commercial nuclear waste facilities
- The 1948 Declaration of Human Rights

RESPONSE

It is beyond the scope of this EIS to address issues that are not related to either
management of DOE SNF or environmental restoration and waste management activities

those listed above.

II COMMENT

The commentor states that the EIS fails to review alternatives and environmental co production side of the spent nuclear fuel issue, such as the continued use of nucle violating the National Environmental Policy Act .

RESPONSE

This EIS considers management of DOE SNF pending ultimate disposition. DOE believe this EIS are adequate to support a decision on this subject.

II COMMENT

The commentor objects to "spent fuel" not being called "high-level nuclear waste" i at scoping hearings for the EIS entitled Proposed Nuclear Weapons Nonproliferation Foreign Reactor Spent Nuclear Fuel.

RESPONSE

Congress established the definitions of various categories of radioactive material Policy Act of 1982, as amended. Section 2 of the Act defines SNF as fuel that has nuclear reactor following irradiation, the constituent elements of which have not b reprocessing. The definitions in the Act place SNF in its own category and disting and low-level waste.

II COMMENT

The commentor asks DOE to delegate authority to some competent people who can come deal with nuclear waste in a safe, reliable manner.

RESPONSE

DOE is committed to comply with all applicable Federal and state laws and regulatio interagency agreements governing SNF and radioactive and hazardous wastes and is re managing these materials. The delegation of authority or appointment of independen beyond the scope of this EIS.

II COMMENT

The commentor asks how or whether the full range of impacts was considered when DOE the Idaho National Engineering Laboratory, the Hanford Site, and the Savannah River 40 years ago. The commentor points out that the National Environmental Policy Act then.

RESPONSE

The National Environmental Policy Act of 1969 did not exist when activities were in predecessors at the three sites mentioned. The basis for previous and remote-in-ti Federal Government to select these locations for siting existing activities is beyo

II COMMENT

The commentor expresses the opinion that the costs of commercial nuclear power plan beyond financial to include the environmental risks posed by reactor operations and The commentor cites as examples the accidents at Chernobyl and Three Mile Island.

RESPONSE

This EIS is limited in scope to DOE SNF. Neither operation and environmental risks commercial nuclear power plants are evaluated in the EIS.

II COMMENT

The commentor contends that cladding on nuclear fuel rods used in U.S. nuclear powe and that the Nuclear Regulatory Commission has done little to prevent potentially f from being used in the United States and abroad.

RESPONSE

This EIS is limited in scope to DOE SNF. The condition of fuels in use in nuclear research reactors is not evaluated in the EIS.

II COMMENT

The commentor suggests that a cost evaluation report of nuclear ships be performed cleanup be included in the EIS cost evaluation.

RESPONSE

Decisions on whether to operate nuclear-powered Naval vessels and the number of suc by Congress and the President and are beyond the scope of this EIS. DOE prepared a report that describes costs associated with the alternatives for SNF management. A evaluation report is in Volume 1, section 3.3.6. See also the responses to comment 08.04 (002).

II COMMENT

The commentor requests that the EIS include an inventory of hazardous and radioacti generated, and leaked to the environment over the years at the Idaho National Engin

RESPONSE

A total inventory of INEL hazardous and radioactive materials used or generated, an

environmental releases are not within the scope of this EIS, except as they may rel the existing site conditions, cumulative impacts, and current or proposed waste man example, Volume 2, section 4.8 includes a discussion of existing water-quality cond River Plain aquifer. Cleanup of contamination from past releases is addressed at I

II COMMENT

The commentor indicates that DOE budgets lack life-cycle costs such as those that w Federal domestic budgets under proposed House Bill HR3870.

RESPONSE

The sources, appropriations, and accounting for fiscal and other resources to suppo Federal Government are determined by Congress and are beyond the scope of this EIS.

II COMMENT

The commentor provides a fact sheet that addresses topics and issues that are only entitled Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Resear Spent Nuclear Fuel.

RESPONSE

While this EIS includes potential future management of foreign research reactor spe cumulative impact analyses, the topic of DOE policy for managing this fuel is outsi

II COMMENT

The commentor raises issues related to the Centers for Disease Control and Preventi study currently under way at the Idaho National Engineering Laboratory.

RESPONSE

Issues related to the Centers for Disease Control and Prevention (CDC) dose reconst beyond the scope of this EIS. However, DOE and the Navy are cooperating with the C the study.

II COMMENT

The commentor is of the opinion that DOE made a political decision to characterize Mountain Site for geologic disposal, rather than all three original sites.

RESPONSE

The decision to characterize only the Yucca Mountain site was made by Congress as p Nuclear Waste Policy Act, and is beyond the scope of this EIS.

II COMMENT

The commentor contends that some facilities have been closed due to noncompliance w regulations.

RESPONSE

The facility closures mentioned by the commentor resulted from a change in DOE's mi needs relative to these sites, not environmental noncompliance. Facility closures this EIS. See also the response to comment 03.08 (011).

II COMMENT

The commentor raises the issue that the EIS does not address the potential impacts foreign research reactor spent nuclear fuel to the United States.

RESPONSE

The ocean-going portion of FRR SNF shipments and a detailed evaluation of port acti addressed in this EIS. Alternatives for managing FRR SNF, including shipping acros are being analyzed in a separate EIS entitled Proposed Nuclear Weapons Nonprolifera Concerning Foreign Research Reactor SNF (Draft). This EIS addresses domestic tran management of FRR SNF if it is returned to the United States. DOE will not make a policy regarding FRR SNF until that EIS and this EIS are both completed.

II COMMENT

The commentor expresses the opinion that the benefits derived from nuclear technolo waste and "destruction," and that nuclear reactors and weapons have not improved ou

RESPONSE

The net benefit of nuclear technology, reactors, and weapons is not within the scop does, however, address alternatives for safely managing DOE SNF over the next 40 ye

II COMMENT

The commentor states that this EIS does not address commercial spent nuclear fuel, to less than optimum decisions and no national policy.

RESPONSE

FRR SNF is included in the EIS in the event that DOE decides to accept such fuel af EIS entitled Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Re SNF (Draft) (FRR EIS). A discussion of the relationship between this EIS and the F Volume 1, section 1.2.4. See also the response to comment 02.02 (002).
Regarding commercial SNF, DOE manages only a very limited quantity of special case which is addressed in this EIS. It is inappropriate to consider commercial SNF, in

because this material is not managed by DOE. Under the Nuclear Waste Policy Act, a responsible for managing the program for development of geologic repositories for p SNF and high-level radioactive waste. A separate EIS is required under this Act to repository site recommendation to the President.

II COMMENT

The commentor requests that best fuel cladding and fuel design be added to the EIS.

RESPONSE

Although the details of the design and fabrication of fuel elements and assemblies, requirements for specific cladding materials, are outside the scope of this EIS, th consideration in the management of SNF. A discussion of the various types of fuel management issues associated with them is in Volume 1, Appendix J.

II COMMENT

The commentor recommends that DOE prepare an overall programmatic EIS to evaluate t associated with all EISs evaluating radioactive waste, weapons dismantlement, and t of all this transportation.

RESPONSE

Evaluating all nuclear waste issues at a programmatic level is beyond the scope of DOE currently has a range of NEPA reviews planned or under way. Volume 1, section more fully explain the interrelationships of these reviews. Further, in the transp analysis in this EIS, DOE considered the impacts of past, present, and reasonably f including other DOE and non-DOE radiological shipments.

II COMMENT

The commentor is of the opinion that radioactive wastes should remain under guard a locations, and that the U.S. should assist Russia with waste management.

RESPONSE

The disposition of special nuclear material, such as plutonium, and assistance to R scope of this EIS.

II COMMENT

The commentor raises issues about activities and/or mishaps unrelated to the propos

RESPONSE

Although these issues are out of the scope, it is a matter of DOE policy to monitor and implement precautions as necessary to preclude like occurrences in the DOE's pr

II COMMENT

The commentor favors keeping foreign spent nuclear fuel out of the United States.

RESPONSE

Alternatives related to the DOE policy on management of SNF of United States origin research reactors are being analyzed in a separate EIS and are outside the scope of analyze the impacts of transporting and managing FRR SNF (less than 1 percent of al in this EIS) if there is a decision to accept such fuel. This effectively bounds t foreseeable management of the SNF under consideration. DOE will not make a final d policy regarding FRR SNF until the EIS entitled Proposed Nuclear Weapons Nonprolife Concerning Foreign Research Reactor Spent Nuclear Fuel and this EIS are completed.0

COMMENT

The commentor recommends zero discharge of persistent toxic chemicals and radionucl recommended by an international joint convention in a report on Great Lakes water q

RESPONSE

DOE waste management policies and practices embrace numerous laws and regulations g hazardous and radioactive wastes. A comprehensive list of these requirements is pr Chapter 7; associated environmental permits are also discussed there. Current mana radioactive waste are described in Volume 2, section 2.2.7 (which is specific to IN applies to wastes at other DOE sites). DOE is committed to comply with all applica local regulations and DOE Orders. All radioactive materials will be managed to pro and the health and safety of the public and site employees. As discussed in Volume proposed alternatives would have minor impacts on water resources, but the differen distinguish among the alternatives. DOE also has
adopted a policy emphasizing waste minimization and avoidance, as discussed in Volu and 2. Most new radioactive waste will be created during cleanup activities and de contaminated facilities that no longer serve essential national missions.

II COMMENT

The commentor provides suggestions for additional options for transporting and stor

RESPONSE

DOE complex-wide decisions on handling low-level and high-level wastes are being ad Management Programmatic EIS and are outside the scope of this EIS.

II COMMENT

A commentor asks DOE to support legislation before Congress that would stop the exp materials. The commentor states that we in this country could bring back fuels from as a final shipment as part of decommissioning all the research reactors. A commen U.S. plans to continue sending fuel to foreign countries, and whether the spent nuc

back.

RESPONSE

Proposals regarding the exportation of fissile materials, reactor fuels, or other n the scope of this EIS. Alternatives for managing FRR SNF are being analyzed in a s Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reacto Nuclear Fuel (Draft).

II COMMENT

The commentor states that low-level radioactivity disposal sites for nongovernment established and suggests that DOE headquarters has not done enough to expedite tran Valley site to the State of California, which shows lack of concern.

RESPONSE

The establishment of low-level waste disposal sites for nongovernment waste is not EIS.

II COMMENT

The commentor states that DOE does not give the No Action alternative the detailed deserves concerning receipt of foreign research reactor fuel.

RESPONSE

Volume 1 analyzes the transportation impacts for a reasonable range of alternatives DOE SNF in the continental United States, including the No Action alternative. Dec policy on management of FRR SNF are is beyond the scope of this EIS. A DOE EIS in Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reacto Nuclear Fuel, (Draft) analyzes the potential for return of FRR SNF to the continent

II 2.7 Hearings

II COMMENT

Commentors state that DOE did not adequately seek public involvement in the process include inadequate availability and comment time for the EIS and too few and insuff meetings.

RESPONSE

In accordance with CEQ regulations, a Notice of Opportunity to comment on the prepa DOE Programmatic SNF Management and Environmental Restoration and Waste Management was published in the Federal Register on September 3, 1993. Numerous individuals a letters, either asking questions or raising issues related to the EIS. Each of the DOE, with information provided as requested.
An Implementation Plan was prepared and released to the public on October 29, 1993;

version was available on May 9, 1994. DOE published a Notice of Availability in th June 24, 1994, to announce the availability of the Draft EIS. The Draft EIS was of available at 64 public libraries and information locations, was delivered to all wh sent to all state and Federal agencies, organizations, and individuals who were bel interested in the subject. Public comments were solicited and written comments we through September 1994, well in excess of the NEPA requirement. Thirty-three publi in 20 locations throughout the country, including 4 locations in Idaho, and comment these hearings, through the mail, and through a toll-free telephone line, which acc orally and by facsimile. Notices of the dates, times, and locations of the public the Federal Register on June 24, 1994. In addition, advertisements were placed in to the meetings. Numerous additional information briefings were also provided to o individuals. In a special effort to involve communities not previously involved, advertisements for the hearings in alternative newspapers, in Spanish-language news DOE conscientiously and thoroughly fulfilled its responsibilities to use available awareness and for solicitation of public input during all stages of the EIS. Never seek ways to improve public involvement and will use the comments in developing imp involvement for future EISs.

II COMMENT

Commentors requested public hearings in Seattle as a potentially affected site.

RESPONSE

Public hearings were held in Seattle and Bremerton, Washington, on July 26, 1994.

II COMMENT

Several commentors described difficulties with registering to make formal comments public meeting, and suggest that DOE manipulated the system to limit the number of

RESPONSE

Standard practice for operating the toll-free telephone lines was to close them at meeting. Prior to the Twin Falls meeting, however, a power outage caused the telep day before the meeting and backup systems failed to bring them back on line. When t lines discovered the problem, they decided to keep the lines open until 5:00 p.m., office and several major stakeholder offices in the Twin Falls area of this time ex several people tried to register during the afternoon and were frustrated when anot temporarily disrupted service. This disruption was brief.

Public hearings around the country were scheduled to fall within the 90-day comment locations in Idaho were used for public hearings. This allowed some people to atte provide written or oral comments later in the comment period, either using the toll by mailing comments. Using this approach, all persons who wanted to comment were g to do so, even if they did not do so at public hearings.

II COMMENT

The Town of Hilton Head, South Carolina, notes and congratulates DOE on the large e employed by DOE on its "most thorough" public involvement program.

RESPONSE

The comment is noted.

II COMMENT

The commentor questions whether the number of meetings and "plethora" of written in presented to the public at DOE sites could be consolidated.

RESPONSE

DOE attempts to coordinate and consolidate information presented and meetings sched public, at both the national and individual site levels. DOE recognizes the need f underinvolving and overburdening its stakeholders in soliciting input from the publ decisions, and must balance that against its legal obligations under the NEPA and o statutes.

II COMMENT

Commentors state that the process of adding the Oak Ridge Reservation as a potentia management location was flawed.

RESPONSE

On October 22, 1990, DOE published a Notice of Intent in the Federal Register annou prepare an EIS addressing environmental restoration and waste management, including management activities, across the entire DOE complex. DOE invited the public to su comments on the scope of the EIS, and held 23 scoping meetings across the country, Ridge, Tennessee, on December 11, 1990. Two hundred and thirty-seven comments were Oak Ridge meeting. DOE issued a Draft Implementation Plan in January 1992, reflect provided. DOE held six regional public workshops on the Draft Implementation Plan comments given at these workshops. The Implementation Plan for this EIS, issued in addressed the comments received from scoping meetings and regional workshops. DOE public scoping periods during the evolution of the EIS. In response to public comm scoping process, DOE undertook a process for identifying possible additional altern selection process included and evaluated two additional sites, including the Oak Ri selection process is summarized in the May 9, 1994, amendment to the EIS Implementa Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Laboratory Environmental Restoration and Waste Management Programs. DOE believes i conscientiously and thoroughly fulfilled its responsibilities to use available aven and for solicitation of public input during all stages of the EIS process, and that obligations and responsibilities in accordance with the NEPA.

II COMMENT

The commentor states that insufficient notification was given for the public to bec activities associated with the EIS.

RESPONSE

DOE has an active stakeholder involvement process, which strives to include represe of the public.
In accordance with CEQ regulations, a Notice of Opportunity was published in the Fe

September 3, 1993, to comment on preparation of an EIS on DOE programmatic SNF mana SNF management, environmental restoration, waste management at INEL. DOE received from individuals and organizations, either asking questions or raising issues relat these letters was answered by DOE, with information provided as requested. An Impl prepared and released to the public on October 29, 1993; the final version was ava A Notice of Availability was published in the Federal Register on June 24, 1994, to availability of the Draft EIS. The Draft EIS was offered on request and was availa and information locations. The Draft EIS was delivered to all who requested it, an and Federal agencies, organizations, and individuals who were believed likely to be subject. Public comments were solicited and written comments were received from J September, 1994, well in excess of the NEPA requirement. Thirty-three public heari locations throughout the country, including 4 locations in Idaho, and comments were hearings, through the mail, and through a toll-free telephone line, which accepted and by facsimile. Notice of the dates, times, and locations of the public hearings Federal Register on June 24, 1994. In addition, advertisements were placed in loca the meetings. Numerous additional information briefings were provided to organizat In a special effort to involve communities not previously involved, DOE advertised alternative newspapers, in Spanish-language newspapers; and on Spanish-language rad had available Spanish-language translators for the meetings in Idaho. DOE conscien fulfilled its responsibilities to use available avenues for public awareness and fo input during all stages of the EIS process. Nevertheless, DOE continues to seek wa involvement process and will use the comments in developing improved public involve future EISs.

II COMMENT

A number of commentors state that the public meetings, particularly in Seattle, wer weekday when most people were at work, and that the meetings were over controlled a time.

RESPONSE

DOE held 33 separate meetings in 20 different locations during the 90-day comment p necessity, some meetings were in the afternoon some were in the evening. The lengt answer sessions varied depending on the level of interest by the local meeting atte sessions were rather long, provisions were in place, and frequently announced durin meetings, to take oral comments from any interested citizen at any time the meeting this arrangement for oral comment, plus the opportunity to provide comments over a line and mail in comments, DOE believes all persons who wished to comment were acco the public comment period.

II COMMENT

The commentor, who lives in Georgia, wishes to work with DOE in a positive way that than the public meetings.

RESPONSE

The commentor is referred to the Office External Affairs at (803) 725-2889 at the S

II COMMENT

The commentor hopes that DOE will remember the comments made by elected officials a Georgia, public hearing.

RESPONSE

All written and oral comments received during the public comment process, regardles carefully reviewed and considered by DOE in its preparation of the EIS and in its d for identification of a preferred alternative for SNF management.

II 2.8 Miscellaneous

II COMMENT

Commentors note the opinions of or opinions regarding others, the media, various el various articles not of DOE or Navy authorship.

RESPONSE

It is inappropriate for DOE to address comments regarding the opinions of non-DOE o or articles not of DOE or Navy authorship.

II COMMENT

Commentors state that some comments were not considered, some comments were ignored comments were given more weight than others in the analysis. Other commentors note wants direct input into the decisionmaking process and hope that DOE addresses all

RESPONSE

All written and oral comments received during the public comment process, regardles carefully reviewed and considered by DOE in its preparation of the EIS and in its d for identification of a preferred alternative for SNF management.

II COMMENT

The commentor is of the opinion that additional EISs should be prepared for every p of nuclear waste because of the uniqueness of potential environmental consequences

RESPONSE

Volume 1, Appendices D and I analyze in detail the environmental consequences of of and cover the impacts of any particular shipment or combination of shipments for an Therefore, separate EISs for individual shipments covered by the proposed action of considered unnecessary. Ongoing activities that are an integral part of the propose the overall action, as allowed by NEPA. The cumulative risks predicted from all t during the 10-year period for shipments of radioactive wastes and the 40-year perio are analyzed in Volumes 1 and 2, Chapter 5, respectively. Under all proposed alter be small.

II COMMENT

The commentor requests that a separate written comment period be provided after the
is selected.

RESPONSE

Under NEPA and its implementing regulations and guidelines, it is permissible to de
a preferred alternative to the Final EIS. DOE elected to do this after it had an o
public input as a part of its process for identifying a preferred alternative. An a
period would be very time consuming and is not permitted under DOE's very rigorous
from an agreement between DOE, the Navy, and the State of Idaho. In addition, NEPA
any additional public comment period when a Final EIS is released, unless new alter
proposed that were not previously considered in the Draft EIS. DOE's preferred alt
range of the alternatives addressed in the Draft EIS. Nevertheless, the ROD will n
30-day waiting period following the issuance of the Final EIS. 02.08 (007) Miscella

COMMENT

The commentor states that the Navy's identification of a preferred alternative for
nuclear fuel will have more influence on DOE's decision than will public input.

RESPONSE

DOE considered all pertinent information in identifying a preferred alternative.

II COMMENT

The commentor suggests that the EIS is based on the assumption that spent fuel must
then drives the rest of the discussion as to where DOE would like to put its spent

RESPONSE

Two of the five alternatives described in Volume 1, Chapter 3 -- the No Action alte
Decentralization alternative -- are based on minimizing the movement of SNF, consis
safe storage and the existence of adequate storage capacity.

II COMMENT

A number of commentors requested that they be placed or kept on the mailing list fo
documents to the EIS.

RESPONSE

DOE placed these names on the mailing list.

II COMMENT

The commentor suggests that making cost data available after the close of the comme

(particularly with regard to the comparison of alternatives) is likely to diminish public comments and the public's confidence in the Record of Decision.

RESPONSE

DOE recognizes that several commentors requested estimated implementation costs for alternatives in this EIS. Volume 1, section 3.3 was added to this EIS to address t data for this section was extracted from the SNF Management Cost Evaluation Report not limited to this EIS, but contains information pertinent to other management dec evaluation report is available to the public in the EIS reading rooms. The Assumpt Document for Spent Nuclear Fuel Cost Evaluation, which was the starting point for d evaluation report, was released for public review and comments were received.

II COMMENT

One commentor asked to meet face to face with DOE officials. When the meeting did individual was offended by the DOE "rudeness" and expressed deep concern over DOE's situation and the apparent lack of concern of DOE officials for the general public.

RESPONSE

DOE regrets that its treatment of this individual was perceived as offensive and ru intention was to be as responsive as possible. DOE replied with two letters to thi explained the details surrounding the situation and expressed regret over the perce developed.

All comments, written and oral, received during the public comment period have been and considered by DOE in its preparation of the EIS and responded to if they were w EIS.

II COMMENT

The commentor states that all public testimony at Idaho hearings on the reconfigura management EIS must be included in the current EIS comments.

RESPONSE

Neither NEPA nor its implementing regulations and guidelines require the inclusion in one programmatic EIS from other, even related, programmatic EISs or related acti EIS considers SNF management, and two other EISs cited by the commentor do not, wai including those other comments would not only result in a delay that would violate would take those comments out of context and be confusing.

II COMMENT

The commentor states that the failure to identify DOE's proposed action and the alt environmental restoration and waste management at the Idaho National Engineering La fundamental flaw under the National Environmental Policy Act.

RESPONSE

The proposed action is stated in the Volume 1, Chapter 2 and Volume 2, Chapter 1 an Volume 1, sections 1 and 2 and Volume 2, section 2. Environmental restoration acti under the Federal Facility Agreement and Consent Order for INEL. This document is public.
See also the response to comment 04.02 (001).

II COMMENT

The commentor states that the decision on processing sodium waste might get lost in issues and not receive adequate public review.

RESPONSE

DOE has already conducted four public scoping periods. Comments from scoping meeti summarized in DOE's Implementation Plan for this EIS, published October 29, 1993. comments submitted on the Implementation Plan during development of the EIS. DOE s comments, of which this is one, from the public on the EIS. DOE has used these com development of the Final EIS. The issues raised by the commentor as issues that mi public review are described in several places within the EIS. Sodium-bearing waste locations throughout this EIS: (1) Volume 2, section 3.1.3.1 describes the alterna of sodium-bearing wastes; and (3) the technology selection for treatment of sodium- wastes is discussed in Volume 2, Appendix C under "Projects Related to High Level W Immobilization Facility." Reference materials, including extensive technical studi the reading rooms and information locations identified in the EIS. While this EIS selecting a technology to be further developed for processing sodium waste and a te calcine, facilities for implementing the technologies will require additional NEPA facilities become more firmly developed. Both the future NEPA actions and the perm additional opportunity for public comment. DOE follows NEPA guidelines for public believes that there is sufficient opportunity for the public to comment on issues.

II COMMENT

The commentor challenges DOE to seriously consider the comments and revise the docu

RESPONSE

DOE considered all comments submitted through public hearings or by telephone, facs examined and responded to each comment, and revised the EIS, as appropriate in resp

II COMMENT

The commentor requests a copy of the responses to comments submitted by the Shoshon and expresses support for their comments.

RESPONSE

Responses to all public comments on the Draft EIS are provided in this Volume of t

II COMMENT

The commentor states that the public is being misled by the National Environmental that "things" are going through the private sector unbeknownst to the public.

RESPONSE

This EIS presents the environmental impacts of several reasonable alternatives avai DOE SNF. Implementation of some specific aspects of SNF management may be privatiz potential research and development activities; however, there are no discussions un prejudice a decision on SNF management or that would be of any interest to the publ this EIS.

II COMMENT

Commentors suggest that the cost of preparing this EIS was too high.

RESPONSE

Preparation of this EIS is required by the provisions of NEPA. The entire NEPA pro costly, is expected to benefit the public because it provides information and the DOE's decision-making process. The NEPA process benefits the public and the govern the basis for making informed decisions, while minimizing the impact of Federal act environment.

II COMMENT

The commentor asserts that DOE failed to consult with the Shoshone-Bannock Tribes' responsible for air quality during preparation of the EIS, and that DOE must do so the EIS.

RESPONSE

DOE and the Navy consulted on this subject and others with the Tribes during prepar Final EIS. DOE consulted further with the Tribes as part of the process of address the Draft EIS. Discussions included air quality concerns.

II COMMENT

The commentor expresses the opinion that DOE halted reprocessing of highly enriched without proper National Environmental Policy Act documentation.

RESPONSE

Historically, DOE produced large numbers of nuclear weapons using material from rep also used highly enriched uranium recovered from SNF to make new fuel. However, du reduction in the need for these recovered materials, DOE, in a memorandum dated Apr Phaseout of Reprocessing, decided to phase out reprocessing of highly enriched uran SRS. This decision was based on the reduced need for products, and did not require decision to discontinue an activity because of lack of need did not, by itself, tri NEPA, because there was no new proposed action. Although a NEPA review was not nee

old mission, a NEPA review would be needed to use the reprocessing facilities for a using recovered uranium for nuclear power production, as suggested by the commentor proposed such a new mission.

II COMMENT

The commentor expresses the opinion that the EIS Summary is biased toward the Idaho Engineering Laboratory, at the expense of other options.

RESPONSE

DOE manages wide-ranging types and a significant quantity of SNF at INEL. Therefor discuss SNF management across the DOE complex in the same EIS as INEL activities f management and for environmental restoration. The second half of the Summary addre is, therefore, devoted to INEL. In the first half, the three DOE sites that have c management activities (INEL, Hanford, and the SRS) plus two additional sites (the O evaluated on a common basis. This evaluation is appropriate for a programmatic EIS The DOE Operations Office at each of the candidate site participated in preparing a for the site. The evaluation of SNF alternatives reflects the policy and viewpoint

II COMMENT

The commentor asks for an explanation of the scientific notation used (e.g., 1.3E-0

RESPONSE

The notation is computer-based and is a simplified method of writing out the full m a number taken to the appropriate decimal places. In the example above, the actual or 1.3 x 10 to the minus sixth power (1.3 divided by 1 million). Similarly, 0.13 i 1.3E-02, etc. A brief description of scientific notation was added to the Glossary

II COMMENT

The commentor states that the term "possible unavoidable" adverse impacts, as used Appendix E, Chapter 6 for the No Action alternative, is a contradiction. The comme research reactor shutdowns and the resulting losses of jobs are avoidable if sites on-site storage of spent nuclear fuel.

RESPONSE

An editorial change was made to the EIS to clarify and change "possible unavoidable be unavoidable." Under the No Action alternative, which is a required baseline und additional actions are not considered. For DOE reactors (Volume 1, Appendix E, sec Decentralization alternative is the same as the No Action alternative, so such site storage. For non-DOE NRC-licensed domestic research reactors, DOE has title to the responsible for interim storage and ultimate disposition of the fuel (Volume 1, App Except for one minor commercial contributor, facilities with limited existing stora universities or government installations (Volume 1, Appendix E, Table 2.1-2).

II COMMENT

The commentor states that DOE failed to recognize the special relationship between Federal Government during the development of the EIS.

RESPONSE

A number of laws pertain to the treatment of Native American concerns. In particul Historic Preservation Act of 1966 provides for the development of a programmatic ag Federal agencies to comply with the law for large projects. DOE acknowledges in Vo Chapter 5 that potential impacts to cultural resources of value to Native Americans hunting and gathering areas, will be determined in consultation with the affected N This is commonly ensured through Memoranda of Agreement involving the groups concer responsible agencies, such as State Historic Preservation Offices. A number of the developed or are in place, as described in Volumes 1 and 2, Chapter 5.
Details on the existing resources and the potential impacts associated with the alt Appendices A through F for specific sites. Although the major DOE sites have not b completely, the locations for the construction of proposed new facilities have gene their cultural importance. No known cultural resources would be affected by constr the alternatives. Potential impacts were assessed by identifying project activitie expected resources at each potential site. Because some projects are not yet fully impacts cannot be completely characterized. However, for any alternative, DOE woul preconstruction surveys and would consult with the State Historic Preservation Offi American groups before any undertaking to determine appropriate measures to minimiz DOE has pursued additional consultation with the affected Native American groups re and will continue consultations as appropriate.

II COMMENT

The commentor notes that the arrows indicating uranium and zircaloy are reversed in page 5 of the EIS Summary.

RESPONSE

The figure was corrected.

II COMMENT

The commentor suggests that Native American concerns are being ignored, and DOE nee concerns of the Shoshone-Bannock Tribes in a separate section because the Shoshone- a sovereign nation with treaty rights to unoccupied lands adjacent to the Idaho Nat Laboratory.

RESPONSE

The Fort Bridger Treaty of 1869 is an agreement between the Eastern Band Shoshone a Tribes, and the United States. It was signed in 1868 in Utah, and ratified and pro the United States and the Tribes pledged their honor to keep and maintain a peace. fixed boundaries to land that would be considered "set apart for the absolute and u occupation of the Shoshone Indians herein named, and for such other friendly tribes as from time to time they may be willing...to admit amongst them..." It is undispu distant past, the Shoshone Indian Tribe was a nomadic nation that roamed over a ran million acres that included portions of Wyoming, Colorado, Utah, Idaho, and Nevada. area may have included land upon which INEL sits, but by signing the Fort Bridger T Tribes relinquished rights to all but that area specifically designated in the tre

the treaty: "...the territory described in this article for the use of said Indian do hereby relinquish all title, claims, or rights in and to any portion of the terr except such as is embraced within the limits aforesaid." This was affirmed by the Court in the case Northwestern Bands of Shoshone Indians v. United States, 324 U.S. INEL site does not lie within any of the land boundaries established by the Fort Br Furthermore, the entire INEL site is occupied by DOE, and therefore the provision o allows the Shoshone-Bannock Tribes the right to hunt on the unoccupied lands of the to any land upon which INEL sits.
DOE currently manages INEL in a way that does not conflict with any of the provisio Bridger Treaty of 1869. To the extent that the Tribes' concerns involve considerat justice, these concerns are addressed in Volume I, Appendix L and Volume 2, section

II COMMENT

The commentor states that the EIS will be deficient unless DOE carries through with consult with the Shoshone-Bannock Tribes as it plans future actions, particularly w actions that could have impacts on the Idaho National Engineering Laboratory, surro Fort Hall Reservation.

RESPONSE

DOE recognizes the value of consulting with other agencies and with the Tribes when understand and address any concerns raised by the agencies or Tribes. DOE recogniz and the Tribes possess special expertise in areas related to activities analyzed in the Shoshone-Bannock Tribes, DOE has established a program of meaningful consultati to support future DOE actions and to gain the benefit of special expertise. Meetin with managers or technical experts of both entities to assure that the Tribes' conc used to evaluate proposed activities. DOE continues to work with the Tribes to res concerns.

II COMMENT

The commentor corrects a reference (typographical error) and requests that another referenced.

RESPONSE

The typographical error was corrected. The contract number now reads "AT(04-3)-633 reference is a subtier reference to the Environmental Assessment for the Retrieval Transuranic Storage Area Waste, which is referenced in the EIS.

II COMMENT

The commentor asserts that sanity and ethics have been left out of this EIS.

RESPONSE

The provisions of NEPA and CEQ regulations require that an EIS consider the effects actions on the human environment. This includes an analysis of economic and social and 2, Chapter 5 both discuss these impacts. In addition, Volume 1, Appendix L, de environmental justice concerns, addresses questions of impacts to the human environ comments were seriously considered in writing the EIS.

II COMMENT

The commentor states that the Waste Management Programmatic EIS should be available in conjunction with this EIS, and suggests that DOE is sequestering this informatio

RESPONSE

Litigation resulted in a very rigorous schedule that required DOE to develop and re Waste Management Programmatic EIS is completed. Writers and analysts worked with t the Waste Management Programmatic EIS to achieve consistency to the extent possible

II COMMENT

The commentor states the EIS was unnecessary because implementation of any alternat additional, site-specific EISs. The commentor suggests that a less expensive and s alternatives would have been preferable to this EIS.

RESPONSE

NEPA, 42 USC Section 4321 et seq. and the CEQ regulations at 40 CFR 1500 et seq. es standards that DOE followed to prepare a programmatic EIS to identify and evaluate impacts of the proposed action and reasonable alternatives for SNF management acros complex. These regulations require that an EIS describe the purpose and need for t alternatives, including no action; the affected environment; and the environmental with the proposed action and alternatives. Volumes 1 and 2 of this EIS meet these volume, Chapter 2 describes the purpose and need for the proposed action; Chapter 3 alternatives being considered; Chapter 4 describes the affected environment; and Ch environmental consequences.

Input was solicited from the public during a 90-day public comment period, which al send written comments, give oral comments and send facsimile comments over a toll-f attend one or more of the 33 public hearings held in 20 locations around the United analyzing the costs of the alternatives, DOE prepared a cost report, which is avail decisionmakers.

All supporting documents referenced in the EIS are on file and are available to the considers issues of concern raised during public meetings and hearings.

II COMMENT

The commentor states that there was a push to publish this EIS before the cost info and that cost information should be available for the public to review.

RESPONSE

At the time the Draft EIS was published, a cost evaluation had been initiated. In a report, Assumptions and Methodology Document for the Spent Nuclear Fuel Managemen Evaluation, and requested a 45-day public comment period. Comments were received a into the cost evaluation report. A summary of the cost report has been added to th section 3.3.6.

II COMMENT

The commentor states that it is difficult to determine impacts of specific actions
fuel, particularly those related to shipping Fort St. Vrain fuel.

RESPONSE

This EIS considers management of DOE SNF pending ultimate disposition. DOE believe
this EIS are adequate to support a decision on this subject. The outline for the d
guidelines established by the CEQ under NEPA. Because the thrust of a programmatic
from a site-specific EIS, the information on specific actions does appear in differ
To adequately summarize the existing environment for all the separate sites include
expanding an already large and complex document means descriptions of specific faci
(such as Fort St. Vrain) must be condensed. The EIS is also tiered, with increasin
detail provided in appendices and supporting references.
A user's guide was provided with the EIS to help readers determine impacts under th
See also the response to comment 02.04 (046).

II COMMENT

The commentor states that the EIS is broadly written and that more detailed documen
National Environmental Policy Act will be required as the national spent nuclear fu

RESPONSE

DOE acknowledges that additional NEPA reviews may be required to implement decision
EIS.

II COMMENT

The commentor suggests that the activities proposed for the Idaho National Engineer
sort of major Federal actions that require a programmatic EIS.

RESPONSE

SNF management activities that could involve INEL are part of the programmatic anal
Waste management and environmental restoration projects specific to INEL are descri
Cumulative impacts are discussed in Volume 2, section 5.5. Activities analyzed in
broad, policy-related decisions that they require programmatic documentation to ass
agency planning.

II COMMENT

The commentor cites a court finding of DOE's reluctance to perform full National En
Act analysis in the preparation of an environmental assessment regarding the shipme
nuclear materials to the Idaho National Engineering Laboratory. The commentor addi
the independence of DOE's consultant in its finding of no significant impacts becau
directed by DOE to prepare the finding of no significant impact prior to completion
Assessment.

RESPONSE

This EIS addresses this and other issues identified by the Court.

II COMMENT

The commentor supports the DOE activities and the hearing process at various locati operations at the Hanford Site, and states the hope that the Idaho National Enginee continue to operate, because its benefit to Idaho, this nation, and the world is in

RESPONSE

The comments are noted.

II COMMENT

The commentor states that DOE and the Department of Defense have a negotiated posit the standards, measures, mission, and funding for which they are responsible.

RESPONSE

The priorities for activities and programs of the Federal Government are determined President, who are the elected representatives of the people. Future funding to su management program will be established by Congress as part of the annual DOE budget

II COMMENT

The commentor indicates that whatever it takes in a nonviolent and direct way to "s done, as evidenced in the past.

RESPONSE

The comment is noted.

II COMMENT

The commentor questions the value of preparing an EIS at considerable cost, versus research and development of alternative energy sources.

RESPONSE

The proposed actions related to research and development of alternative energy sour scope of this EIS.

II COMMENT

The commentor wants more information about the relationships between Volumes 1, 2,

National Engineering Laboratory land use plan.

RESPONSE

The Summary, page 39, describes the relationship between Volumes 1 and 2. Volume 2 explains the relationship between this EIS and other applicable National Environmen documents. Volume 2, section 5.2 discusses the impacts to and consequences of land Although there is no single document that describes all of these relationships, Vol coordinated with and reviewed by those writing INEL Long-Term Land-Use Future Scena

II COMMENT

The commentor indicates that the EIS gives a big picture of DOE spent nuclear fuel operations.

RESPONSE

This EIS is intended to address the national management of DOE SNF.

II COMMENT

The commentor expresses the desire that there be interaction with modeling efforts Management Programmatic EIS.

RESPONSE

Writers and analysts of this EIS worked with those developing the Waste Management to achieve consistency wherever possible.

II COMMENT

The commentor suggests that radioactivity source terms and other input parameters f in a separate appendix.

RESPONSE

The purpose of Volume 1 of this EIS is to compare potential environmental impacts f across the various sites addressed in the volume. The EIS is tiered with respect t information. The Summary is intended to present the information in a manner that w understandable to nontechnical persons. For this reason, the results of each impac and in the summary to Volume 1. The appendices are organized to present more techn information on each site. All of the information requested by the commentor is ava appendices or in the references provided therein. Providing additional appendices technical information on each area of analysis would be duplicative and not in keep and structure of the EIS.

II COMMENT

The commentor suggests that DOE could reduce the cost of involving the public in th process by consolidating meetings and informational materials on several different actions.

RESPONSE

DOE encourages time and cost efficiency by combining meetings of like or related to possible. However, actions may arise under different environmental laws, and each of decisions for public consideration and is own timetable driven by many factors, not possible to group them together.
NEPA requires public involvement in the process as an essential element in ensuring decisionmaking and provides for public involvement at two stages: initial scoping Draft EIS.
When several Federal actions at one site are in progress simultaneously, it is some to combine meetings or to share informational materials to reduce costs. DOE does materials available to all sites to assist in planning more cost effectively for p

II COMMENT

The commentor states that the Final EIS must address the actions required to implem Facility Safety Board Recommendation 94-1.

RESPONSE

The Defense Nuclear Facilities Safety Board (DNFSB) issued Recommendation 94-1 on M DOE accepted this on August 31, 1994, and submitted its Implementation Plan on Febr DOE has broadened the original scope of the response to Recommendation 94-1 to incl nuclear weapons materials in the manufacturing pipeline, but also bulk liquids and materials and other radioactive substances from such sources as spent fuel storage reprocessing canyons, processing lines, and various facilities that require modific interim storage conditions.

II COMMENT

The commentor states that the EIS contains extraneous information that goes beyond the National Environmental Policy Act.
The EIS focuses on alternatives for programmatic SNF management and SNF management, restoration, and waste management at INEL. Although voluminous, DOE believes the public and decisionmakers with the necessary and sufficient information to comment decisions.

PAGE TOC FIGURES TABLES PAGE