CHAPTER 3: TRITIUM SUPPLY AND RECYCLING ALTERNATIVES

Chapter 3 provides a detailed description of the tritium supply and recycling alter for meeting the Nation's nuclear weapons stockpile tritium supply requirements. Thi chapter begins with a summary of the development of the alternatives, followed by a description of these alternatives, and concludes with a summary comparison of the environmental impacts of the tritium supply and recycling alternatives.

3.1 Development of Tritium Supply and Recycling Alternatives

Tritium is used in nuclear weapons to enhance their performance and to enable the d and production of smaller and more powerful weapons. Since the United States based design of nuclear weapons on the use of tritium, an assured supply of this isotope necessary to ensure that the Nation's nuclear weapons stockpile is properly manufac and maintained. Tritium has a relatively short radioactive half-life of 12.3 years, decaying at the rate of 5.5percent per year. Because of this radioactive decay, it replenished periodically in nuclear weapons so their effectiveness is preserved. Cu rently, the Nuclear Weapons Complex (Complex) does not have the capability to produ required amounts of tritium; the last tritium was produced in 1988. Without new production, the Nation's supply of tritium will decrease, through radioactive decay the point where the effectiveness of the nuclear weapons stockpile and a cornerston our Nation's defense policy, nuclear deterrence, would be lost.

This Tritium Supply and Recycling Programmatic Environmental Impact Statement (PEIS evaluates the potential direct, indirect, and cumulative environmental impacts associated with alternatives for the siting, construction, and operation of tritium and recycling facilities at each of five candidate sites. Also analyzed is the purc the Department of Energy (DOE) of an existing operating or partially completed comm light water reactor and its conversion to tritium production for defense purposes. Production of tritium using irradiation services contracted from commercial power reactors is also analyzed as a reasonable alternative and as a potential contingenc measure to meet the projected tritium requirements for the Nation's nuclear weapons stockpile in the event of a national emergency. This PEIS assesses the environmenta impacts of a range of reasonable alternatives, including No Action, in sufficient d to allow for meaningful consideration of their comparative merits.

This PEIS evaluates alternative tritium supply technologies against a baseline trit requirement (i.e., a specific quantity of tritium, the exact amount of which is classified). Understanding the concept of the baseline tritium requirement is cruci understanding the alternatives and the analysis in this PEIS. The baseline tritium requirement is the amount necessary to support the Nuclear Weapons Stockpile Plan, is approved by the President as discussed in section 1.1. In this PEIS, the baselin tritium requirement is approximately 3/8ths of the tritium requirement that was ana in the New Production Reactor Draft Environmental Impact Statement (EIS) published April 1991. This is the tritium requirement "baseline" which the tritium supply technologies must support, and against which they are assessed.

This baseline tritium requirement is made up of two specific components: (1) a steady-state tritium requirement to make up for tritium lost through natural decay; (2) a surge tritium requirement to replace any tritium which might be used in the e the Nation ever dipped into, or lost, its tritium reserve. The sizing of the surge capacity is based on the requirement set forth in the Nuclear Weapons Stockpile Pla reconstitute the entire reserve in a 5-year period. The steady-state component acco for approximately 50 percent of the baseline tritium requirement, while the surge a for the remaining 50 percent. Tritium supply technologies being evaluated must be a support the steadystate tritium requirement (a specific quantity of tritium every y and make up for any lost tritiumreserves.

Depending on the specific tritium supply technology, there may be two different way meet these requirements: (1) construct a tritium supply facility large enough to sa the entire baseline tritium requirement, operate that facility at a reduced level t the steady-state requirement, and increase the operating tempo up to baseline level necessary; or (2) if sufficient flexibility exists, construct and operate a tritium facility that would satisfy the steady-state tritium requirement (approximately 50p of the baseline tritium requirement), and be capable of adding capacity (adding modifications to the steady-state sized facility) in a timely enough fashion to mee surge tritium requirements.

This PEIS assesses alternatives for both cases. Tritium supply technologies represe of the first case are the Heavy Water Reactor (HWR), the Modular High Temperature Gas-Cooled Reactor (MHTGR), and the Advanced Light Water Reactor (ALWR) (Large and Because the addition of capability for these reactors is not possible or would take than 5years, they must be constructed to meet the entire baseline tritium requireme only new tritium supply technology representative of the second case is the Acceler Production of Tritium (APT). The APT has the flexibility to be initially constructe meet the steady-state tritium requirement and enhanced as necessary to meet the bas tritium requirement. Additionally, the commercial light water reactor alternative h the flexibility to meet changing tritium requirements by purchasing additional reac or irradiation services, as needed.

3.1.1 Planning Assumptions and Basis for Analysis

A number of planning assumptions and considerations form the basis of the analyses impact assessments presented in this PEIS. These considerations and assumptions fol

The purpose of the Department's action is to produce the tritium needed to maintain Nation's nuclear weapons stockpile.

Best available design information is utilized to represent tritium supply technolog and recycling facilities being considered for construction at candidate sites. Thes facilities are briefly described in section 3.4 and are described in greater detail appendix A. Design maturity of the tritium facilities varies greatly. For example, for some of the tritium supply technologies are more mature than others (e.g., HWR technology, a past effort from the New Production Reactor Program, is more mature t that of the APT). However, due to large reductions in estimated future requirements tritium (resulting in a new requirement equal to approximately 40 percent of the ba estimate represented in Environmental and other Evaluations of Alternatives for Siting, Constructing, and Operating New Production Reactor Capacity (DOE/NP0014)), even those designs have been downsized to meet reduced requirements. The technical feasibility of each of these alternate technologies is presented in the Tritium Sup Recycling Plants Technical Reference Report. Construction and operational resource requirements are representative numbers only and may change slightly as more data b available.

Sizing of the tritium supply technologies and recycling facilities is based upon th periodic requirement to replace tritium inventories lost to radioactive decay. Stoc sizing projections have been developed jointly by the Department of Defense (DOD) a This process, which culminates in a Presidential directive, is described in section These projections and related analyses take into account initiatives and agreements have substantially reduced the required number of nuclear weapons. New facilities w be designed with the capacity to support tritium requirements for the projected sto and to make up the loss of tritium reserves within a 5-year period. An APT, with a capacity, could initially be built to maintain tritium supply at a level which woul support the projected stockpile, but which would have the capability, if necessary, modified to meet surge production requirements to reconstitute the tritium reserve. steady-state component of this option accounts for approximately 50percent of the t tritium requirement, while the surge accounts for the remaining 50 percent.

Under the No Action alternative, neither new tritium supply and recycling facilitie modification/upgrading of the existing recycling facilities at the Savannah River S (SRS) would be done. This alternative represents a reference condition for each sit against which the tritium supply technologies and recycling facilities can be compa Under No Action, future stockpile tritium requirements would be supported as long a possible by recycling tritium from retired weapons. Eventually, tritium requirement not be met.

This PEIS does not attempt to identify specific locations on each site for any of t proposed tritium facilities; however, reference locations used to evaluate the pote environmental impacts of the tritium supply technologies and recycling facilities h been selected at each candidate site. These locations were designated by the indivi sites and are consistent with their internal site development plans. These referenc locations are designated as the tritium supply site (TSS) and would not interfere w Superfund sites. In general, undeveloped areas are used so that any potential environmental impacts would be greater than those projected for a developed locatio These reference locations are defined for each site in sections 4.2 through 4.6. Th characterization of the affected environment addresses the entire candidate site an affected region surrounding each site. The region varies by resource, but generally extends to a 50-mile radius from the center of eachsite.

The best available data were used to represent existing conditions at candidate sit the Draft PEIS. In some cases, information that is several years old represented th best available data regarding design or upper-bound operating conditions of facilit that are now functioning at reduced capacities due to lower workload. Since annual environmental reports take up to a year and sometimes longer to be approved and pub the latest publicly available environmental monitoring and annual report data were for the Draft PEIS. All candidate sites reviewed and updated, as appropriate, the affected environment sections to accurately describe the site and its environment. preparing the Final PEIS, any updated information relating to the sites' affected environment was reviewed and appropriate changes were made if new information could potentially change results of the impact analyses.

Both construction and operation impacts are considered for all resources at all sit Construction impacts are generally short-term, while operation impacts are expected long-term. The period of construction for each alternative varies; however, for ana purposes of the baseline case (START II), full operations are assumed to begin duri year 2010 and continue until the middle of the 21st century. The Phased APT for red tritium requirements would enable operations to begin during the year 2008 or earli purposes of analysis, the representative years have been selected to portray key ph the project and are as follows: 2005-representative year for peak construction activities, and 2010, 2030, and 2050-representative years for the beginning, middle end of the operations phase, respectively. An analysis of changes in impacts in the tritium is needed before 2011 is included in section 4.11. Changes to the assumptio performing this analysis are discussed in that section.

Generated waste will be managed in accordance with applicable Federal, state, and l laws, regulations, and requirements, as well as DOE's internal waste management requirements, including DOE's pollution prevention and waste minimization policy. A separate PEIS being prepared by the DOE Office of the Assistant Secretary for Environmental Management (EM) will address waste management options for all DOE-gen ated wastes. The Environmental Management Programmatic Environmental Impact Stateme (DOE/EIS-0200) will address the treatment, storage, and disposal of radioactive, hazardous, and mixed wastes to include treatment technology application or developm Accordingly, an important consideration in planning for the tritium facilities woul ensure that wastes can be safely packaged, stored, and transported in compliance wi applicable regulatory requirements until viable treatment and disposal options are available.

Baseline process technologies have been selected for tritium supply technologies an recycling facilities and are integral to the preconceptual designs. The design goal all new facilities include consideration of waste minimization and pollution preven to minimize facility and equipment contamination thereby making the future decontam

and decommissioning (D&D) of these facilities as simple and inexpensive as feasible relative comparison of D&D activities and potential impacts between tritium supply technologies is presented in section 4.14. These impacts would be the subject of fu tiered National Environmental Policy Act (NEPA) reviews when those facilities are p for retirement.

The impacts associated with the storage of spent nuclear fuel generated from a new supply facility are analyzed in this PEIS. Impacts presented are based on the manag of this spent nuclear fuel at the generation site, either in pools or dry storage b appropriate for the type of fuel. Although the recently issued ROD (60 FR 28680) fo Programmatic Spent Nuclear Fuel Management EIS outlines a Department-wide approach the temporary storage of existing spent nuclear fuel at INEL and SRS, this analysis assumes that any spent nuclear fuel generated from a tritium supply facility would stored on-site to preclude additional transportation to the ultimate disposition si spent nuclear fuel. Eventually, the spent nuclear fuel would be packaged and transp to a site for ultimate disposition, such as a suitable repository. DOE presently is evaluating the Yucca Mountain Site in Nevada as a repository site, but no acceptanc criteria have been established to date. Thus, this PEIS does not assess any long-te impacts associated with ultimate disposition of spent nuclear fuel in a repository at the present time such impacts are too speculative.

Low-level waste (LLW) will be disposed of onsite unless specifically prohibited or restricted. Mixed LLW would be stored in Resource Conservation and Recovery Act (RCRA)-permitted facilities until treatment to Land Disposal Restriction requiremen available. Sanitary (e.g., sewage and industrial) wastewater would be treated onsit Hazardous waste generated at the tritium supply and recycling facilities would be a lated, packaged, shipped offsite to a commercial RCRA facility, and in some instanc stored in accordance with all applicable regulatory requirements.

This PEIS broadly analyzes the environmental impacts associated with construction a operation of electrical distribution capacity for those reactors (MHTGR and ALWR) c of generating electricity. Although the sale of steam for power or the generation o electricity is possible, the conditions of such a sale are highly uncertain. For a general discussion of such impacts, see section 4.8.1. Appropriate NEPA reviews wou conducted in connection with any future proposals for such sale.

For electricity needs, particularly those of the APT, this PEIS assesses the availa ity of power from the regional power pools that service the various sites. Any addi capacity that would be required is identified. While electricity needs are foreseea the specific manner in which that need would be provided is uncertain, particularly regard to the type of electrical facility, and its location within a regional power It is likely that the electrical requirement would be met by facilities well away f site itself, or as an option a dedicated power plant (for the APT) could potentiall constructed at a site. Thus, this PEIS assesses the impacts on the regional power p providing the required electricity for each tritium supply technology at each site. site-specific impacts of a conceptual dedicated gas-fired power plant to support th is presented in sections 4.2 through 4.6. A generic discussion of the environmental effects to site infrastructure, air quality, water resources, biotic resources, socioeconomics, and waste management of supplying the APT with power from the regio power pool from a power plant is provided in section 4.8.2.

Fuel for the ALWR technologies would be available for purchase from commercial sour Enriched uranium to fabricate fuel for the HWR and MHTGR technologies would be avai from existing sources. Facilities to fabricate fuel using this uranium are included part of the design for these alternatives. The PEIS includes an analysis of transportation health risks of HEU to the potential tritium supply candidate sites.

With the exception of the commercial irradiation services alternative, this PEIS presupposes that the United States Government would design, construct, and operate tritium supply facility at any of the five candidate sites. It is conceivable that private sources could design, construct, and operate a tritium supply facility at a the same five sites and lease irradiation services to the government. In this case environmental impacts would be the same as the corresponding alternatives evaluated the PEIS.

For alternatives involving the commercial light water reactor, the PEIS assesses th environmental impact of the changes resulting from the insertion of tritium product target rods into the reactor. These environmental impact changes would be above and additional to the normal environmental impacts of the ongoing operation of these re Those ongoing environmental impacts are addressed in existing reactor specific environmental documents prepared by the NRC.

The general impacts of a multipurpose MHTGR and ALWR and associated plutonium fuel processing and fabrication are described in section 4.8.3 of this PEIS. While that describes a new ALWR operating in a multipurpose mode, that discussion is also appl to the commercial reactor alternative. A commercial reactor could be used to make t produce electricity, and burn plutonium as fuel. The environmental impacts associat with performing those missions would be similar to those described for the multipur ALWR. Throughout the document, references to and discussion of impacts for the mult purpose ALWR can be applied to a multipurpose commercial reactor alternative. The site-specific impacts of the multipurpose reactor and support facilities are descri for each of the five candidate sites in sections 4.2 through 4.6 for land use, geol soils, water and biotic resources, socioeconomics, human health, and waste manageme

3.1.2 Environmental Impact Analysis

This PEIS evaluates the direct, indirect, and cumulative impacts associated with th tritium supply and recycling alternatives. For the reactors, this includes construc impacts of a full-sized facility, and operational impacts associated with producing baseline tritium requirement (which is the greatest amount of tritium, and thus, th greatest operating tempo that might be required in any given year). This PEIS ackno that the reactors would likely produce less than the baseline tritium requirement (in most years, it would only be necessary to produce 50 percent of the baseline tri requirement in order to support the steady-state tritium requirement). This PEIS al provides a discussion of differences, if any, in environmental impacts between the conservative baseline tritium requirement operating tempo and the steady-state trit requirement operating tempo. However, since it is reasonably foreseeable that the r would be required to operate to support the baseline tritium requirement, this is t that will be analyzed in the greatest detail. This case thus bounds the potential i associated with producing the steady-state tritium requirement.

For the APT, which has the flexibility to be initially constructed to meet the steady-state tritium requirement and enhanced as necessary to meet the baseline tri requirement, this PEIS assesses the construction impacts of a full-sized baseline f because it is highly uncertain when additional capacity might be required. Thus, in to bound the potential construction impacts, this PEIS assumes that all constructio performed during the same construction period even though it is likely the construc would be phased in. Operationally, using the same logic as that of the reactors, th impacts associated with producing the baseline tritium requirement are presented. T would likely be operated at less than the baseline tritium requirement (i.e., again most years, it would only be necessary to operate the facilities at 50 percent of t baseline tritium requirement in order to support the steady-state tritium requireme This PEIS also provides a discussion of differences in environmental impacts betwee conservative baseline tritium requirement operating tempo and the steady-state trit requirement operating tempo.

3.1.3 Alternatives Considered but Eliminated from Detailed Study

By law, DOE is required to support the Nuclear Weapons Stockpile Plan. In order to

this, DOE must maintain a nuclear weapons production, maintenance, and surveillance capacity consistent with the President's Nuclear Weapons Stockpile Plan. For the pr action, the following alternatives were considered but eliminated from detailed stu for the reasons stated:

Purchase Tritium From Foreign Sources. DOE has considered the purchase of tritium f other sources, including foreign nations. Conceptually, the purchase of tritium fro foreign governments could fulfill the tritium requirement. However, while there is national policy against purchase of defense materials from foreign sources, DOE has determined that the uncertainties associated with obtaining tritium from foreign so render this alternative unreasonable for an assured long-term supply.

Redesign of Weapons to Require Less or No Tritium. The nuclear warheads in the endu stockpile were designed and built in an era when the tritium supply was assured, wh underground nuclear testing was being conducted, and when military needs required t warheads be optimized in terms of weight and volume. Replacing these warheads with ones that would use little or no tritium for the sole reason of reducing overall tr demand would be infeasible and unreasonable. Without underground nuclear testing to their safety and reliability, new warhead designs cannot deviate very far from curr designs which require the use of tritium. Even with underground testing to facilita designs and a fully operational production complex, it would still take many years build enough warheads to replace the enduring stockpile. Therefore, replacing the e stockpile of warheads with new designs would most likely take longer and could cost than constructing and operating a new tritium supply facility. Because neither the President nor the Congress has proposed that the Government embark on a costly and expansive design, testing, and construction program solely to eliminate tritium requirements, weapons redesign to use less or no tritium is not a reasonable short long-term alternative.

Use of Existing Department of Energy Reactors or Accelerators. DOE (and its predece agencies) has designed, constructed, and operated many nuclear reactors over the pa years. The majority of these reactors were designed to assist in the development of nuclear research and safety standards development. DOE has also constructed nuclear reactors to produce the materials required to support the production and maintenanc nuclear weapons and has constructed nuclear reactors in support of the Naval Propul Program.

Among the first experimental reactors were the water boiler at Los Alamos National Laboratory and CP-3 at Argonne National Laboratory-West, which were completed in 19 Since then, numerous experimental and research reactors were constructed for a vari of purposes, including material tests, new reactor concepts, and safety experiments four DOE research reactors are currently operational: The High Flux Isotope Reactor Ridge Reservation (ORR); the High Flux Beam Reactor at Brookhaven National Laborato the Experimental Breeder Reactor-II and the Advanced Test Reactor at Idaho National Engineering Laboratory (INEL). In addition, there are some low power/critical facil supporting medical research (at Brookhaven) and supporting reactor core configurati research (at Argonne National Laboratory-West at INEL). None of these facilities ar enough to produce the amount of tritium required to support the projected stockpile requirements. All are fully or partially committed to existing programs, and were c structed in the early 1960s, rendering their design life reliability unsuitable for timeframe required for a new, assured, long-term tritium supply facility.

Of the existing DOE reactors that are currently not being operated, only one has th potential for producing any significant quantities of tritium: the Fast Flux Test F at the Hanford Site (Hanford). This facility was designed and constructed to perfor materials research for the national liquid-metal breeder reactor program. This smal (440-megawatt thermal (MWt)) experimental reactor, based on liquid-metal reactor technology, could, after substantial core and cooling system modifications, as well target technology development, have the potential to supply a significant percentag the steady state tritium requirement. The Fast Flux Test Facility, however, was des in the late 1970s and began operation in 1980. The Fast Flux Test Facility is curre defueled. A technical study to extend the life of the Fast Flux Test Facility 10 ye past its design 20-year lifetime has been completed. While technically possible to the lifetime, in the year 2010 the facility would be at the end of even the extende

Relying on the ability to modify and operate Fast Flux Test Facility well into the of the next century is not a reasonable alternative.

DOE also constructed and operated more than a dozen nuclear reactors for production nuclear materials at SRS and Hanford, starting with the early part of the Manhattan Project during World War II. None of these reactors is currently operational. Of th reactors specifically designed to produce nuclear materials for the nuclear weapons program, the K-Reactor at SRS is the only remaining reactor which could be capable returning to operation. It is presently in a "cold stand-by state" and has not been operated since 1988. The reactor was shut down for major environmental, safety, and upgrades, to comply with today's stringent standards. DOE discontinued the K-Reacto Restart Program when the reduced need for tritium to support a smaller stockpile de the need for tritium. In this context, reliance upon the ability to upgrade and ope well into the middle of the next century a first generation reactor designed in the is not a reasonable alternative for new, long-term, assured tritium supply.

DOE has been a world leader in the design and construction of particle accelerators currently operates six national facilities. Of the existing research accelerators, capable of producing significant quantities of tritium. The existing DOE research accelerators are all of the pulsed design and are only capable of producing low pow accelerator beams in the 800 kilowatt (kW) range. A production accelerator facility utilizing continuous wave operation, would be required to deliver a high power prot beam of 100 megawatt (MW) for tritium production. None of the existing research accelerators could be reasonably upgraded to meet the long-term, assured tritium requirements.

Alternative Sites. Section 3.3.1 describes the process that was carried out to iden the range of reasonable site alternatives for the tritium supply and recycling faci that are considered in this PEIS. The process of determining these reasonable triti supply alternative sites has been evolutionary, starting with the engineering studi criteria developed by the New Production Reactor program, then utilizing additional criteria and considerations from the Reconfiguration Program, information related t changing missions at DOE sites, and input from public scoping.

During the preparation of this PEIS, the Department has continued to assess other alternative sites. In fact, once the APT was added as a potential tritium supply technology, an assessment was conducted to determine if the Los Alamos National Laboratory, which operates a linear accelerator and is the home of significant acce expertise, would be a reasonable site for a tritium producing accelerator.

The APT conceptual designs for tritium supply have established that evaporative coo towers would be used to dissipate the heat generated in the tritium target assembli in the accelerator facility. These APT cooling water requirements are significantly greater than the current regulated allotment of water for Los Alamos National Labor Increasing the allotment to support the APT water requirement would be impractical infeasible, and in any event beyond DOE's control.

It may be possible that an APT could use nonevaporative cooling towers, which would greatly reduce the water requirements. However, there is sufficient technical uncer regarding the feasibility and practicality of using nonevaporative cooling towers f continuous wave APT to render this option unacceptable as a source for the Nation's supply of tritium. The other five sites being analyzed in this PEIS could reasonabl support the water requirements of the APT using evaporative cooling towers and, thu would not incur the technical uncertainty and risk of Los Alamos National Laborator Thus, DOE has concluded that Los Alamos National Laboratory is not a reasonable sit an accelerator to produce tritium (LA DOE 1994a:1).

REDUCED TRITIUM REQUIREMENTS

As discussed in chapter 2, the need for new tritium supply is based on the 1994 Nuc Weapons Stockpile Plan, which projects a need for new tritium by approximately 2011 on a START II level stockpile size of approximately 3,500 accountable weapons. A sm than START II stockpile size would extend the need date for new tritium beyond approximately 2011. If the need date for new tritium were significantly later than

the Department would not have a proposal for new tritium supply, and would not be preparing a PEIS for Tritium Supply and Recycling.

3.2 Tritium Supply and Recycling Alternatives

This PEIS evaluates the environmental impacts associated with alternatives for only functional area of the nuclear element of the Complex: tritium supply and recycling nonnuclear element of the Complex has already been evaluated in the Nonnuclear Consolidation Environmental Assessment (EA) Nuclear Weapons Complex Reconfiguration Program (DOE/EA-0792). The specific alternatives evaluated in this Tritium Supply a Recycling PEIS are presented in figure 3.2-1 and explained in section 3.2.2. The re elements of the Complex, other than tritium supply and recycling, will be covered i new Stockpile Stewardship and Management PEIS described in section 1.5.1.

3.2.1 No Action

To satisfy the requirements of the National Environmental Protection Act of 1969 (N No Action is presented for comparison with the action alternatives. Under No Action would not establish a new tritium supply capability, the current inventory of triti would decay, and DOE would not meet stockpile requirements of tritium. This would b contrary to DOE's mission as specified by the Atomic Energy Act of 1954, as amended would continue waste management programs to meet the legal requirements and commitm formal agreements and would proceed with cleanup activities. Production facilities support roles at specific sites, however, would be downsized or eliminated in accor with the reduced workload projected for the year 2010 and beyond. The current DOE m assumed to continue under No Action are listed in section 3.3 for each candidate si

Figure (Page 3-9)
Figure 3.2-1.-Tritium Supply and Recycling Alternatives.

3.2.2 Tritium Supply and Recycling

The four technologies considered as a new supply of tritium include: HWR, MHTGR, AL APT. Both Large (1,300 MWe) and Small (600 MWe) options for the ALWR and a phased o for the APT are evaluated. This PEIS includes an analysis of the MHTGR and ALWR technologies for tritium production together with plutonium disposition and steam/electricity production. Also included is the use of commercial light water re to irradiate tritium target rods. Descriptions of these technologies and their opti provided in section 3.4. The five candidate sites evaluated for such a facility are the Nevada Test Site (NTS), ORR, the Pantex Plant, and SRS. Descriptions of specifi are given in section 3.3.

This PEIS provides environmental analyses to support a decision to select both the supply technology and the location of the tritium supply and recycling facilities. tritium supply facility is located at any site other than SRS, the tritium recyclin function could be provided either by collocating a new tritium recycling facility a that site or by the upgraded tritium recycling facilities at SRS. If the new tritiu supply facility is located at SRS, it would utilize upgraded recycling facilities a As shown in figure 3.2-1, the following alternatives for tritium supply and recycli analyzed.

HWR and New Recycling Facility-Col-location of an HWR for tritium supply and a new tritium recycling facility at either INEL, NTS, ORR, or Pantex. Tritium recycling facilities at SRS would be phased out if any of these alternatives were chosen.

HWR and Recycling Facilities Upgrade-Location of an HWR for tritium supply at any o five candidate sites. The Replacement Tritium Facility and other support facilities would be upgraded for tritium recycling.

MHTGR and New Recycling Facility-Collocation of an MHTGR for tritium supply and a n tritium recycling facility at either INEL, NTS, ORR, or Pantex. Tritium recycling facilities at SRS would be phased out if any of these alternatives are chosen.

MHTGR and Recycling Facilities Upgrade-Location of an MHTGR for tritium supply at a the five candidate sites. The Replacement Tritium Facility and other support facili SRS would be upgraded for tritium recycling.

ALWR and New Recycling Facility-Collocation of an ALWR for tritium supply and new t recycling facilities at either INEL, NTS, ORR, or Pantex. Both large and small reac options are evaluated at each site. Tritium recycling facilities at SRS would be ph out if any of these alternatives are chosen.

ALWR and Recycling Facilities Upgrade-Location of an ALWR for tritium supply at any five candidate sites. Both large and small reactor options are evaluated at each si Replacement Tritium Facility and other support facilities at SRS would be upgraded tritium recycling.

APT and New Recycling Facility-Col-location of an APT for tritium supply and a new tritium recycling facility at either INEL, NTS, ORR, or Pantex. The Phased APT opti described in section 3.4.2.4 and appendix section A.2.1.4, is evaluated for less th baseline operations. Tritium recycling facilities at SRS would be phased out if any these alternatives are chosen.

APT and Recycling Facilities Upgrade-Location of an APT for tritium supply at any o five candidate sites. The Phased APT option is evaluated for less than baseline operations. The Replacement Tritium Facility and other support facilities at SRS wo be upgraded for tritium recycling.

Commercial Light Water Reactor-Purchase of an existing operating or partially compl commercial light water reactor by DOE and conversion to tritium production for defe purposes or purchase of irradiation services contracted from commercial power react The Replacement Tritium Facility and other support facilities at SRS would be upgra tritium recycling. In addition, facilities for tritium extraction and fabrication o tritium targets would be constructed.

3.2.3 Other Missions Beyond Tritium Production

Tritium production is the only mission addressed in this PEIS, although it is possi that some of the tritium supply technology alternatives would be capable of perform missions other than tritium production. Two such examples are plutonium disposition steam/electricity production.

As discussed in section 1.5.3, alternatives for plutonium disposition are being ass in the Long-Term Storage and Disposition of Weapons-Usable Fissile Materials PEIS. Nonetheless, this PEIS includes an analysis of the option of utilizing the MHTGR an technologies for tritium production together with plutonium disposition and steam/electricity production.

3.3 Candidate Sites

Five locations (INEL, NTS, ORR, Pantex, and SRS) are being considered as candidate for the tritium supply and recycling facilities. All of these sites, with the excep INEL, are currently performing defense program activities.

For the commercial light water reactor alternatives, no specific site has been iden Therefore, any one of the existing operating commercial reactors or partially compl reactors is a potential candidate site for the tritium supply mission. Currently 109commercial nuclear power plants are located at 71 sites in 32 of the contiguous Of these, 57 sites are located east of the Mississippi River. Approximately one-hal these 71 sites contain two or three nuclear units per site.

3.3.1 Site Selection

As shown in figure 3.3.1-1, in mid-1988, at the onset of the New Production Reactor Program, 13 DOE-owned sites were considered as potential locations for deployment o new production reactor. All sites were evaluated against basic screening criteria a three, Hanford, INEL and SRS, satisfied the criteria. These three sites were furthe evaluated by a DOE Site Evaluation Panel against more stringent criteria and were f be suitable for a new production reactor. A detailed discussion of this selection process is described in the Implementation Plan for the New Production Reactor Capa Environmental Impact Statement (DOE/NP-0003).

Concurrent with the publication in the Federal Register (56 FR 5590) on February 11 of the Notice of Intent (NOI) to prepare a PEIS for Reconfiguration of the Nuclear Weapons Complex, a Notice of Availability of an Invitation for Site Proposals for t Nuclear Weapons Complex Reconfiguration Site was also published (56 FR 5595). The invitation solicited proposals for consideration of non-DOE sites and listed five D sites which met the initial screening criteria. No additional locations were identi a result of this invitation.Subsequent evaluation by the Site Evaluation Panel of t DOE sites found them to be fully qualified. These five initial sites were Hanford, ORR, Pantex, and SRS.

On November 1, 1991, the then Secretary of Energy announced his decision to incorpo the New Production Reactor environmental analysis into the Reconfiguration PEIS. On November 29, 1991, DOE published a Notice of Opportunity for public comment on this (56 FR 60985). The New Production Reactor Program had been evaluating the siting of a HWR, Light Water Reactor, or MHTGR technology at either Hanford, INEL, or SRS to new tritium supply capability for the Complex. In light of the reduced requirements resulting from the President's initiative to downsize the nuclear weapons stockpile tritium production requirement was reduced. This reduction permitted the addition t Reconfiguration PEIS of the option of producing tritium using a linear accelerator downsizing the three reactor technologies to the new goal quantities. The two reconfiguration sites, ORR and Pantex, previously rejected as candidate sites for a Production Reactor, were then evaluated using 10 CFR 100 reactor siting criteria an to be acceptable for the downsized reactors.

Figure (Page 3-12)
Figure 3.3.1-1.-Site Selection Process.

A Revised NOI to prepare a PEIS was published in the Federal Register (58FR39528) o 23, 1993. In this notice, DOE eliminated Hanford from further consideration as a ca site because all nuclear weapons production functions at that location had been ter and it was dedicated to environmental and waste management activities. NTS was eval using the siting criteria described above and was determined to be a reasonable sit

alternative for new tritium supply and recycling facilities. The resulting five sit INEL, NTS, ORR, Pantex, and SRS, are described in the following sections.

3.3.2 Idaho National Engineering Laboratory

INEL, located on approximately 570,000 acres near Idaho Falls, ID, was established to build, test, and operate various types of nuclear facilities. This site is one o principal centers for conducting nuclear energy research and providing support to t Navy nuclear fleet. It has the world's largest and most varied collection of reacto including research, testing, power, and ship propulsion reactors. There have been 5 research and test reactors at INEL that have been used over the years to test fuel target design, reactor systems, and overall safety. Currently, there are four react use, three of which are in continuous operation.

In addition to its nuclear reactor research, other INEL facilities are operated to reactor operations. These facilities include high-level waste (HLW) and LLW process storage sites; hot cells; analytical laboratories; machine shops; laundry; railroad administrative facilities. Other activities include management of one of DOE's larg storage sites for the LLW and transuranic (TRU) waste generated by defense program activities. Until 1992, spent reactor fuels were reprocessed at the Idaho Chemical Processing Plant to recover enriched uranium and other isotopes. Due to a DOE decis terminate spent fuel reprocessing, the Idaho Chemical Processing Plant was transfer the EM Program for disposition. There are currently no defense program activities a

DOE activities at INEL have been divided among nine distinct and geographically sep functional mission areas as listed in table 3.3.2-1. The current functions can be f grouped into the following two major categories, environmental management activitie other DOE activities.

Environmental Management Activities. Environmental management performs research and development activities for waste processing at the Power Burst Facility and provide waste management expertise to the Radioactive Waste Management Complex. The Power B Facility supports facilities for research and development for waste reduction progr the Boron Neutron Capture Therapy Program. Waste management efforts at INEL are dir toward safe and environmentally sound treatment, storage, and disposal of radioacti hazardous, and sanitary waste generated from facility operations. Details of enviro mental management activities are discussed in section 4.2.2.10 and appendix H.

A reactor used for thermal fuels behavior studies is now in a standby mode. Major w management facilities include the waste engineering development facility, the waste experimental reduction facility, and the mixed waste storage facility.

Table 3.3.2-1.-Current Missions at Idaho National Engineering Laboratory

Mission	Description	Spo
Idaho Chemical Processing Plant	Transferred to management of EM.	Ass Env
Radioactive Waste Management Complex	Provide waste management functions for present and future site and department needs.	Ass Env
Power Burst Area	Perform waste processing, technology research, and development. Provide interim storage for hazardous wastes.	Ass Env
Test Area North	Perform research on reactor safety operations and conduct a specific manufacturing capability project.	Off

Auxiliary Reactor Area	Perform materials testing and environmental monitoring.	Off
Argonne National Laboratory-West	Perform breeder reactor irradiation tests.	Off
Test Reactor Area	Perform irradiation service, develop nuclear instruments, conduct safety programs, and perform geological research. Develop methods to meet radioactive release limits.	Off Off
Naval Reactors Facility	Standby facility for conducting ship propulsion reactor research and training.	Off
Central Facilities Area	Provide centralized support services for the site.	Ida

Other Department of Energy Activities. The following six additional DOE activities located at INEL:

The Test Area North complex is the northernmost facility within INEL and consists o several experimental reactors and support facilities conducting research and develo activities on reactor performance. These include the technical support facility, th containment test facility, the water reactor research test facility, and the inerti engine test facility. The inertial engine test facility has been abandoned, and no programs are planned. The remaining facilities support ongoing programs that are ex to continue for the foreseeable future.

Materials testing and environmental monitoring activities are conducted in the Auxi Reactor Area. The facilities in this area are scheduled for D&D.

Argonne National Laboratory-West supports breeder reactor development and the Waste Isolation Pilot Plant (WIPP) test program, as well as stores plutonium for the DOE of Nuclear Energy.

The Test Reactor Area supports the Advanced Test Reactor. This reactor is used for irradiation testing of reactor fuels and material properties; instrumentation for n reactors; and production of radioisotopes in support of nuclear medicine, industria applications, research, and product sterilization. Wastes from this facility are ha by the Radioactive Waste Management Complex.

The Naval Reactors Facility is operated for DOE and the U.S. Navy by Westinghouse E Corporation under jurisdiction of DOE's Pittsburgh Naval Reactors Office. Included facility are the submarine prototypes and the expended core facility. Activities in the testing of advanced design equipment and new systems for current naval nuclear propulsion plants and obtaining data for future design. Additionally, the facilitie used to provide a comprehensive nuclear plant operational training program for nava personnel. DOD plans to shut down older prototype reactors, leaving operational onl most modern prototype reactors and Expended Core Facility.

The mission of the Central Facilities Area is to provide effective, site-wide suppo services including transportation, shop services, health services, radiation monito and administrative offices.

Non-Department of Energy Activities. Non-DOE activities at INEL include research be conducted by the National Oceanic and Atmospheric Administration, the U.S. Geologic Survey (USGS), and various institutions of higher learning. These activities suppor designation of INEL as a National Environmental Research Park.

Environmental Regulatory Setting. The Department is working with Federal and state regulatory authorities to address compliance and cleanup obligations arising from i

past operations at INEL. The Department is engaged in several activities to bring i operations into full regulatory compliance. These activities are set forth in negot agreements that contain schedules for achieving compliance with applicable requirem and financial penalties for nonachievement of agreed upon milestones. A brief descr of the environmental regulatory setting at INEL follows. More detail is available i appendix section A.1.1.

The State of Idaho has regulatory authority for air, water, solid waste, mixed wast hazardous waste management. DOE and the State of Idaho have developed the Environme Oversight and Monitoring Agreement to assure the citizens of Idaho that their healt safety and the environment are being protected. DOE is required to comply with all applicable environmental laws and regulations and provide technical and financial s for state activities to assess such compliance at INEL.

The INEL air emissions inventory, completed in March 1991, catalogs and characteriz vents, stacks, and potential sources of air pollutants at INEL. The air toxic compo inventory for radioactive and other hazardous air pollutants is being compiled, and added to the air emissions inventory, will serve as the basis for the operating per required under Title V of the 1990 Clean Air Act (CAA).

All nine public water systems within INEL boundaries are currently in compliance wi primary drinking water standards. Annual averages for all onsite and offsite drinki water samples were below EPA's maximum contaminant level for community drinking wat systems. INEL holds two National Pollutant Discharge Elimination System (NPDES) per requests for discharges of noncontact cooling water and for discharges of wastewate the Big Lost River from the Idaho Chemical Processing Plant.

EPA placed INEL on the National Priorities List (NPL) on December 21, 1989. As a re DOE entered into a Federal Facility Agreement and Consent Order on December 9, 1991 EPA and the State of Idaho to coordinate cleanup activities under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and RCRA. The agre is implemented by an action plan which outlines the remedial action process which w encompass all investigations of hazardous substances and cleanup activities at INEL

On October 7, 1992, DOE signed another Consent Order with the State of Idaho to res the Hazardous Waste Notice of Violation issued by the State after a September 1990 inspection for 23alleged hazardous waste violations. This Consent Order provides th schedule for corrective actions which, when completed, will resolve this Notice of Violation.

DOE has proposed to enter into a compliance agreement with the State of Idaho conce the storage, treatment, and continued generation of land disposal restricted waste would form the basis for the INEL site-specific mixed waste treatment plan required Federal Facility Compliance Act of 1992. The proposed agreement would address INEL compliance with the Land Disposal Restrictions of the Hazardous and Solid Waste Ame of 1984, allowing INEL to continue to operate and to generate, treat, and store mix wastes.

INEL is not in full compliance at present with the Toxic Substances Control Act (TS to the storage of radioactive polychlorinated biphenyl (PCB)-contaminated equipment materials. DOE is negotiating a compliance agreement with the State of Idaho for th continued storage of radioactive PCB-contaminated wastes until a method for their treatment or disposal can be developed.

DOE, the U.S. Navy, and the State of Idaho concurred on the Idaho Agreement on Augu 1993. The Idaho Agreement encompasses the transportation, receipt, processing, and of spent nuclear fuel at INEL. This Agreement is a negotiated settlement among the to satisfy a June 28, 1993, order by the U.S. District Court for the District of Id granting a motion for summary judgment, injunction, and administratively terminatin action. The effect of this motion is to limit receipt of spent nuclear fuel pending completion of an EIS analyzing DOE's spent nuclear fuel activities and certain prop INEL activities.

3.3.3 Nevada Test Site

NTS occupies approximately 864,000 acres in the southeastern part of Nye County in southern Nevada. Located about 65 miles northwest of Las Vegas, NTS is operated by management and operating contractors under the direction of the Nevada Operations Office. It is a remote, secure facility that maintains the capability for conductin underground testing of nuclear weapons and evaluating the effects of nuclear weapon military communications systems, electronics, satellites, sensors, and other materi The first nuclear test at NTS was conducted in January 1951. Since the signing of t Threshold Test Ban Treaty in 1974, it has been the only U.S. site used for nuclear testing. Approximately one-third of the land (located in the eastern and northweste portions of the site) has been for nuclear weapons testing, one-third (located in t western portion of the site) has been reserved for future missions, and one-third i for research and development and other facility requirements. Facilities include nu device assembly, diagnostic canister assembly, hazardous liquid spill, and the Radi Waste Management Site. In addition, Yucca Mountain, an area on the southwestern bou of the site, is being evaluated by DOE for siting of a spent nuclear fuel and high-radioactive waste repository. While the primary purpose of Yucca Mountain is for commercial HLW, it is also slated to receive some military HLW.

Activities at NTS are concentrated in several general areas. Most of the onsite wor related to defense program activities, although there are environmental management, DOE, and non-DOE activities as well. NTS is a unique facility because it is a large area into which access is tightly controlled, it has a substantial infrastructure, has the capability to handle and run tests with hazardous or radioactive materials. Because of this, activities other than nuclear testing, such as mobile missile tran tests and nuclear rocket tests, have been carried out for other Federal departments agencies. The current missions and functions of NTS are shown in table3.3.3-1.

Table 3.3.3-1.-Current Missions at Nevada Test Site

Mission	Description
Maintain Underground Nuclear Testing Program Capabilities	Underground nuclear testing has been suspended; however, the capability to resume testing will be maintained.
Maintain Nuclear Emergency Search Team Program Capabilities	Tests and exercises are carried out to verify procedures and equipment of the Nuclear Emergency Search Team.
Radioactive Waste Management	Manage radioactive and mixed waste facilities.
Support the Yucca Mountain Waste Storage Program	Characterize environment of Yucca Mountain and surrounding area, especially geology, with respect to possible storage of high-level radioactive waste.
Support Arms Control and Treaty Verification Activities	Fulfill U.S. international obligations concerning verification of underground nuclear tests.
Other DOE and non-DOE Missions	Various, as described in text.

Defense Program Activities. The defense program efforts and the Defense Nuclear Age

(non-DOE activity) activities are closely related, with both contributing to nation security. Prior to the moratorium described below, nuclear testing was limited to t tests that supported the safety and reliability of the Nation's nuclear stockpile. moratorium significantly restricted DOE experiments and virtually eliminated DOE su of Defense Nuclear Agency nuclear tests. In July 1993, the President extended the moratorium on nuclear tests indefinitely (both DOE and DOD). The moratorium started October 1992, in accordance with the Hatfield Amendment. However, the President als required that NTS retain the capability to resume testing if authorized. The Nevada Operations Office, with DP oversight, has the lead Federal role in maintaining the capability to respond to certain kinds of national emergencies or situations. The N Emergency Search Team, a team of highly trained DOE and contractor radiological specialists, can be mobilized in case of accidents involving radioactive materials terrorist threat involving nuclear weapons.

The only major new facility for defense program activities is the 100,000 square fe (ft2) Device Assembly Facility. It is located in Area 6, just south of the control Because of its multiple processing areas which include assembly cells, assembly bay high bays, radiographic facilities, special nuclear materials laboratories, high ex storage, special nuclear material storage, shipping and receiving areas, and associ administrative and support areas, all aspects of the operations will be handled in one facility. In addition, the facility provides for increased overall security and permits easier entrance and exit accessibility for the workers during hazardous operations. There will be no manufacturing of special nuclear material at this faci

Environmental Management Activities. There are active radioactive and mixed waste d areas onsite in Areas 3 and 5. The only major environmental management facility anticipated for the NTS is a waste management facility to handle TRU wastes. A majo program to characterize the groundwater at NTS is in progress to determine regional paths and rates, and to detect any migration of contamination from past nuclear tes

Other Department of Energy Activities. Although the principal activity at NTS has b underground testing of nuclear devices, DOE is also involved in a number of other activities. These include the Yucca Mountain waste storage program, liquified gaseo spill tests, and explosive pulsed power experiments.

A high-level radioactive waste facility at nearby Yucca Mountain is under study. Th Mountain high-level radioactive waste facility is handled by the Yucca Mountain Sit Characterization Office, which reports directly to the Office of Civilian Radioacti Waste Management. However, because it is based at NTS, the Nevada Operations Office provides some administrative support services to the project.

The Liquified Gaseous Fuel Test Facility in Area 5 was completed in 1986. It is ope on a fee basis for commercial users as a basic research tool for studying the dynam accidental releases of hazardous materials and to evaluate the effectiveness of var foams and fire retardants in accidents involving chemicals and hazardous materials.

The manifestation of several other programs remain onsite. In Area 25 the Rover Pro (nuclear rocket) facilities cover a large area. Area 26 held the Pluto Program (nuc ram-jet) and three buildings remain there.

NTS is the demonstration site for the development of a Solar Enterprise Zone in Nev 100 MW solar facility is currently planned at the site, with potential for expansio 500 MW in the future.

Non-Department of Energy Activities. The main non-DOE activity at NTS was the Defen Nuclear Agency's use of the site as a nuclear weapons effects testing facility. Wea effects tests were conducted to study a number of nuclear effects including x-rays, rays, neutrons, electromagnetic pulse, air blast, ground and water shock, propagati and temperature. These tests assessed military systems in a nuclear environment. Va other military exercises and training activities are also carried out at NTS.

Environmental Regulatory Setting. The Department is working with Federal and state regulatory authorities to address compliance and cleanup obligations arising from i past operations at NTS. The Department is engaged in several activities to bring it

operations into full regulatory compliance. Negotiated agreements will include fina penalties for nonachievement of agreed upon milestones. A brief description of the environmental regulatory setting at NTS follows. This is described in more detail i appendix section A.1.2.

The State of Nevada has regulatory authority for air, water, solid waste, and hazar waste. A Memorandum of Understanding between DOE and the State of Nevada covers radiological releases on NTS and required notifications. Releases to the NTS enviro may originate from tunnels, underground test event sites, and facilities where mate are used, processed, stored, or discharged. DOE and the State of Nevada signed an Agreement in Principle in October 1990 to provide DOE funding to Nevada for oversig environment, safety, and health (ES&H) activities, including environmental restorat activities at NTS. The Agreement in Principle provides the understanding between an commitment of the parties regarding DOE's provision to the State for technical and financial support in return for environmental oversight and monitoring.

Liquid discharges at NTS are primarily the result of equipment cleaning and sanitar wastes. Discharges also result from groundwater seeping into the tunnels in Rainier which have now been sealed. Periodic large discharges to lined sumps occur during characterization well drilling, development, and testing. These discharges are done accordance with a draft fluid management plan being developed in consultation with State of Nevada. Surface water monitoring at NTS is limited to sampling wastewater into lagoons and ponds under a series of permits issued by the State of Nevada.

In 1987, a DOE Headquarters task force determined that underground nuclear device t areas are subject to the provisions of CERCLA. Under CERCLA, all releases of hazard extremely hazardous substances that exceed reportable quantities must be reported t National Response Center. Soils contaminated by plutonium and other radioactive contaminants are the major concern for NTS. Preliminary Assessment/Site Investigati reports required by CERCLA were prepared for NTS and provided to EPA in 1988. In 19 revised Hazard Ranking System package was provided to EPA. EPA will consider the re derived from the revised Hazard Ranking System to determine if any NTS sites are to included on the NPL. The State of Nevada and DOE are in the process of negotiating two-party agreement for environmental restoration pursuant to the State's correctiv actions regulations.

The Hazardous Waste Accumulation site on NTS is used to collect hazardous wastes pr shipping offsite to a RCRA-permitted commercial hazardous waste disposal facility. 1990, mixed waste disposal operations were discontinued in compliance with the Land Disposal Restrictions of the Hazardous and Solid Waste Amendment of 1984. Mixed was disposal operations of offsite generated waste at NTS will not resume until issuanc State of Nevada RCRA Part B permit.

3.3.4 Oak Ridge Reservation

ORR covers approximately 35,000 acres. It includes the following three major facili Oak Ridge National Laboratory; Y-12 Plant, ORR (Y-12); and Oak Ridge K-25 Site (K-2 Ridge National Laboratory missions include basic and applied scientific research an technology development. Y-12 engages in national security activities and manufactur outreach to U.S. industry. K-25, formerly known as the Oak Ridge Gaseous Diffusion now serves as an operations center for environmental restoration and waste manageme programs.

Y-12 was constructed as part of the World War II Manhattan Project. The first site was the separation of U-235 from natural uranium by electromagnetic separation. The magnetic separators were taken out of commission at the end of 1946, when gaseous diffusion became the accepted process for enriching uranium. Missions have evolved changed with the easing of international tensions and resulting conclusion of Y-12' weapon component production mission.

In the near-term, the operational space at Y-12 will be downsized in response to re workloads. Y-12 is designated as the single interim DOE repository for both unirrad enriched uranium not required for program use and unirradiated depleted uranium. Pr interim storage capability will be enhanced to accommodate additional enriched uran returned from stockpiled weapons and other DOE sites. The current missions and func are described in table 3.3.4-1.

Defense Program Activities. The five Y-12 defense program assignments include maint the capability to fabricate components (primarily uranium and lithium) for nuclear weapons, storing uranium and lithium materials and parts, dismantling nuclear weapo components returned from the national stockpile, processing special nuclear materia and providing special production support to the DOE design agencies and other DOE programs.

Table 3.3.4-1.-Current Missions at Oak Ridge Reservation

Mission	Description	Spons
Weapons Components	Maintain capability to fabricate uranium and lithium components and parts for nuclear weapons.	Assis Progr
Uranium and Lithium Storage	Store enriched uranium, depleted uranium, and lithium materials and parts.	Assis Progr
Dismantlement Activities	Dismantle nuclear weapon components returned from the stockpile.	Assis Progr
Special Nuclear Material	Process uranium.	Assis Progr
Support Services	Provide support to design agencies as requested.	Assis Progr
Environmental Restoration and Waste Management	Waste Management and D&D activities at Oak Ridge National Laboratory, Y-12, and K-25.	Assis Envir
Research and Development	Oak Ridge National Laboratory basic research and development in energy, health, and environment.	Offic Assis Envir Offic
Isotope Production	Oak Ridge National Laboratory produces radioactive and stable isotopes not available elsewhere.	Offic
Educational and Research Programs	Oak Ridge Institute for Science and Education programs in the areas of health, environment, and energy.	Offic Assis Envir Offic
Work for other Federal Agencies	Projects to support other Federal programs.	Depar
Technology Transfer	Programs to transfer unique technologies developed at ORR to private industry.	Depar
Meteorological Research	Meteorological and atmospheric diffusion research.	Natio Admin

Historically, Y-12's primary mission has been to fabricate and assemble uranium (en and depleted) and lithium components and other specialty compounds in support of th nuclear weapons stockpile. While unprecedented changes in the world are resulting i nuclear disarmament and reduced nuclear weapons stockpiles, Y-12 continues to maint capability to fabricate nuclear weapon components as a major mission. Maintaining production capability involves the ability to fabricate materials into components, and certify the components, and produce subassemblies from components.

As nuclear weapons are removed from the stockpile, these returned weapons must be dismantled, and materials and parts appropriately dispositioned. These returned mat and components, as well as those currently located at Y-12, must be safely and secu placed in short-term or long-term storage. Prior to storage, some processing of spe nuclear materials must be performed to recover materials from the returned weapons.

Y-12 also provides fabrication support to DOE's weapon design laboratories at Los A National Laboratory, Lawrence Livermore National Laboratory, and Sandia National Laboratories, New Mexico. Y-12 produces components for design evaluation for these customers. In addition, Y-12 performs some stockpile surveillance activities to ens reliability of the nuclear stockpile.

Environmental Management Activities. Environmental management activities are curren planned or in progress at each major functional area on ORR. These activities are summarized below.

K-25. The site D&D program will continue to perform Phase I activities including th removal of hazardous materials, utilities, ventilation, lubrication, and cooling sy from the buildings until 1998. In addition, uranium deposits will be removed from p equipment; buildings will be characterized for radiological contamination; and pilo projects will be implemented to test and evaluate technologies before full-scale decontamination, dismantlement, and demolition of the buildings take place. DOE's o TSCA mixed waste incinerator is located at K-25.

Within the environmental restoration program, site assessments will continue to be focus through 1998. Investigations will proceed according to priorities based on ri to human health and the environment. In addition, ongoing remediation work will con and interim corrective actions will be initiated as needed.

Oak Ridge National Laboratory. The primary outlook for waste management activities Ridge National Laboratory is to provide waste treatment, storage, and disposal supp to DOE's research and development programs. Among areas of emphasis will be increas attention to waste reduction activities, full implementation of waste certification characterization programs for all waste types, and continued improvement of facilit operations through routine maintenance, operator training, and facility upgrades an involvement of private industry capabilities.

Remedial action is proceeding in 12 of 20 regions known as waste area groupings. Th waste area groupings contain about 222 sites of contamination. Current activity is upon actions which address conditions with potential for affecting human health and environment.

Y-12. Waste management activities at Y-12 continue to treat, store, and dispose of generated by defense program activities and other resident programs. The decreasing of waste generated by defense production at Y-12 is expected to be offset by waste weapon dismantlement activities, while the volume of waste from environmental restoration and D&D activities will significantly increase. Environmental managemen activities are discussed in detail in section 4.4.2.10 and in appendix H.

Other Department of Energy Activities. Other DOE activities conducted at ORR includ missions and programs of K-25, Oak Ridge National Laboratory, Y-12, nondefense prog missions, and the Oak Ridge Institute for Science and Education.

K-25 serves as the operations center for the management and operations contractor's programs. K-25 also houses DOE's Center for Environmental Technology and Center for

Waste Management. Missions include activities in technology development; technology transfer; engineering technology; uranium enrichment support; and engineering, comp and telecommunications.

Oak Ridge National Laboratory supports DOE activities in energy production and conservation technologies, physical and life sciences, scientific and technological facilities, environmental protection and waste management, science and technology transfer, and education. Oak Ridge National Laboratory also supplies radioactive an stable isotopes that are not available from the private sector.

In addition to the defense program activities described previously, Y-12 provides s to Oak Ridge National Laboratory and other government agencies for processing sourc materials. The Oak Ridge Institute for Science and Education's primary missions are provide educational and research programs in the areas of health, environment, and for DOE, other Federal agencies, and privateindustry.

Non-Department of Energy Activities. At present, the only non-DOE activity at ORR i ongoing meteorological and atmospheric diffusion research work at the National Ocea Atmospheric Administration Atmospheric Turbulence and Diffusion Laboratory. This fa also provides services to DOE contractors and operates the Weather Instrument Telemonitoring Monitoring System for DOE. The site also provides support for Depart Defense programs as needed.

Environmental Regulatory Setting. The Department is working with Federal and state regulatory authorities to address compliance and cleanup obligations arising from i past operations at ORR. The Department is engaged in several activities to bring it operations into full regulatory compliance. These activities are set forth in negot agreements that contain schedules for achieving compliance with applicable requirem and financial penalties for nonachievement of agreed upon milestones. A brief descr of the environmental regulatory setting at ORR follows. More detail is available in appendix section A.1.3.

The State of Tennessee has regulatory authority for air, water, solid waste, hazard waste, and mixed waste (hazardous component only). DOE and the State of Tennessee h signed a Monitoring and Oversight Agreement intended to assure Tennessee citizens t their health, safety, and environment are being protected during ORR facility opera Under this agreement, DOE will provide financial support to allow the State of Tenn to carry out its commitment under the Monitoring and Oversight Agreement and the Fe Facility Agreement regarding cleanup activities.

EPA placed ORR on the NPL on December 21, 1989. To satisfy the requirement for an interagency agreement, DOE, EPA Region IV, and the State of Tennessee completed a Federal Facility Agreement effective January 1, 1992.

On March 26, 1993, EPA Region IV certified that DOE had completed all of the action required by the ORR Radionuclide National Emissions Standards for Hazardous Air Pol (NESHAP) Federal Facility Compliance Agreement that they entered into on October 31 ORR is now considered to be in compliance with the National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities (4 61, Subpart H).

Activities are underway to reduce discharges of priority pollutants, high temperatu water, and toxic agents such as chlorine to the East Fork Poplar Creek. NPDES permi required for each ORR facility. A renewed NPDES permit was issued to K-25 on Octobe 1992. The ORNL is operating under the provisions of its expired permit while the St Tennessee acts on the remaining NPDES permit renewal. ORNL submitted a request for modification of its NPDES permit based on evidence that past exceedances of permit for total suspended solids, oil, and grease have not impacted watershed water quali Y-12's NPDES permit was approved on July1, 1995.

ORR facilities are being operated with a combination of RCRA Part B permits and int status regulations. The RCRA Part B permit applications have been submitted for all the active storage and treatment units listed on the Part A permit. The Federal Fac Compliance Agreement signed by EPA and DOE on June 12, 1992, addresses ORR complian

the Land Disposal Restrictions of the Hazardous and Solid Waste Amendments of 1984, allowing ORR to continue to operate, and to generate and store mixed wastes. This agreement and subsequent plans would form the basis for the ORR site-specific treat plan required by the Federal Facility Compliance Act of 1992.

TSCA requires that PCB wastes be disposed of within 1 year of initial storage. Howe some PCB wastes are not acceptable to the TSCA incinerator at K-25 and therefore ha stored in excess of 1 year. On June 11, 1992, DOE formally requested negotiation of Federal Facility Compliance Agreement with EPA to allow development of a treatment disposal schedule for ORR's radioactive PCB-contaminated waste and storage or dispo per the Agreement.

3.3.5 Pantex Plant

Pantex is located about 17 miles northeast of Amarillo, TX, on approximately 10,000 Pantex was originally constructed by the U.S. Army as a conventional bomb plant ear during World War II and was deactivated and vacated after the war. In 1949, Texas Technological College (Texas Tech) purchased the entire site for a token fee of $1 in experimental agriculture. However, in 1951, the Atomic Energy Commission asked t to "recapture" the main plant and 10,000 surrounding acres for use as a nuclear wea production facility, at which time the plant was refurbished and expanded. Pantex a the weapons modification functions of the Clarksville, TN, and Medina, TX, plants i 1965 and 1966, respectively. In 1975, Pantex absorbed the functions of the decommis Burlington Plant in Iowa. In 1984, an additional 5,800 acres of the original site w leased back from Texas Tech to serve as a security buffer zone between the main pla and U.S. Highway60.

Pantex functions include the fabrication of chemical explosives; nuclear weapons as disassembly, testing, quality assurance, repair, and nonnuclear component disposal; development work in support of the design laboratories. Pantex is the only DOE faci that can execute the final assembly of a nuclear weapon for the DOD stockpile, incl the joining of plutonium pits to the chemical explosive main charges to form primar assemblies. In the near term, weapons disassembly and component storage activities dominate activities at Pantex. Facilities at Pantex will not be downsized or consol to a significant degree. Due to ongoing activities to reduce the weapons stockpile, has developed a capability for sealed pit storage. The present storage capacity is units although DOE has agreed to store no more than 12,000 units at Pantex until it completes a site-wide EIS. The current missions and functions are listed in table3.

Defense Program Activities. Almost all activities at Pantex are related to the defe program. Brief descriptions for operations falling under plant missions and functio provided in the followingparagraphs.

Table 3.3.5-1.-Current Missions at Pantex Plant

Mission	Description	Sp
Plutonium Storage	Provide required plant facility.	As Pr
High Explosive(s) Components	Manufacture for use in nuclear weapons.	As Pr
Weapon Assembly	Assemble nuclear weapons for the stockpile.	As Pr
Weapon Maintenance	Retrofit, maintain, and repair stockpile weapons.	As Pr

Quality Assurance	Stockpile quality assurance testing and evaluation.	As Pr
Weapon Disassembly	Disassemble stockpile weapons as required.	As Pr
Test/Training Programs	Assemble nuclear weapon-like devices for training.	As Pr
Weapons Dismantlement	Dismantle nuclear weapons no longer required.	As Pr
Development Support	Provide support to design agencies as requested.	As Pr
Support Services	Provide required plant support services.	As Pr
Waste Management	Provide waste management and D&D activities.	As En

High explosive(s) (HE) components production includes: manufacturing main charge subassemblies and mock components for use in weapon test assemblies; manufacturing HE components; producing a variety of explosive materials from chemical reactants a commercially produced explosives; and evaluating explosive materials and components through a variety of analytical, mechanical, and explosive tests. New production in context of the Pantex mission is defined as the final assembly of a new nuclear wea Pantex receives weapons components and other materials from throughout the DOE Comp from the U.S. military. Historically, the DOE facilities at SRS, Y-12, the Rocky Fl Environmental Technology Site (formerly known as the Rocky Flats Plant), and the Ka City Plant, located in Kansas City, MO, have contributed components and subassembli use in the final assembly of nuclear weapons. After final assembly, the items produ Pantex are shipped either to other facilities within the DOE Complex or to military facilities by safe secure trailers.

Modification, maintenance, and repair involves the disassembly of a stockpiled nucl weapon so that one or more of the components can be repaired, replaced, or modified replacing the components, the weapon is reassembled and returned to the stockpile. Pantex also performs many quality assurance evaluation activities on both new and stockpiled nuclear weapons. These tests involve the disassembly of a weapon, the laboratory testing of various components, and the rebuilding of the weapon for ship back to the stockpile. The plant also disassembles nuclear weapons no longer needed stockpile.

In addition to the primary efforts associated with weapons assembly and disassembly Pantex provides development support and services to the nuclear weapon design agenc to other government entities as requested. Pantex contains a number of facilities t stage weapon components destined either for the assembly cells or for shipment back other DOE facilities. Staging procedures may involve the leak testing of staging containers, inventory procedures to verify the number and contents of containers, a unpacking and repacking to physically verify and test contents.

Environmental Management Activities. Waste management operations at Pantex in the n term (1996 to 1997) would add facilities to enhance capabilities to adequately hand existing waste streams. New facilities for HE incineration and hazardous waste stag treatment, and storage would be coupled with increased use of commercial offsite facilities to treat mixed waste streams. The long-range outlook (5 to 30 years) ind increased waste generation as a result of accelerated retirement of the weapons inv New waste-handling capacities may be required to meet this need, such as new recycl markets. However, upon completion of the current backlog of dismantlements due to t recent stockpile reductions, this waste generation will decrease. Environmental man

activities are discussed in detail in section 4.5.2.10 and in appendixH.

Environmental Regulatory Setting. The Department is working with Federal and state regulatory authorities to address compliance and cleanup obligations arising from i past operations at Pantex. The Department is engaged in several activities to bring operations into full regulatory compliance. These activities are set forth in negot agreements that contain schedules for achieving compliance with applicable requirem and financial penalties for nonachievement of agreed upon milestones. A brief descr of the environmental regulatory setting at Pantex follows. More detail is available appendix section A.1.4.

DOE entered into an Agreement in Principle, effective July 31, 1990, with the State Texas to independently determine and verify any plant operational impacts to the environment. Pursuant to the terms of this agreement, DOE agrees to provide technic financial support to the state agencies responsible for waste management, environme monitoring, and emergency response planning at Pantex. DOE will provide the State w chemical and radiological contaminant inventory and assessment of the plant. The Te Natural Resources Conservation Commission implemented an environmental monitoring program at Pantex and is providing an independent evaluation of environmental monit data. EPA placed Pantex on the NPL on May 31, 1994.

The city of Amarillo operates a major water supply well field immediately north and gradient of Pantex. Pantex receives its drinking water via five groundwater wells l on the northeast corner of the plant. The water is treated onsite and tested in acc with requirements for public drinking water systems. The domestic water supply at P meets all of the national primary and secondary drinking water standards for noncom nontransient public water supply systems. The system is being operated and maintain compliance with the State of Texas statutes and regulations.

On April 25, 1991, the EPA and the Texas Natural Resources Conservation Commission a hazardous waste permit to Pantex to manage hazardous and industrial solid wastes operate a hazardous waste treatment, storage, and disposal facility. Pantex thermal treats explosive waste and explosive-contaminated waste at the Burning Ground. The hazardous waste permit specifically excluded the 17 RCRA units at the Burning Groun continued the interim status of the units which can operate under their "Written Gr Authority" from the Texas Natural Resources Conservation Commission. In November 19 formally submitted to the State of Texas a request for a modification to add the un the Burning Ground to its hazardous waste permit. The State of Texas, DOE, and part the hearing process are continuing discussions on terms of the proposed permit modification.

3.3.6 Savannah River Site

SRS, located on approximately 198,000 acres near Aiken, SC, became operational in 1 The major nuclear facilities at SRS have included fuel and target fabrication facil nuclear material production reactors; chemical separation plants used for recovery plutonium and uranium isotopes; a uranium fuel processing area; and the Savannah Ri Technology Center that provides process support.

Tritium recycling facilities empty tritium from expired reservoirs, purify it to el the helium decay product, and fill replacement reservoirs with specification tritiu nuclear stockpile weapons. Filled reservoirs are delivered to Pantex for weapons as and directly to DOD as replacements for expired reservoirs. Historically, DOE has p tritium at SRS. However, DOE has not produced new tritium since 1988. Until a new s facility is online, DOE will not have an assured long-term tritium production capab

Plutonium and spent nuclear fuel processing at SRS have been terminated. DOE is cur preparing a separate EIS to explore the use of these facilities to stabilize existi quantities of plutonium residues. Tritium recycling operations will continue with t

Replacement Tritium Facility conducting the majority of these operations. As part o nonnuclear consolidation, SRS is also in the process of receiving some of the triti processing functions performed at the Mound Plant in Miamisburg, OH.

The current missions at SRS are shown in table 3.3.6-1. These activities can be categorized as defense program, environmental management, nuclear energy, and other activities.

Defense Program Activities. In the past, the SRS complex for the production of nucl materials consisted of five reactors (the C-, K-, L-, P-, and R-Reactors) in additi a fuel and target fabrication plant, two target and spent nuclear fuel chemical sep aration plants, a tritium-target processing facility, a heavy water rework facility waste management facilities. Recently, the K-Reactor, the last operational reactor, put into cold standby status with no planned provision for restart, thus ending all tritium and special isotope production capability. SRS is conducting tritium-recycl operations in support of stockpile requirements using retired weapons as the tritiu supply source.

Environmental Activities. Environmental management is pursuing a 30-year plan to ac full compliance with all applicable laws, regulations, and agreements; treat, store dispose of existing waste; reduce generation of new wastes; clean up inactive waste remediate contaminated groundwater; and dispose of surplus facilities. Environmenta management activities are discussed in detail in section 4.6.2.10 and appendix H.

Other Department of Energy Activities. The Savannah River Technology Center provide technical support to all DOE operations at SRS. In this role, it provides process engineering development to reduce costs, waste generation, and radiation exposure. continues to provide Pu-238 required to support space programs and has an expanding mission to transfer unique technologies developed at the site to industry. SRS is a active participant in the Strategic Environmental Research and Development Program formulated to develop technologies to mitigate environmental hazards at DOD and DOE

Table 3.3.6-1.-Current Missions at Savannah River Site

Mission	Description	Sponso
Tritium Recycling	Operate H-Area tritium facilities.	Assist Progra
Space Program Support	Provide Pu-238 for space program missions.	Office
Interim Plutonium Storage	Operate Plutonium Storage Facility Vault.	Assist Progra
Waste Management	Operate waste processing facilities.	Assist Enviro
Environmental Monitoring and Restoration	Operate remediation facilities.	Assist Enviro
Process Backlog Targets and Spent Nuclear Fuel	Operate F- and H-Canyons.	Assist Progra
Research and Development	Savannah River Technology Center Technical support of DP, EM, and Nuclear Energy programs.	Assist Progra for En Office
Other DOE and non-DOE Missions	Various, as described in text.	Variou

Non-Department of Energy Activities. There are several facilities and operations at such as the Savannah River Forest Station, the Savannah River Ecology Laboratory, a Institute of Archaeology and Anthropology. The Savannah River Forest Station is an administrative unit of the U.S. Forest Service that provides timber management, res support, soil and water protection, wildlife management, secondary roads management fire management to DOE. The Savannah River Forest Station manages 154,000 acres (approximately 80 percent of the site area). It has been responsible for reforestat manages an active timber business. The Savannah River Forest Station assists with t development and updating of site-wide land use and provides continual support with layout and vegetative management. It also assists in long-term wildlife management soil rehabilitation projects.

The Savannah River Ecology Laboratory is operated for DOE by the Institute of Ecolo the University of Georgia. It has established a center of ecological field research faculty, staff, and students perform interdisciplinary field research and provide a understanding of the impact of energy technologies on the ecosystems of the southea United States. This information is communicated to the scientific community, govern agencies, and the general public. In addition to Savannah River Ecology Laboratory studies, the Institute of Archaeology and Anthropology is operated by the Universit South Carolina to survey the archaeological resources of SRS. This survey is used b when planning new facility additions or modifications, and is referred to in the operations management of the site.

Environmental Regulatory Setting. The Department is working with Federal and state regulatory authorities to address compliance and cleanup obligations arising from i past operations at SRS. The Department is engaged in several activities to bring it operations into full regulatory compliance. These activities are set forth in negot agreements that contain schedules for achieving compliance with applicable requirem and financial penalties for nonachievement of agreed upon milestones. A brief descr of the environmental regulatory setting at SRS follows. More detail is available in appendix section A.1.5.

The State of South Carolina has regulatory authority for air, water, solid waste, hazardous waste, and mixed waste. DOE and the State of South Carolina have signed a Memorandum of Agreement whereby SRS agrees to abide by South Carolina environmental as any other industry in the state, and will also implement an environmental manage plan and report regularly on the progress of that plan.

EPA placed SRS on the NPL effective December 21, 1989. DOE entered into a Federal F Agreement effective August 16, 1993, with the EPA and the State of South Carolina t coordinate CERCLA and RCRA cleanups under one comprehensive strategy, that expands ongoing RCRA Facility Investigation Program. This strategy governs the corrective/r dial action process from site investigation through site remediation, including sch for producing work plans and facilitating public involvement in decision-making processes.

DOE and EPA entered into the Federal Facility Compliance Agreement for NESHAP on Oc 31, 1991, allowing SRS to continue operations while installing and certifying addit monitoring and sampling equipment. DOE issued a Letter of Commitment on October 21, 1991, agreeing to redress drinking water system deficiencies. In addition, DOE ente into a Settlement Agreement on February 27, 1990, to satisfy violations of discharg wastewater without a permit.

The Federal Facility Compliance Agreement signed by EPA and DOE on March 13, 1991, addresses SRS compliance with the Land Disposal Restrictions of the Hazardous and S Waste Amendments of 1984, allowing SRS to continue to operate, generate, and store wastes. This agreement was amended on April 24, 1992, to include mixed wastes whose treatment standards are outlined in the Land Disposal Restrictions Third Thirds Rul CFR 268.35) and an alternative treatment strategy for M-Area waste. This amended agreement would form the basis for the SRS mixed waste site-specific treatment plan required by the Federal Facility Compliance Act of 1992.

TSCA requires PCB wastes to be disposed of within one year of its initial storage.

currently storing radioactive PCB-contaminated equipment and materials past the all storage cutoff date. Due to the radioactive nature of these wastes, treatment capab for these wastes is not currently available. DOE is developing this treatment capab and working with South Carolina to approve a treatability study to remove the PCB contamination and return the radioactive materials to SRS as LLW.

3.3.7 Commercial Light Water Reactor Site

The commercial light water reactor alternative does not include a specific site for analysis in the PEIS. Any one of the existing operating commercial nuclear reactors partially completed reactors is a potential candidate site for the tritium supply m Currently, 109 commercial nuclear power plants are located at 71 sites in 32 of the contiguous states. Of these, 53 sites are located east of the Mississippi River. No commercial nuclear power plants are located in Alaska or Hawaii. Approximately one- of these 71 sites contain two or three nuclear units per site.

Typically, commercial nuclear power plant sites and the surrounding area are flat-to-rolling countryside in wooded or agricultural areas. More than 50 percent o sites have 50-mile population densities of less than 200 persons per square mile an 80 percent have 50-mile densities of less than 500 persons per square mile.

Site areas range from 84 acres to 30,000 acres. Twenty-eight site areas range from 1,000 acres and an additional 12 sites are in the 1,000 to 2,000acre range. Thus, a 60 percent of the plant sites encompass 500 to 2,000 acres. The larger land-use are associated with plant cooling systems that include reservoirs, artificial lakes, an buffer areas.

3.4 Tritium Supply Technologies and Recycling

Four new tritium supply technologies are being considered in this PEIS: HWR, MHTGR, ALWR, and APT. Each of these would be either collocated with a new tritium recyclin facility or use upgraded recycling facilities at SRS. The PEIS also considers purch a commercial reactor and conversion to defense purposes or use of a commercial reac irradiation services. These commercial reactor alternatives would use upgraded recy facilities and new extraction and target fabrication facilities at SRS. These triti supply technologies and recycling facilities and their construction, operation, and generation data are discussed in the following sections.

3.4.1 Background

Tritium, primarily a man-made radioactive isotope of hydrogen, is an essential comp of all United States nuclear weapons. Tritium is needed by warheads to ensure that perform as designed. Because of its radioactive decay, the tritium in the warheads periodically replenished. Because it is so rare in nature, all tritium used for wea and other applications is man-made. However, no new tritium has been produced in th United States since 1988, when all of the tritium-producing reactors at SRS were sh down. Had the Cold War continued, the nuclear weapons stockpile would have quickly of tritium if no new tritium were produced. However, because of agreements between United States and Russia, many nuclear weapons are being removed from the stockpile

dismantlement. This has reduced overall demand for tritium and made more tritium av to support the remaining stockpile. Eventually, however, even this tritium will dec the point that there will not be enough to meet all nuclear weapons stockpile requirements. A new facility for producing new tritium will be needed early in the century. The overall tritium supply and recycling complex is depicted in figure 3.4

3.4.1.1 Production of Tritium

The production of tritium occurs when target materials containing lithium-6 or the helium-3 are exposed to neutrons. The subsequent absorption of neutrons by the targ atoms causes the target atom to become highly unstable, breaking apart almost instantaneously, leaving tritium as one of the decay products. After neutron bombar the target material is removed and the tritium extracted. In the case of the three reactor technologies analyzed in this PEIS (HWR, MHTGR, and ALWR), neutrons are pro by fission of uranium which has been enriched with U-235. In the case of the proton accelerator, neutrons are produced by the impact of high energy protons in a heavy target, such as lead or tungsten. Such a process is called nuclear spallation.

3.4.1.2 Construction

Construction of each tritium supply technology would involve heavy construction equ such as bulldozers, dump trucks, cranes, concrete trucks, and paving equipment. Construction time would vary from 5 to 9 years, depending upon the tritium supply technology. Heavy duty construction activity would fluctuate during the course of construction. At various times there would be increases in the number of workers, vehicular traffic, and noise.

Construction activity for each of the tritium supply technologies would require a c amount of onsite clearing and excavation activity for the laying of foundations, th laying of utility cables for electrical systems, and the installation of undergroun water and sewage systems. Substantial below ground construction would be required f MHTGR reactor modules and the APT accelerator tunnel.

A construction laydown area would be required for each technology for the purpose o storing raw materials, building supplies, and construction equipment. The size of e laydown area would vary (173 acres to 360 acres), depending on the tritium supply technology, and generally would not exceed the eventual operation area.

3.4.1.3 Operation

Although not all of the four technologies use the same methods to produce tritium, all share common operations facilities. In addition to security, general services, administrative activities, each technology would require an extraction facility to separate the newly produced tritium from target rods or blankets, a waste treatment facility to process generated waste and a spent nuclear fuel storage area to store fuel assemblies. A spent fuel storage facility would not be required for the APT be fuel rods are not used in this technology. Additionally, all of the tritium technol would require a cooling system, an adequate source of water, and in some cases, a c basin.

Figure (Page 3-28)
Figure 3.4.1-1.-Tritium Supply and Recycling Complex.

Each of the reactor technologies would require a periodic changing of the fuel and rods. Target rods or assemblies would be placed in cooling pools for a short period time to allow decay of short-lived activation products prior to tritium extraction. targets would then be sent to the tritium extraction facility where the tritium wou extracted from the irradiated target rods or blankets, purified, and sent to the re facility where it would be used to fill tritium reservoirs for weapons. The acceler would require removal or replacement of the target material depending on the target chosen. The recycling facility would also take reservoirs returned from the stockpi empty them, and purify the tritium for reuse in new reservoirs.

Operation for all technologies would require routine maintenance activities such as preventative maintenance and equipment repair, which are found in any industrial activity. Each of the technologies would generate LLW such as glove box tools, prot clothing, and high efficiency particulate air (HEPA) filters; mixed LLW such as rag contaminated with solvents and oils; hazardous wastes, including cleaning solvents vacuum pump oils; and normal nonhazardous wastes such as sewage and trash. Addition the reactor technologies would generate spent nuclear fuel.

3.4.1.4 Cooling Systems

Because of the heat generated by nuclear reactors and accelerators, an extensive co system would be required to keep them within specified temperature ranges. The heat dissipation system would be dependent on site characteristics. Both wet and dry coo systems would use water as the heat exchange medium. Wet or dry cooling systems can used for the reactor technologies considered in this PEIS. As previously described section 3.1, dry cooling is not presently a feasible option for the APT technology cooling would be used for it even at dry sites.

In a wet or once-through cooling system, water is drawn continuously at a high rate an adjacent body of water and circulated through a condenser. This condensor transf waste heat from the reactor or accelerator to the cooling water, and discharges it into the body of water. Hence, plants with once-through cooling systems are located near major rivers, large lakes, or an ocean, where the water supply is adequate. We systems would typically use natural draft cooling towers (figure 3.4.2.3-1) and the evaporation process to carry off heat.

Dry systems would typically use water in closed nonevaporative mechanical draft coo towers (figure 3.4.2.1-1) to carry off heat to the atmosphere by conduction through radiator like vanes with fans to move air over the vanes. There would be some water through evaporation in a dry system, but significantly less than with a wet tower. cooling towers would be used for the reactors at all dry sites (e.g., sites with li or no surface water). In this PEIS the dry sites are considered to be INEL, NTS and Pantex.

Depending on the type of cooling system selected and various other factors such as climatic conditions at the site, these cooling towers could range from 7 stories fo mechanical draft dry cooling towers to 20 to 50 stories for natural draft wet cooli towers. Typically, each unit is made of concrete and circular in shape. Natural dra cooling towers must be very tall structures in order to produce sufficient draft to properly. As a result, natural draft wet cooling towers are more expensive to build mechanical draft dry cooling towers; however their operating costs are significantl and the units are much quieter in operation. Mechanical draft dry cooling towers us consist of a number of individual units. As previously stated, they are less expens to build than natural towers but more costly to operate. This is reflected in highe utility costs, especially for electricity.

3.4.1.5 Decontamination and Decommissioning

D&D activities would be carried out at the end of the facility's life to permit the facility to be removed safely from service and to enable the property to be used fo purposes. The scope of work required for D&D activities can range from performing a radiological survey to completely dismantling and removing a radioactively-contamin facility.

Although D&D activities do not begin until the end of a facility's life, planning f begins in the design phase. All proposed tritium supply technologies and recycling facilities would be designed to minimize facility equipment contamination and there future D&D of such facilities as simple and inexpensive as feasible, and to minimiz impacts of future D&D, as required by DOE Orders 5820.2A, Radioactive Waste Managem 6430.1A, General Design Criteria. Further discussion of future D&D requirements is presented in section 4.14. Examples of design features that may be incorporated int tritium supply and recycling facilities to facilitate future D&D are:

Modular, separable confinements for radioactive and other hazardous materials that preclude contamination of fixed portions of the structure.

Localized liquid transfer systems that avoid long runs of buried contaminated pipin including special provisions that ensure the integrity of joints in buried pipeline

Exhaust filtration components of the ventilation systems at or near individual enclosures to minimize long runs of internally contaminated ductwork.

Equipment, including effluent decontamination equipment, that precludes the accumul of radioactive or other hazardous materials in relatively inaccessible areas, inclu curves and turns in piping and ductwork.

Easily decontaminated materials that reduce the amount of radioactive and other haz materials requiring disposal.

Designs that ease cutup, dismantlement, removal, and packaging of contaminated equi from the facility.

Modular radiation shielding in lieu of or in addition to monolithic shielding walls

Lifting lugs on large tanks and equipment.

Fully drainable piping systems that carry contaminated or potentially contaminated liquids.

3.4.2 Tritium Supply Technologies

Of the tritium supply technologies considered by DOE for the production of tritium PEIS, only the HWR has tritium production operating experience. The light water rea (upon which the ALWR and commercial reactor alternative are based) and gas reactor technologies have been used in electrical power production but lack tritium product experience and development of tritium target technology. The APT technology, which an operating history in research and development programs, also has no tritium prod experience and only recent development of tritium targets.

Since the MHTGR, ALWR, and the commercial reactor were developed originally to prod electricity and as such have steam turbines as an integral part of their designs, t

PEIS evaluates the environmental effects of both of these technologies with turbine included. The actual sale of steam or generation of electricity by DOE would be cov in the site-specific tiered NEPA documents if either of these technologies were cho DOE developed a proposal to sell steam or generate electricity. The general impacts transmission lines necessary to carry this generated electricity are discussed in s 4.8.1. In addition, the general impacts of constructing and operating a power plant (either coal or natural gas burning) to provide the required power for the APT are presented in section 4.8.2. As both the MHTGR and the ALWR technologies could also for the ultimate disposition of plutonium by burning mixed-oxide fuel, the general of operating these two technologies with mixed-oxide fuel is presented in section 4 The site-specific impacts of a gas-fired power plant and a multipurpose reactor are described for affected resources in sections 4.2 through 4.6.

3.4.2.1 Heavy Water Reactor

The HWR would be a low pressure, low temperature reactor whose sole purpose would b produce tritium. A detailed description of the HWR technology and its operation is provided in appendix A. The HWR would use heavy water as the reactor coolant and moderator. Because of the low temperature of the exit coolant, a power conversion s designed to produce electrical power as an option would not be feasible. In additio the reactor, the HWR complex would consist of several support buildings and other facilities required for the supply and extraction of tritium.

The HWR complex would cover approximately 260acres and would be surrounded entirely security fence. The main reactor would be about 10 stories high and other associate buildings would range from one story to three stories in height. The cooling towers vary in height, depending on the type of cooling towers utilized. The cooling tower which serves as a holding pond for the cooling towers, would cover approximately 2 In this PEIS dry sites (INEL, NTS, and Pantex) would use mechanical draft dry cooli towers while wet sites (ORR and SRS) would use natural draft wet cooling towers.

The conceptual design of the HWR complex includes a fuel and target fabrication fac to assemble fuel and target rods that are used in the reactor core; a tritium targe processing facility to extract and collect tritium from irradiated targets; an inte spent fuel storage building to store used target and fuel rods; a general services building for administrative purposes; and security infrastructure to control access complex. Figure 3.4.2.1-1 shows a representative drawing of an HWR complex with mechanical draft cooling towers for illustrative purposes only. The number and arra of buildings and support areas are descriptive only and can change significantly as progresses. The fuel and target fabrication facility would be a steel or concrete structure designed to control the spread of contamination within the building and p the uncontrolled release of radioactive material. The target processing facility wo consist of two attached structures; a process building and a support building. The building would include the laboratory, and other activities associated with handlin tritium. The support building contains offices, maintenance areas, and nonradioacti ventilation systems.

The design of the HWR would incorporate numerous safety features including: an emer power facility to house diesel generators or gas turbines for short-term emergency to support safety related loads in the event of temporary failure of the offsite po supply; a reactor containment building to limit any operational or accidental relea radioactivity, an emergency core cooling system to makeup coolant for heat removal event of a loss of coolant or a loss of pumping; an emergency shutdown system with rods independent of the reactor control rods; a neutron poison system to inject neu absorbing material into the moderator tank; and a backup system to remove heat from reactor if the primary coolant fails to circulate.

Construction of the HWR would take somewhat less than 8 years and require approxima 2,320workers during the peak construction period. The construction area would be

approximately 260acres. Once constructed, approximately 1 to 2years would be needed systems checkout of the reactor prior to actual tritium production. Construction an operation requirements for the HWR are given in tables 3.4.2.1-1 and 3.4.2.1-2. Est waste generation data for the HWR facility are given in table 3.4.2.1-3.

Figure (Page 3-32)
Figure 3.4.2.1-1.-Heavy Water Reactor Facility (Typical).

Table 3.4.2.1-1.-Heavy Water Reactor Construction Requirements

Requirement	Consumption
Material/Resources	-
Electrical energy (MWh)	87,000
Concrete (yd3)	220,000
Steel (tons)	45,000
Gasoline, diesel fuel, and lube oil (gal)	2,400,000
Water (gal)	170,000,000
Land disturbance (acres)	260
Employment	-
Total employment (worker years)	9,760
Peak employment (workers)	2,320
Construction period (years)	8

Source: DOE 1995d.

Table 3.4.2.1-2.-Heavy Water Reactor Operation Requirements

Requirement	Consumption
Electrical Energy (MWh/yr)	-
Wet site	370,000
Dry site	540,000
Electrical Load (MWe)	-
Wet site	51
Dry site	69
Fuel	-
Gas (ft3/yr)	240,000,000
Liquid (GPY)	82,000
Water (MGY)	-

Wet site	5,900
Dry site	48
Plant Footprint	-
Plant (acres)	260
Employment	-
Total workers	930
Badged workers	230

Source: DOE 1995d.

Table 3.4.2.1-3.-Heavy Water Reactor Estimated Spent Nuclear Fuel and Waste Volumes

-	Annual Average Volume Generated From Construction	Annual Volume Gene From Operations
Category	(yd3)	(yd3)
Spent Nuclear Fuel	None	7
Low-Level	-	-
Liquid	None	10,400 (2,100,000 gal)
Solid	None	5,200
Mixed Low-Level	-	-
Liquid	None	None
Solid	None	120
Hazardous	-	-
Liquid	Included in solid	Included in solid
Solid	20	40
Nonhazardous (Sanitary)	-	-
Liquid	79,220 (16,000,000 gal)	238,000 (48,000,000 gal)
Solid	7,800	7,600
Nonhazardous (Other)	-	-
Liquid	2,570 (520,000 gal)	Included in sanitary
Solid	Included in sanitary	6,500

3.4.2.2 Modular High Temperature Gas-Cooled Reactor

The MHTGR would be a high temperature, moderate pressure reactor whose primary purp would be to produce tritium. A detailed description of the MHTGR technology and its operation is provided in appendix A. The MHTGR would use helium gas as a core coola graphite as a moderator. Because of the high temperature of the exit coolant, a pow conversion facility designed to produce electricity is an integral part of the desi will be included in this analysis. In addition to the reactor building and the powe conversion building, the MHTGR complex would consist of several buildings and other facilities required for the supply and extraction of tritium.

The MHTGR complex would cover approximately 360 acres and would be surrounded entir a security fence. The MHTGR would consist of three 350 MWt reactor vessels housed i adjacent, below-grade, reinforced-concrete silos. The silos would extend approximat 160 feet below-grade and each reactor vessel would be about 22 feet in diameter and feet high. Each reactor vessel would contain a reactor core, reflectors, and associ supports. A shutdown cooling heat exchanger and a shutdown cooling circulator would located at the bottom of the vessels. Support buildings and other associated facili within the MHTGR complex would range in height from one to three stories. Two cooli towers would be needed and their height would vary, depending on the type of coolin towers that are utilized. In this PEIS dry sites (INEL, NTS, and Pantex) would use mechanical draft dry cooling towers and wet sites (ORR and SRS) would use natural d wet cooling towers.

The design of the MHTGR complex would include a fuel and target fabrication facilit tritium target processing building, helium storage buildings, waste treatment facil spent fuel storage facility, a general services building, a security infrastructure power conversion facility consisting of three turbine-generators and associated ele control equipment. Figure 3.4.2.2-1 shows a representative drawing of a MHTGR compl mechanical draft cooling towers shown for illustrative purposes only. The number an arrangement of buildings and support areas are descriptive only and can change significantly as design progresses.

The design of the MHTGR would incorporate numerous safety features that include: an emergency power facility to house diesel generators or gas turbines for short-term emergency power to support safety related loads in the event of temporary failure o offsite power supply; a below-grade design, which serves as a barrier to external h (aircraft, turbine blades, and tornado-generated debris), reduces seismic-induced s on the reactors, and provides radiological shielding; a below-grade containment structure made of reinforced concrete; an emergency core cooling system; and an eme shutdown system with safety rods independent of the reactor control rods.

Construction of the MHTGR would take about 9 years and require approximately 2,210 during the peak construction period. The construction area would be approximately 3 acres. One to two years would be needed after construction for system check-out of reactor prior to actual tritium production. Construction and operation requirements the MHTGR are given in tables 3.4.2.2-1 and 3.4.2.2-2. Estimated waste generation d the MHTGR complex are given in table 3.4.2.2-3

Figure (Page 3-35)
Figure 3.4.2.2-1.-Modular High Temperature Gas-Cooled Reactor Facility (Typical).

Table 3.4.2.2-1.-Modular High Temperature Gas-Cooled Reactor Construction Requireme

Requirement	Consumption
Material/Resources	-
Electrical energy (MWh)	73,000
Concrete (yd3)	220,000
Steel (tons)	60,000
Gasoline, diesel fuel, and lube oil (gal)	3,200,000
Water (gal)	160,000,000
Land Disturbance (acres)	360
Employment	-
Total employment (worker years)	8,810
Peak employment (workers)	2,210
Construction period (years)	9

Source: DOE 1995e.

Table 3.4.2.2-2.-Modular High Temperature Gas-Cooled Reactor Operation Requirements

Requirement	Consumption
Electrical Energy (MWh/yr)	-
Wet site	260,000
Dry site	360,000
Electrical Load (MWe)	-
Wet site	36
Dry site	46
Fuel	-
Gas (ft3/yr)	6,000,000
Liquid (GPY)	81,000
Water (MGY)	-
Wet site	4,000
Dry site	30
Plant Footprint	-
Plant (acres)	360
Employment	-
Total workers	910

Badged workers	180

Source: DOE 1995e.

Table 3.4.2.2-3.-Modular High Temperature Gas-Cooled Reactor Estimated Spent Nuclea and Waste Volumes

-	Annual Average Volume Generated From Construction	Annual Volume Gene Operations
Category	(yd3)	(yd3)
Spent Nuclear Fuel	None	80
Low-Level	-	-
Liquid	None	2,600 (525,000 gal)
Solid	None	1,300
Mixed Low-Level	-	-
Liquid	None	None
Solid	None	<1
Hazardous	-	-
Liquid	Included in solid	Included in solid
Solid	20	100
Nonhazardous (Sanitary)	-	-
Liquid	64,400 (13,000,000 gal)	149,000 (30,000,000 gal)
Solid	7,100	7,400
Nonhazardous (Other)	-	-
Liquid	3,020 (610,000 gal)	Included in sanita
Solid	Included in sanitary	6,400

3.4.2.3 Advanced Light Water Reactor

The ALWR would be a high temperature, high pressure reactor whose primary purpose w to produce tritium. There are two options for the proposed ALWR technology: a Large (1,300MWe) and a Small ALWR (600 MWe). The large and small options would be chosen the following four candidates: a large or small pressurized water reactor or a larg small boiling water reactor. A detailed description of the ALWR technology options their operations is provided in appendix A. All ALWR options would use light (regul water as the reactor coolant and moderator. Like the MHTGR, a power conversion faci (steam turbine) is an integral part of the design for the ALWR because of the high temperature of the exit coolant and will be included in this analysis. In addition reactor building, the ALWR complex would consist of several support buildings and o facilities for the supply and extraction of tritium.

The ALWR would cover approximately 350 acres and the whole complex would be surroun a security fence. The main reactor building would be approximately 10 stories high. other associated buildings would range from one to three stories in height. The differences between the large and small options are primarily in the power output o reactors. Both of the small reactors are rated at 600 MWe, while the large options rated at 1,300 MWe. The physical sizes of the large and small options for each of t technologies are generally the same.

In addition to the reactor, the ALWR complex would include an interim spent fuel st building, a waste treatment facility, a tritium target processing facility, warehou and a power conversion facility. Unlike the other technologies, the ALWR would not fuel fabrication facility since fuel rods would be obtained from offsite sources. F 3.4.2.3-1 shows a representative drawing of an ALWR complex with a natural draft co tower shown for illustrative purposes only. The number and arrangements of building support areas are descriptive only and can change significantly as design progresse

The tritium target processing facility would consist of the following two attached structures: a processing building and a support building. The process building woul include the tritium extraction processes, laboratory, and other activities associat with handling tritium. The support building contains offices, maintenance areas, an nonradioactive ventilation systems. The type of cooling tower used depends upon whe the ALWR is located. In this PEIS dry sites (INEL, NTS and Pantex) would use mechan draft dry cooling towers and wet sites (ORR and SRS) would use natural draft wet co towers.

The design of the ALWR would incorporate numerous safety features such as: an emerg power facility to house diesel generators or gas turbines for short-term emergency to support safety related loads in the event of temporary failure of the offsite po supply; a reactor containment building to limit any release of radioactivity; an em core cooling system to makeup coolant in the event of a loss of coolant or a loss o pumping; an emergency shutdown system; and a neutron poison system to inject neutro absorbing material into the reactor vessel.

Construction of the ALWR would take about 6 years and require approximately 3,500 w for the Large ALWR and 2,200 workers for the Small ALWR during the peak constructio period. The construction area would be approximately 350 acres. Once constructed, 1 years would be needed to check out the reactor prior to actual tritium production. Construction and operation requirements for the Large and Small ALWR are given in t 3.4.2.3-1 and 3.4.2.3-2. Estimated waste generation data for the Large and Small AL facility are given in tables 3.4.2.3-3 and 3.4.2.3-4.

Figure (Page 3-38)
Figure 3.4.2.3-1.-Advanced Light Water Reactor Facility (Typical).

Table 3.4.2.3-1.-Advanced Light Water Reactor Construction Requirements

	Consumption	
Requirement	Large ALWR	Small ALWR

Material/Resources	-	-
Electrical energy (MWh)	120,000	120,000
Concrete (yd3)	380,000	200,000
Steel (tons)	68,000	50,000
Fuel, liquid (gal)	1,500,000	1,500,000
Water (gal)	200,000,000	120,000,000
Land disturbance (acres)	350	350
Employment	-	-
Total employment (worker years)	12,600	7,100
Peak employment (workers)	3,500	2,200
Construction period (years)	6	6

Source: DOE 1995f.

Table 3.4.2.3-2.-Advanced Light Water Reactor Operation Requirements

	Consumption	
Requirement	Large ALWR	Small ALWR
Electrical Energy (MWh/yr)	-	-
Wet Site	700,000	380,000
Dry Site	1,100,000	580,000
Electrical Load (MWe)	-	-
Wet Site	96	52
Dry Site	140	75
Fuel	-	-
Gas (ft3/yr)	0	0
Liquid (GPY)	200,000	110,000
Water (MGY)	-	-
Wet site	16,000	7,200
Dry site	90	50
Plant Footprint	-	-

Plant (acres)	350	350
Employment	-	-
Total workers	830	500
Badged workers	210	125

Source: DOE 1995f.

Table 3.4.2.3-3.-Advanced Light Water Reactor (Large) Estimated Spent Nuclear Fuel Waste Volumes

-	Annual Average Volume Generated From Construction	Annual Volume Gene From Operations
Category	(yd3)	(yd3)
Spent Nuclear Fuel	None	55
Low-Level	-	-
Liquid	None	24,800 (5,000,000 gal)
Solid	None	710
Mixed Low-Level	-	-
Liquid	None	None
Solid	None	6
Hazardous	-	-
Liquid	Included in solid	Included in solid
Solid	930	35
Nonhazardous (Sanitary)	-	-
Liquid	134,000 (27,000,000 gal)	446,000 (90,000,000 gal)
Solid	15,000	6,900
Nonhazardous (Other)	-	-
Liquid	2,480 (500,000 gal)	Included in sanita
Solid	Included in sanitary	5,800

Table 3.4.2.3-4.-Advanced Light Water Reactor (Small) Estimated Spent Nuclear Fuel Waste Volumes

-	Annual Average Volume Generated From Construction	Annual Volume Generated From Operations
Category	(yd3)	(yd3)
Spent Nuclear Fuel	None	36
Low-Level	-	-
Liquid	None	3,910 (790,000 gal)
Solid	None	660
Mixed Low-Level	-	-
Liquid	None	None
Solid	None	6
Hazardous	-	-
Liquid	Included in solid	Included in solid
Solid	850	35
Nonhazardous (Sanitary)	-	-
Liquid	74,300 (15,000,000 gal)	248,000 (50,000,000 gal)
Solid	10,000	4,200
Nonhazardous (Other)	-	-
Liquid	2,480 (500,000 gal)	Included in sanitary
Solid	Included in sanitary	3,500

3.4.2.4 Accelerator Production of Tritium

The APT would be a linear accelerator whose primary purpose would be to produce tri detailed description of the APT technology and its operation is provided in appendi The APT accelerates a proton beam in a long tunnel to one of two target/blanket assemblies located in separate target stations. There are two target/blanket concep being considered in the conceptual design of the Full APT: the helium-3 target and spallation-induced lithium conversion target. The helium-3 target is the primary ta the Phased APT option.

The APT complex would cover approximately 173acres and would be surrounded by a sec fence. The accelerator, 3,940 feet in length, would be housed in a concrete tunnel 40 to 50 feet underground for radiation shielding. The design of the APT radio freq

power system and its distribution network is similar to that of existing accelerato for which there are decades of operational experience. The existing accelerators ha shown to pose no appreciable health threat to workers and the public. In addition, is no appreciable danger of interference with communications or the many signal sen electronic systems (LANL 1994a:1). The tunnel would be sealed and evacuated during operation but would vent to the atmosphere during shutdown period. The full size fa would consist of 10 cooling towers and 13substations located above-ground along the length of the underground accelerator. Additionally, there would be two cooling tow the target/blanket beam stop, located next to the target building. The cooling towe the substations would be approximately one to two stories in height.

The preconceptual design of the APT complex includes: a target building that would either the helium-3 or the spallation-induced lithium conversion target chambers lo in a subterranean structure at the same level as the accelerator; a tritium process facility to extract tritium from the targets; a klystron remanufacturing and mainte facility; waste treatment buildings to treat all generated wastes; and various administration, operation, and maintenance facilities. Figure 3.4.2.4-1 shows a rep resentative drawing of a APT complex. The number and arrangement of buildings and s areas are illustrative only and can change significantly once as design progresses.

The design of the APT would incorporate numerous safety features to include: an eme power facility to house diesel generators or gas turbines for short-term emergency to support safety related loads in the event of temporary failure of the offsite po supply; multiple sensors and diagnostics which would determine if the accelerator b out of acceptable limits in terms of position, energy, size, etc.; redundant coolin systems for all heat-removal systems; and an automatic beam shutoff in the event of of cooling, a misaligned beam, or abnormal radiation levels.

Construction of the APT would take about 5 years and require approximately 2,760 wo during the peak construction period. Additional construction area for equipment and materials would not be required since there would be sufficient unencumbered space within the APT boundaries. Once constructed, 1 to 2 years would be needed to check the accelerator prior to actual tritium production.

If desired, a phased construction of the APT could also occur. Under this scenario, initial construction of the APT would complete the majority of the civil engineerin would result in a facility that could produce the steady-state requirement (approxi 50 percent of baseline case). Expansion of the facility could be possible at a late in order to increase tritium production to the baseline requirements if necessary. expansion would consist of the addition of another injector leg, a funnel to combin proton beam with the other, and additional radio frequency power sources to acceler it. All tables display requirements for both a full production APT and a phased app to the construction of an APT. Construction and operation requirements for the APT given in tables 3.4.2.4-1 and 3.4.2.4-2. Estimated waste generation data for the AP complex are given in tables 3.4.2.4-4 and 3.4.2.4-4. An option to collocate a dedic natural gas-fueled power plant with the APT at each site is also considered. Estima construction and operation requirements for this power plant are given in tables 3.4.2.4-5 and 3.4.2.4-6.

Figure (Page 3-42)
Figure 3.4.2.4-1.-Accelerator Production of Tritium Facility Site Layout (Typical).

Table 3.4.2.4-1.-Accelerator Production of Tritium Construction Requirements

Requirement	Consumption	-
-	Full APT	Phased APT
Material/Resources	-	-
Electrical energy (MWh)	40,000	40,000
Concrete (yd3)	275,000	275,000

Steel (tons)	61,495	55,820
Gasoline, diesel fuel, and lube oil (gal)	2,110,000	2,110,000
Water (gal)	41,700,000	41,700,000
Land Disturbance (acres)	173	173
Employment	-	-
Total employment (worker years)	6,380	6,380
Peak employment (workers)	2,760	2,760
Construction period (years)	5	5

Source: SNL 1995a.

Table 3.4.2.4-2.-Accelerator Production of Tritium Operation Requirements

-	Consumption (Wet and Dry Sites)	-
Requirement	Full APT	Phased APT
Electrical Energy (MWh/yr)	3,740,000	2,400,000
Electrical Load (MWe)	550	355
Fuel	-	-
Gas (ft3/yr)	0	0
Liquid (GPY)	13,200	13,200
Water (MGY)	1,200	770
Plant Footprint	-	-
Plant (acres)	173	173
Employment	-	-
Total workers	624	624
Badged workers	258	258

Source: SNL 1995a.

Table 3.4.2.4-3.- Accelerator Production of Tritium (Full) Estimated Waste Volumes

Category	Annual Average Volume Generated From Construction (yd3)	Annual Volume Gene From Operations (yd3)
Low-Level	-	-
Liquid	None	None
Solid	None	544
Mixed Low-Level	-	-
Liquid	None	None
Solid	None	6.8
Hazardous	-	-
Liquid	Included in solid	None
Solid	13	2.5
Nonhazardous (Sanitary)	-	-
Liquid	1,570 (317,000 gal)	1,210,000 (245,000,000 gal)
Solid	5,500	1,240
Nonhazardous (Other)	-	-
Liquid	Included in sanitary	-
Solid	Included in sanitary	-

Table 3.4.2.4-4.- Accelerator Production of Tritium (Phased) Estimated Waste Volume

Category	Annual Average Volume Generated From Construction (yd3)	Annual Volume Generated From Operations (yd3)
Low-Level	-	-
Liquid	None	None
Solid	None	68
Mixed Low-Level	-	-
Liquid	None	None
Solid	None	3
Hazardous	-	-
Liquid	Included in solid	None

Solid	13	1.2
Nonhazardous (Sanitary)	-	-
Liquid	1,570 (317,000 gal)	789,000 (159,000,000 gal)
Solid	5,500	1,240
Nonhazardous (Other)	-	-
Liquid	Included in sanitary	Included in sanitary
Solid	Included in sanitary	None

Table 3.4.2.4-5.-Accelerator Production of Tritium Power Plant Construction Require

Requirement	Consumption
Land Disturbance (acres)	25
Employment	-
Total employment (worker years)	300
Peak employment (workers)	225
Construction period (years)	2

Source: Derived from text.

Table 3.4.2.4-6.-Accelerator Production of Tritium Power Plant Operation Requiremen

Requirement	Consumption (Wet and Dry Sites)
Electrical Energy Produced (MWh/yr)	3,740,000
Electrical Load (MWe)	550
Fuel	-
Gas (million ft3/yr)	54,200
Liquid (GPY)	0
Water (MGY)	80
Plant Footprint	-
Plant (acres)	25
Employment	-
Total workers	75

Source: Derived from text.

3.4.2.5 Commercial Light Water Reactor

The commercial light water reactor alternative involves either: 1) the purchase by an existing operating or partially completed commercial power reactor and the conve of the facility to tritium production for defense purposes; or 2) the purchase of irradiation services from an operating commercial power plant to produce tritium us supplied tritium target rods. Irradiation services could also be used as a continge measure to meet the projected tritium requirements for the Nation's nuclear weapons stockpile in the event of a national emergency.

Of the two types of commercial light water reactors, pressurized water reactors are readily adaptable than boiling water reactors to the production of tritium because use burnable poison rods which could be replaced by tritium targets; therefore, onl pressurized water reactors are considered for the commercial reactor alternative in PEIS. Pressurized water reactors are high-temperature, high-pressure reactors that ordinary light water as the coolant and moderator and are capable of generating lar amounts of electricity through a steam turbine-generator. The range of electricity production for these plants is approximately 390 million kWh per year to 6,900 mill per year using an assumed annual capacity factor of 62 percent. A typical light wat reactor facility includes the reactor building, cooling towers, a switchyard for th transmission of generated electricity, maintenance buildings, administrative buildi and security facilities. Acreage for existing operating commercial light water reac facilities varies in size from a low of 84 acres to a high of 30,000 acres.

The designs of typical commercial reactors incorporated numerous safety features to include: a reactor containment building to limit any release of radioactivity; an emergency core cooling system for heat removal in the even of a loss of coolant or of pumping; an emergency shutdown system with safety rods independent of the reacto control rods; a neutron poison system to inject neutron-absorbing material into the moderator tank; and a backup system to remove heat from the reactor if the primary fails to circulate.

Commercial reactor sites would have to obtain new fuel assemblies with the DOE targ included from an offsite source. Additionally, irradiated target rods would have to shipped offsite to the SRS tritium extraction and recycling facilities.

The commercial reactor production of tritium alternative includes building new trit extraction facilities at SRS and upgrading the existing tritium recycling facilitie there. Tritium target fabrication could be obtained through commercial vendors or a option a new facility could be constructed at SRS with the tritium extraction and u recycling facility. All commercial light water reactors have existing NEPA and lice documents prepared by the NRC to support construction and operation of these facili

3.4.3 Tritium Recycling and Extraction

The primary mission of the tritium recycling facility is to process and recycle tri for use in nuclear weapons. This mission includes the steps necessary to empty rese (small pressure vessels containing tritium installed in nuclear weapons), recover t tritium, provide new gas mixtures according to specifications, and reclaim usable

reservoirs. Additionally, the tritium recycling facility would perform a full range analytical, physical, and environmental tests to ensure that the quality and integr of all reservoirs are maintained throughout their operational life. It would also provide for appropriate waste management, including storage, treatment, and disposa tritiated wastes.

The tritium recycling facility would receive tritium in reservoirs returned from DO other activities, or as virgin tritium from the extraction facility that is associa with the tritium supply facility. The reservoirs would be unpacked from their shipp containers in the auxiliary building and taken to the tritium processing building f temporary storage. They would then be emptied and the contained gases would be proc to separate the hydrogen isotopes from other gases, primarily helium-3 (a stable is resulting from the radioactive decay of tritium). Prior to being placed into reserv the tritium would undergo a purification process. The empty reservoir bottles would sent to the tritium auxiliary building to be reclaimed. If reclamation is not possi the bottles would be disposed of as LLW. Otherwise, they would be refurbished and s the tritium processing building to be filled.

Reservoirs that have been filled with tritium and sealed would be transferred to th auxiliary building for finishing, where they would be decontaminated, leak tested, inspected, marked, measured for tritium content, and if required, combined with var piece parts necessary for final assembly. The reservoirs would then be placed in st until they are needed for limited life component exchange, or sent to the assembly disassembly facility for use in new weapons.

Some reservoirs would be placed in the weapon surveillance program. The tritium recycling facility would include testing capability for production, surveillance, a research and development reservoirs. In general, tests on reservoirs filled with tr would be performed in the tritium processing building, while tests on other bottles parts of bottles would be performed in the auxiliary building.

Tritium recycling could be collocated with tritium supply, or be done in existing facilities at SRS. The commercial light water reactor alternative would use the exi facilities at SRS. At SRS, an upgrade of the existing recycling facilities would be mented rather than construction of a new facility. In the case of commercial light reactor alternative, an extraction facility and possibly a target fabrication facil would be constructed in addition to the upgrade of the recycling facilities at SRS. Discussed below are the options for new or upgraded recycling facilities and a new extraction and target fabrication facility to support the commercial light water re alternative.

3.4.3.1 New Recycling Facility

If the tritium supply and recycling facilities are located at any site other than S new recycling facility would have to be constructed (figure 3.4.2.1-1). The tritium recycling facility would be housed in two major buildings and in several support facilities. The first building, the tritium processing building, would be a hardene facility designed with systems to contain tritium releases should they occur. The s building, the auxiliary building, would house non-tritium and extremely small amoun working tritium. These buildings would be located within a 196-acre plant area. Construction, operation, and waste generation data for the new tritium recycling facility are presented in tables 3.4.3.1-1, 3.4.3.1-2, and 3.4.3.1-3, respectively.

Figure (Page 3-47)
Figure 3.4.3.1-1.-New Tritium Recycling Facility (Typical).

Table 3.4.3.1-1.-New Tritium Recycling Facility Construction Requirements

Requirement	Consumption
Material/Resources	-
Electrical energy (MWh)	10,000
Concrete (yd3)	32,000
Steel (tons)	5,600
Gasoline, diesel fuel, and lube oil (gal)	260,000
Water (gal)	6,100,000
Land Disturbance (acres)	202
Employment	-
Total employment (worker years)	992
Peak employment (workers)	335
Construction Period (years)	4

Source: DOE 1995g.

Table 3.4.3.1-2.-New Tritium Recycling Facility Operation Requirements

Requirement	Consumption
Electrical Energy (MWh/yr)	88,000
Electrical Load (MWe)	16
Fuel	-
Gas (ft3/yr)	7,000,000
Liquid (GPY)	50,000
Water (MGY)	-
Wet site	37
Dry site	14
Plant Footprint	-
Plant (acres)	196
Employment	-
Total workers	910
Badged workers	400

Source: DOE 1995g.

Table 3.4.3.1-3.-New Tritium Recycling Facility Estimated Waste Volumes

-	Annual Average Volume Generated From Construction	Annual Volume Gene From Operations
Category	(yd3)	(yd3)
Low-Level	-	-
Liquid	None	None
Solid	None	350
Mixed Low-Level	-	-
Liquid	None	0.03 (6 gal)
Solid	None	2
Hazardous	-	-
Liquid	Included in solid	None
Solid	0.5	1
Nonhazardous (Sanitary)	-	-
Liquid	4,460 (900,000 gal)	70,800 (14,300,000 gal)
Solid	163	7,400
Nonhazardous (Other)	-	-
Liquid	Included in sanitary	Included in sanita
Solid	Included in sanitary	6,400

3.4.3.2 Tritium Recycling Facilities Upgrades at Savannah River Site

If the tritium supply facilities are located at SRS or at one of the other sites wi collocated recycling facility, the existing tritium recycling facilities would be upgraded. The upgrade presented here, called the unconsolidated upgrade, would resu no buildings closed and no consolidation of tritium handling activities. Buildings 232-H, 232-1H, 234-H, 238-H, and 249-H (figure 3.4.3.2-1), would be upgraded to mee Order 5480.28, Natural Phenomenon Hazards Mitigation. These upgrades would involve additions of wall and cross bracings to existing beams, strengthening some exterior and reinforcing existing building frames. Additionally, Building 232-H would requir anchor for the service area roof slab as well as an upgrade to the radiation contro monitoring system. Building 234-H would require upgrades to its reservoir storage e safes which are used to protect filled reservoirs during high winds and earthquakes

upgrade modifications would be required for buildings 233-H (Replacement Tritium Facility), 235-H, 236-H, and 720-H (SNL 1995a).

As a potential mitigation, a consolidation of tritium activities into fewer buildin minimize tritium emissions and waste is also possible. In this upgrade, called the consolidated upgrade, Building 232-H would be closed and its functions transferred buildings 233-H and 234-H. As discussed above, upgrades would then be made to build 232-1H, 234-H, 238-H, and 249-H. Additionally, Building 233-H would require modific in order to accept activities transferred from Building 232-H. Construction and operation requirements for the recycling facilities upgrade at SRS are presented in 3.4.3.2-1 and 3.4.2.4-6. The estimated waste generation data is shown in tables 3.4 and 3.4.3.2-4.

Figure (Page 3-50)
Figure 3.4.3.2-1.-Tritium Recycling Facilities Upgrades at Savannah River Site (Generalized).

Table 3.4.3.2-1.-Upgraded Tritium Recycling Facilities Construction Requirements

Requirement	Consumption	-
-	Unconsolidated with Building 232-H	Consolidated without Building 232-H
Material/Resources	-	-
Electrical energy (MWh)	2,000	2,000
Concrete (yd3)	1,900	2,100
Steel (tons)	210	240
Gasoline, diesel fuel, and lube oil (gal)	16,000	17,000
Water (gal)	130,000	140,000
Land Disturbance (acres)	NA	NA
Employment	-	-
Total employment (worker years)	62	91
Peak employment (workers)	26	36
Construction period (years)	3	3

Source: SR DOE 1995a.

Table 3.4.3.2-2.-Upgraded Tritium Recycling Facilities Operation Requirements

Requirement	Consumption	-

-	Unconsolidated with Building 232-H	Consolidated without Building 232-H
Electrical Energy (MWh/yr)	24,000	24,000
Electrical Load (MWe)	3	3
Coal (tons)	5,200	5,200
Fuel, Liquid (GPY)	60,000	56,000
Water (MGY)	51	51
Employment	-	-
Total workers	970	910
Badged workers	400	400

Table 3.4.3.2-3.-Upgraded Tritium Recycling Facilities (Unconsolidated-With Buildin 232-H) Waste Volumes

Category	Annual Average Volume Generated From Construction (yd3)	Annual Volume Generated From Ope (yd3)
Low-Level	-	-
Liquid	None	None
Solid	None	350
Mixed Low-Level	-	-
Liquid	None	0.03 (6 gal)
Solid	None	2
Hazardous	-	-
Liquid	Included in solid	None
Solid	<0.3	1
Nonhazardous (Sanitary)	-	-
Liquid	149 (30,000 gal)	158,000 (32,000,000 gal)
Solid	14	7,800
Nonhazardous (Other)	-	-
Liquid	Included in sanitary	Included in sanita
Solid	Included in sanitary	6,800

Table 3.4.3.2-4.-Upgraded Tritium Recycling Facilities (Consolidated-Without Buildi 232-H) Waste Volumes

Category	Annual Average Volume Generated During Construction (yd3)	Annual Volume Generated From Operations (yd3)
Low-Level	-	-
Liquid	None	None
Solid	None	350
Mixed Low-Level	-	-
Liquid	None	0.03 (6 gal)
Solid	None	2
Hazardous	-	-
Liquid	Included in solid	None
Solid	<0.3	1
Nonhazardous (Sanitary)	-	-
Liquid	182 (36,1)	153,000 (31,000,000 gal)
Solid	15	7,4000
Nonhazardous (Other)	-	-
Liquid	Included in sanitary	Included in sanitary
Solid	Included in sanitary	6,400

3.4.3.3 Extraction and Target Fabrication Facilities for Commercial Light Water Rea

The commercial light water reactor alternative does not include a collocated tritiu extraction facility at the reactor site. Therefore irradiated DOE target roads woul sent offsite to an extraction facility which would be collocated with the upgraded recycling facility at SRS. Construction, operation, and waste generation data for t mercial light water reactor extraction facility are presented in tables 3.4.3.3-1, 3.4.3.3-2, and 3.4.3.3-3, respectively. Target rods not procured commercially would manufactured at a new facility at SRS collocated with target extraction and upgrade recycling facilities. Construction, operation, and waste generation data for the ta fabrication facility are presented in table 3.4.3.3-4, 3.4.3.3-5, and 3.4.3.3-6, respectively.

Table 3.4.3.3-1.-Extraction Facility for Commercial Light Water Reactor Constructio Requirements

Requirement	Consumption
Material/Resources	-
Electrical energy (MWh)	1,000
Concrete (yd3)	7,800
Steel (tons)	940
Gasoline, diesel fuel, and lube oil (gal)	84,000
Water (gal)	1,000,000
Land Disturbance (acres)	19
Employment	-
Total employment (worker years)	326
Peak employment (workers)	144
Construction Period (years)	3

Source: DOE 1995x.

Table 3.4.3.3-2.-Extraction Facility for Commercial Light Water Reactor Operation Requirements

Requirement	Consumption
Utility	-
Electrical energy (MWh)	4,500
Electrical load (MWe)	1.6
Fuel	-
Gas (ft3/yr)	16,000,000
Liquid (GPY)	17,000
Water (MGY)	-
Wet site	4,800,000
Plant Footprint	-
Plant (acres)	15
Employment	-
Total workers	170
Badged workers	70

Source: DOE 1995x.

Table 3.4.3.3-3.-Extraction Facility for Commercial Light Water Reactor Waste Volum

Category	Annual Average Volume Generated From Construction (yd3)	Annual Volume Generated From Operations (yd3)
Low-Level	-	-
Liquid	None	None
Solid	None	460
Mixed Low-Level	-	-
Liquid	None	0.015 (3 gal)
Solid	None	3
Hazardous	-	-
Liquid	Included in solid	Included in solid
Solid	<1	1
Nonhazardous (Sanitary)	-	-
Liquid	1,290 (260,000 gal)	16,870 (3,400,000 gal)
Solid	54	1,300
Nonhazardous (Other)	-	-
Liquid	Included in sanitary	Included in sanitary
Solid	Included in sanitary	None

Table 3.4.3.3-4.-Target Fabrication Facility for Commercial Light Water Reactor Construction Requirements

Requirement	Consumption
Material/Resources	-
Electrical energy (MWh)	2,100
Concrete (yd3)	5,300
Steel (tons)	1,900
Gasoline, diesel fuel, and lube oil (gal)	70,000
Water (gal)	4,000,000

Land Disturbance (acres)	11
Employment	-
Total employment (worker years)	390
Peak employment (workers)	240
Construction Period (years)	3

Source: DOE 1995z.

Table 3.4.3.3-5.-Target Fabrication for Commercial Light Water Reactor Operation Requirements

Requirement	Consumption
Electrical energy (MWh/yr)	1,900
Electrical load (MWe)	0.4
Fuel	-
Gas (ft3/yr)	0
Liquid (GPY)	1,500
Water (MGY)	3.3
Plant Footprint	-
Plant (acres)	11
Employment	-
Total workers	60

Source: DOE 1995z.

Table 3.4.3.3-6.-Target Fabrication for Commercial Light Water Reactor Waste Volume

Category	Annual Average Volume Generated From Construction (yd3)	Annual Volume Generated From Operations (yd3)	An Ef Op (y
Hazardous	-	-	-
Liquid	5 (1,000 gal)	Included in solid	In
Solid	None	3	3
Nonhazardous (Sanitary)	-	-	-
Liquid	2,376 (480,000 gal)	16,340 (3,300,000 gal)	16 (3

Solid	5,900	400	40
Nonhazardous (Other)	-	-	-
Liquid	2,178 (440,000 gal)	None	No
Solid	Included in sanitary	None	No

3.5 Pollution Prevention and Waste Minimization

The Pollution Prevention Act of 1990 established a national policy that whenever fe pollution should be prevented or reduced at the source. Under the Act, pollution th cannot be prevented should be recycled in an environmentally safe manner. Disposal other releases into the environment should be employed only as a last resort and sh conducted in an environmentally safe manner. Executive Order 12856, Federal Complia with Right-to-Know Laws and Pollution Prevention Requirements dated August 3, 1993, DOE Order 5400.1 General Environmental Protection Program implement the provisions Pollution Prevention Act of 1990. Pollution prevention is designed to keep pollutan from being released into the environment. Preventive measures could include source reduction, recycling, treatment, and disposal. The emphasis is on source reduction recycling to prevent the creation of wastes, i.e., waste minimization. Source reduc and waste minimization techniques include good operating practices, technology modifications, input material changes, and product changes. Use and reuse plus recl are onsite and offsite recycling techniques. Tritium supply and recycling facility would consider and incorporate waste minimization and pollution prevention to the m extent practicable. Segregation of activities that generate radioactive and hazardo wastes would be employed, where possible, to avoid the generation of mixed wastes. applicable, treatment to separate radioactive and nonradioactive components would b performed to reduce the volume of mixed wastes and provide for cost-effective dispo recycle. To facilitate waste minimization, where possible, nonhazardous materials w be substituted for those materials that contribute to the generation of hazardous o mixed waste. Production processes would be configured with minimization of waste production given high priority. Material from the waste streams would be treated to facilitate disposal as nonhazardous wastes, where possible. Some designs produce wa quantities or waste forms that could undergo additional reductions by utilizing eme technologies. Pollution prevention and waste minimization would be major factors in determining the final design of any facility constructed as part of the Complex. Po prevention and waste minimization will be analyzed as part of the site-specific ana and tiered NEPA documents following the decision on tritium supply and recycling facilities.

3.6 Comparison of Tritium Supply and Recycling Alternatives

A comparison of the environmental impacts of the tritium supply and recycling alter is summarized in tables 3.6-1 and 3.6-2. The tables compare the impacts to environm resources associated with tritium supply technologies and recycling at each of the candidate sites and the commercial light water reactor. In addition, impacts associ with No Action are included for a baseline comparison.

The table 3.6-1 format presents the impacts of each alternative by resource or issu Impacts associated with collocation of a tritium supply and recycling alternatives evaluated for every site except SRS. At SRS, impacts are evaluated for a tritium su with upgraded recycling. In addition, impacts associated with tritium supply alone

alternatives are evaluated for all the candidate sites except SRS. A supply alone alternative does not exist for SRS because of existing recycling facilities. The tr upgrade at SRS is part of the supply alone alternatives at the other four candidate sites (INEL, NTS, ORR, Pantex and the commercial reactor alternative). For the supp alone alternatives and the commercial reactor alternative, there would be minor imp associated with upgrading the facilities at SRS. Table 3.6-2 presents the construct operation impacts of key issues for the commercial reactor alternative.

Under No Action (2010), DOE would not establish a new tritium supply capability, th current inventory of tritium would decay and DOE would not meet stockpile requireme tritium. Sites would continue waste management programs to meet the legal requireme commitments in formal agreements and would proceed with cleanup activities. Product facilities and support roles at specific sites, however, would be downsized or elim inated in accordance with the reduced workload projected for the year 2010 and beyo current DOE missions assumed to continue under No Action are listed in section 3.3 each candidate site.

To aid the reader in understanding the differences in environmental impacts among t alternatives (particularly the tritium supply technology alternatives i.e., HWR, MH ALWR, and commercial light water reactor), this section presents a brief, qualitati summary comparison of the alternatives. Tables 3.6-1 and 3.6-2 present a quantitati parison of greater detail.

For some of the resource areas evaluated in the PEIS, the analyses indicate that th no major differences in the environmental impacts among the tritium supply technolo and site alternatives. Resource areas where no major differences exist, or where po environmental impacts are small, are: land resources, air quality, water resources, geology and soils, biotic resources, and socioeconomics. For these resource areas, general conclusion is particularly true when comparing the operational impacts of t tritium supply facilities. For construction, this general conclusion is also particularly true when comparing among the various types of new tritium supply faci (e.g., HWR, MHTGR, ALWR, and APT).

However, when comparing the potential impacts of constructing a new tritium supply facility against the alternative of using an existing commercial reactor (purchase irradiation services or purchase and conversion of an existing commercial reactor), environmental impacts of the latter are clearly fewer because the facility already exists, and, thus, there are minimal construction-related environmental impacts. Fo tritium recycling, this also applies when comparing the existing tritium recycling facilities at SRS against constructing a new tritium recycling facility at another

For other resource areas evaluated in this PEIS, the analyses indicate that there a notable environmental impact differences. Resource areas where notable differences are: site infrastructure (electrical requirements), human health (from radiological impacts due to accidents), and wastes generated. Each of these resource areas is di in greater detail below.

Site Infrastructure. Infrastructure and electrical capacity exist at each of the alternative sites to adequately support any of the tritium supply technology alternatives. Nonetheless, because the MHTGR and ALWR technologies could generate electricity while also producing tritium, these technologies could have a positive environmental impact by delaying the need to build some electrical generating facil the future. This PEIS acknowledges, and qualitatively discusses, these potential "a environmental impacts. The APT, and to a significantly lesser degree the HWR, would energy consumers. This PEIS assesses the environmental impacts of providing power t energy consumers. Thus, in terms of environmental impacts, there could be approxima 1,800 MWe of difference (i.e., ALWR generating 1,300 MWe versus an APT consuming 50 between the tritium supply technologies. For commercial reactors that already exist produce electrical power, there would be no change to the existing electrical infrastructure.

Human Health. There are differences among the tritium supply technology and site alternatives regarding the potential human health impacts from accidents. The poten consequences are directly related to the amount of radioactivity released and the

population density near the facility. For each of the tritium supply technology alternatives, the probability of severe accidents occurring is extremely small, on order of once every millions of years at most. Based upon the PEIS analyses, the AL could cause the largest potential impacts to human health from severe accidents, wh MHTGR would have the smallest potential impacts of the reactor technologies. Becaus APT does not utilize fissile materials, and there is no significant decay heat, the are virtually no radiological consequences from any APT accidents.

Consequently, the APT would have the smallest potential impacts to human health fro accidents. The commercial reactor alternatives do not acquire any substantial risks assuming a tritium-production mission.

Regarding the site alternatives, in the event of an accident at sites with small populations (INEL, NTS, and to a lesser extent Pantex), there would be fewer impact human health. Because ORR and SRS have larger populations within 50 miles of the pr facilities, these two sites have greater potential human health impacts than the ot sites. Because there are virtually no radiological consequences from any APT accide there are no grounds for discrimination among sites in the case of the APT. It is, essence, site neutral with respect to potential impacts to human health.

Generated Wastes

Spent Fuel Generation. All of the tritium supply reactor technologies would generat fuel. While the MHTGR would generate the greatest volume of spent fuel (because of graphite moderator), the residual heavy metal content of spent fuel from the ALWR w be the greatest. Reactors providing irradiation services would not generate additio spent fuel over and above what they would otherwise generate during their planned lifetime, assuming that multiple reactors are used and the operating scenarios do n change fuel cycles. However, if only a single reactor were used (irradiation servic purchased and converted), additional spent fuel would likely be generated because t reactor's refueling cycle would be shortened. The APT is not a reactor and would no generate spent fuel.

Low-Level Waste. None of the alternatives would generate unacceptably large amounts LLW. However, of the alternatives, the HWR would create the most LLW in a year (alm times as much as any other reactor alternative). The APT would generate the least a of LLW annually. In producing tritium, the commercial reactor alternatives would generate additional LLW, but this amount would be less than the new reactor alterna With regard to sites, except for Pantex, all sites have the ability to handle and d of low level nuclear waste at the site. Low-level nuclear wastes generated at Pante need to be shipped to another site for disposal.

Table 3.6-1.-Summary Comparison of Environmental Impacts of Tritium Supply and Recy Alternatives [Page 1 of 50]

INEL	NTS	ORR
		Land Resources-No Act
Under No Action there would be no impacts to land use or visual resources.	Under No Action there would be no impacts to land use or visual resources.	Under No Action there would be no impacts to land use or visual resources.

Land Resources-Collocated Tritium Su

Construction and operation of a tritium supply would disturb between 173 and 360 acres. The disturbance for each technology would be: HWR: 260 acres MHGTR: 360 acres ALWR: 350 acres APT: 173 acres	Construction and operation of a tritium supply would disturb between 173 and 360 acres. The disturbance for each technology would be: - HWR: 260 acres MHGTR: 360 acres ALWR: 350 acres APT: 173 acres	Construction and operation of a tritium supply would disturb between 173 and 360 acres. The disturbance each technology would b - HWR: 260 acres MHGTR: 360 acres ALWR: 350 acres APT: 173 acres
Collocation of tritium recycling would require an additional 202 acres during construction and 196 acres during operation for all technologies.	Collocation of tritium recycling would require an additional 202 acres during construction and 196 acres during operation for all technologies.	Collocation of tritium recycling would require additional 202 acres during construction and 196 acres during operat for all technologies.
The existing VRM classification of Class 4 visual landscape characteristics would remain unchanged.	The existing VRM classification of the proposed site would change from Class 2 to Class 5. Depending on the final siting, the facilities may be visible from a portion of the Desert National Wildlife Range.	The existing VRM class cation of Class 4 visua landscape characteristi would change to Class 5 and the use of an evapo tive cooling system wou result in visible plume during certain atmosphe conditions.

Site Infrastructure-No

Under No Action the peak electrical load requirement would reduce by 51 MWe. Annual energy consumption would remain the same.	Under No Action the peak electrical load requirement would reduce by 7 MWe. Annual energy consumption would remain the same.	Under No Action the pe electrical load require would reduce by 1,304MWe. Annual energy consumption would reduce by 11,641,800 MWh per year

Site Infrastructure-Collocated Tritium

Collocated tritium supply and recycling would increase the current site electrical requirement by 11 to 515 MWe. The increase for each technology would be: - - - HWR: 34 MHGTR: 11 Large ALWR: 105 - Small ALWR: 40 - Full APT: 515 -	Collocated tritium supply and recycling would increase the current site electrical requirement by 55 to 559 MWe. The increase for each technology would be: - - - HWR: 78 MHGTR: 55 Large ALWR: 149 - Small ALWR: 84 - Full APT: 559 -	Collocated tritium sup and recycling would require less than the current site electrical requirement by 738 to 1,252 MWe. The reductio for each technology wou be: - - HWR: 1,237 (less) MHGTR: 1,252 (less) Large ALWR: 1,192 (less - Small ALWR: 1,236 (less - Full APT: 738 (less) -

Phased APT: 320 - The percent of the power pool capacity margin ranges from 0.45 to 4.15 HWR: 0.62 MHTGR: 0.45 Large ALWR: 1.14 Small ALWR: 0.67 Full APT: 4.15 Phased APT: 2.72	Phased APT: 364 - The percent of the power pool capacity margin ranges from 0.53 to 4.79. HWR: 0.72 MHTGR: 0.53 Large ALWR: 1.32 Small ALWR: 0.77 Full APT: 4.79 Phased APT: 3.14	Phased APT: 933 (less) - The percent of the pow pool capacity margin ranges from 1.14 to 12. HWR: 1.47 MHTGR: 1.14 Large ALWR: 2.46 Small ALWR: 1.50 Full APT: 12.44 Phased APT: 8.15
		Site Infrastructure-Tritium S
The tritium supply alone would reduce the peak load requirement above by 16 MWe for all technologies.	The tritium supply alone would reduce the peak load requirement above by 16 MWe for all technologies.	The tritium supply alo would reduce the peak load requirement above 16 MWe for all technolo gies.
		Air Quality and Acoustics-
Under No Action no change from existing conditions.	Under No Action no change from existing conditions.	Under No Action no change from existing co ditions.
		Air Quality and Acoustics-Collocated Trit
Construction of collocated tritium supply and recycling facilities would result in exceedance of 24-hour PM10 and TSP standards. Air pollutant concentration would increase during operation but would be within standards. Noise levels would increase during construction and operation.	Construction of collocated tritium supply and recycling facilities would result in exceedance of 24-hour PM10 standards. Air pollutant concentration would increase during operation but would be within standards. Noise levels would increase during construction and operation.	Construction of colloc tritium supply and recycling facilities wo result in exceedance of 24-hour PM10 and TSP standards. Air pollutan concentration would increase during operati but would be within sta dards. Noise levels wou increase during constru tion and operation.
		Air Quality and Acoustics-Tritiu
Construction and operation air and noise emissions for the tritium supply alone would be slightly less than those expected above.	Construction and operation air and noise emissions for the tritium supply alone would be slightly less than those expected above.	Construction and operation air and noise emissions for the triti supply alone would be slightly less than thos expected above.
		Water Resources-No Ac
Under No Action there would be no impacts to water resources.	Under No Action there would be no impacts to water resources.	Under No Action there would be no impacts to water resources.

Water Resources-Collocated Tritium S

Surface water would not be used during construction.	Surface water would not be used during construction.	Surface water use for located supply and recycling facilities wo range from 10 to 35 MGY during construction. Th surface water use and c responding percentage increase by technology would be: HWR: 23 (1 percent) MHTGR: 19 (1 percent) Large ALWR: 35 (2 percent) Small ALWR: 22 (1 percent) APT: 10 (<1 percent)
Groundwater use would range from 10 to 35 MGY during construction. The groundwater use by technology would be: - - - HWR: 23 MHTGR: 19 Large ALWR: 35 Small ALWR: 22 APT : 10	Groundwater use would range from 10 to 35 MGY during construction. The groundwater use by technology would be: - - - HWR: 23 MHTGR: 19 Large ALWR: 35 Small ALWR: 22 APT: 10	Groundwater would not used during constructio or operation of any col cated tritium supply an recycling.
The total percent of groundwater use increase during construction by technology would be: - - HWR: 1 MHTGR: 1 Large ALWR: 2 Small ALWR: 1 Full APT: <1 Phased APT: <1	The total percent of groundwater use increase during construction by technology would be: - - HWR: 3 MHTGR: 3 Large ALWR: 5 Small ALWR: 3 Full APT: 1 Phased APT: 1	No groundwater use.

Water Resources-Collocated Tritium S

No construction will take place in 100- or 500-year floodplains.	No construction will take place in areas designated as 100-year floodplains, however a 500-year flood plain assessment would be required.	No construction will t place in areas designat as 100-year floodplains however a 500-year floo plain assessment would required.
Stormwater runoff would have negligible impacts on surface water during construction and operation.	Stormwater runoff would have negligible impacts on surface water during construction and operation.	Stormwater runoff woul have negligible impacts surface water during co struction and operation
Surface water would not be used during operation.	Surface water would not be used during operation.	Operation surface wate requirements would rang from 784 to 16,014 MGY.

		The surface water use a corresponding percentag increase by technology would be: HWR: 5,914 (320 percent MHTGR: 4,014 (217 percent) Large ALWR: 16,014 (866 percent) Small ALWR: 7,214 (390 percent) Full APT: 1,214 (66 percent) Phased APT: 784 (42 percent)

Water Resources-Collocated Tritium S

No blowdown discharges to surface water.	No blowdown discharges to surface water.	Blowdown discharges to surface waters would range from 168 to 6,192MGY. Blowdown discharges to surface waters by technology would be: HWR: 2,314 MHTGR: 1,618 Large ALWR: 6,202 Small ALWR: 2,818 Full APT: 250 Phased APT: 178
Groundwater requirements for operation would range from 44 to 1,214MGY. The groundwater use by technology would be: - - HWR: 62 MHTGR: 44 Large ALWR: 104 Small ALWR: 64 Full APT: 1,214 Phased APT: 784	Groundwater requirements for operation would range from 44 to 1,214MGY. The groundwater use by technology would be: - - HWR: 62 MHTGR: 44 Large ALWR: 104 Small ALWR: 64 Full APT: 1,214 Phased APT: 784	Groundwater would not used for operation.

Water Resources-Collocated Tritium S

The total percent increase in groundwater use during operation by technology would be: HWR: 3 MHTGR: 2 Large ALWR: 5 Small ALWR: 3 Full APT: 61 Phased APT: 39 Total increase in ground-water use for all the tech-nologies except APT	The total percent increase in groundwater use during operation by technology would be: HWR: 9 MHTGR: 7 Large ALWR: 16 Small ALWR: 10 Full APT: 181 Phased APT: 117 Groundwater withdrawals during operation would not exceed the lowest	No groundwater use.

would be approximately less than 1 percent of the INEL groundwater allotment; the APT groundwater use represents an increase of approximately 11 percent of the INEL groundwater allotment.	estimated aquifer recharge rate for all technologies.	
		Water Resources-Tritium Sup
The groundwater requirement for the tritium supply alone would be 1.5MGY less than for collocation during construction and 14MGY less than for collocation during operation for all technologies. No surface water would be used.	The groundwater requirement for the tritium supply alone would be 1.5MGY less than for collocation during construction and 14MGY less than for collocation during operation for all technologies. No surface water would be used.	No groundwater would b used. Total surface wat requirement for the tri supply alone would be 1.5MGY less than for collation during constr tion and 37MGY less tha for collocation during operation for all techn gies.
		Geology and Soils-No A
Under No Action there would be no impacts to geology or soils.	Under No Action there would be no impacts to geology or soils.	Under No Action there would be no impacts to geology or soils.
		Geology and Soils-Collocated Tritium
Construction and operation for collocated supply and recycling or the tritium supply alone would neither affect nor be affected by geological conditions.	Construction and operation for collocated supply and recycling or the tritium supply alone would neither affect nor be affected by geological conditions.	Construction and operation for collocate supply and recycling or tritium supply alone wo neither affect nor be affected by geological ditions.
The soil disturbed area for collocated supply and recycling would range from 375 to 562 acres. The acres disturbed by each technology would be: HWR: 462 MHTGR: 562 ALWR: 552 APT: 375	The soil disturbed area for collocated supply and recycling would range from 375 to 562 acres. The acres disturbed by each technology would be: HWR: 462 MHTGR: 562 ALWR: 552 APT: 375	The soil disturbed are collocated supply and recycling would range from 375 to 562 acres. acres disturbed by each technology would be: HWR: 462 MHTGR: 562 ALWR: 552 APT: 375
		Geology and Soils-Tritium Su
The disturbed area for the tritium supply alone would be 202 acres less.	The disturbed area for the tritium supply alone would be 202 acres less.	The disturbed area for tritium supply alone wo be 202 acres less.
Soil erosion due to wind and stormwater runoff would be minor.	Soil erosion due to wind and stormwater runoff would be minor.	Soil erosion due to wi and stormwater runoff would be minor.

		Biotic Resources-No Ac
Under No Action there would be no impacts to biotic resources.	Under No Action there would be no impacts to biotic resources.	Under No Action there would be no impacts to biotic resources.
		Biotic Resources-Collocated Tritium S
Construction and operation of a collocated tritium supply and recycling or supply alone would affect terrestrial resources. The impact would vary by the acreage disturbed during construction for each technology (see geology and soils for acreage).	Construction and operation of a collocated tritium supply and recycling or supply alone would affect terrestrial resources. The impact would vary by the acreage disturbed during construction for each technology (see geology and soils for acreage).	Construction and operation of a collocat tritium supply and recy cling, or supply alone would affect terrestria resources. The impact would vary by the acrea disturbed during constr tion for each technolog (see geology and soils acreage).
Impacts from cooling system salt drift are possible with APT.	Impacts from cooling system salt drift are possible with APT.	Salt drift from wet co towers would likely impact less than 13 acr during operation for al technologies.
Wetlands and aquatic resources would not be affected.	Wetlands and aquatic resources would not be affected.	Without appropriate mi gation measures, increa stream flow from operational discharges could affect wetland and aqua plant communities.
No Federal-listed threatened or endangered species would be affected during construction or operation, but several Federal candidates or state-listed species may be affected.	One Federal-listed threatened species, the desert tortoise, could be affected during construction and operation. Several Federal candidate or state-listed species may be affected.	No Federal-listed thre ened or endangered species would be affect during construction or operation, but several Federal candidates or state-listed species ma affected.
		Biotic Resources-Collocated Tritium S
The ferruginous hawk would lose foraging habitat equal to the amount of land disturbed for each technology during construction and operation. The Townsend's western big-eared bat may roost and forage throughout the disturbed area during construction and forage at stormwater retention ponds during operation.	The ferruginous hawk could lose foraging habitat equal to the amount of land disturbed for each technology during construction and operation. The loggerhead shrike could lose foraging and breeding habitats well. Neither species should be adversely affected due to the large extent of nearby suitable habitat.	Four state-listed rapt would lose potential nesting and foraging habitat equal to the am of disturbed land for e technology, however thi type of habitat is abun in the area. The Tennes dace and hellbender, bo state-listed, could be affected by constructio

Cultural and Paleontological Reso

Under No Action there would be no impact to cultural and paleontological resources.	Under No Action there would be no impact to cultural and paleontological resources.	Under No Action there would be no impact to cultural and paleontolo cal resources.

Cultural and Paleontological Resources-Collocate

Some NRHP-eligible prehistoric and historic resources may occur within the tritium supply site.	Some NRHP-eligible prehistoric and historic resources may occur within the tritium supply site.	Some NRHP-eligible pre historic and historic resources may occur within the tritium supp site.
Native American resources may be affected by land disturbance and audio or visual intrusions.	Native American resources may be affected by land disturbance and audio or visual intrusions.	Native American resour may be affected by land disturbance and audio o visual intrusions.
Paleontological resources may be affected when excavation exceeds 50 feet.	Paleontological resources may be affected.	Paleontological resour may be affected.

Cultural and Paleontological Resources

Impacts to cultural and paleontological resources from tritium supply alone would be less.	Impacts to cultural and paleontological resources from tritium supply alone would be less.	Impacts to cultural an paleontological resourc from tritium supply alo would be less.

Socioeconomics-No Act

Under No Action INEL employment decreased by 1,000 persons between 1990 and 1994 to 10,100 persons, and will remain at this level through 2020.	Under No Action NTS employment decreased by 1,170 persons between 1990 and 1994 to 6,850 persons and will remain at this level through 2020.	Under No Action ORR employment decreased by 300 persons between 199 and 1994 to 15,000 persons, and will remai this level through 2020

Socioeconomics-No Act

Under No Action employment in the 63 is expected to grow by less than 1percent annually through 2009, and then decrease by less than 1 percent annually through 2020.	Under No Action employment in the regional economic area is expected to grow by less than 1percent annually through 2009, and then continue to increase by less than 1percent annually through 2020.	Under No Action employ ment in the regional economic area is expect to grow by less than 1percent annually throu 2009, and then decrease less than 1 percent annually through 2020.
Under No Action unem-	Under No Action unem-	Under No Action unem-

ployment is expected to be at 6.4 percent between 2001 and 2020. Per capita income is expected to increase from $17,800 to $20,900.	ployment is expected to be at 5 percent between 2001 and 2020. Per capita income is expected to increase from $23,600 to $25,100.	ployment is expected to at 6.2 percent between 2001 and 2020. Per capi income is expected to increase from $17,900 t $20,700.
Under No Action population and housing annual average increase is expected to be less than 1 percent through 2010.	Under No Action population and housing annual average increase is expected to be 1 percent through 2020.	Under No Action popula tion and housing annual average increase is expected to be 1 percen through the year 2009 a less than 1 percent between 2010 and 2020.
Population is expected to reach 207,300 in 2010 and 215,200 in 2020.	Population is expected to reach 1,020,900 in 2010 and 1,103,500 in 2020.	Population is expected reach 561,000 in 2010 a 586,000 in 2020.
		Socioeconomics-No Act
Under No Action total revenue and expenditures for the ROI counties, cities and school districts is expected to increase by an annual average of less than 1 percent from 2001 to 2020.	Under No Action total revenue and expenditures for the ROI counties, cities and school districts is expected to increase by an annual average of less than 1 percent to 3 percent between 2001 and 2005, and by 1 to 2 percent between 2005 and 2010. Between 2010 and 2020, annual increases of less than 1 percent are expected.	Under No Action total revenue and expenditure for the ROI counties, c and school districts is expected to increase by annual average of appro mately 1 percent or les through 2020.
		Socioeconomics-Collocated Tritium Su
Employment in the regional economic area would increase by 7,200 to 10,800 persons during peak construction when collocating tritium supply and recycling. The increase by technology would be: HWR: 7,500 MHTGR: 7,200 ALWR: 10,800 APT: 8,750	Employment in the regional economic area would increase by between 9,100 to 13,700 persons during peak construction when collocating tritium supply and recycling. The increase by technology would be: HWR: 9,500 MHTGR: 9,100 ALWR: 13,700 APT: 11,100	Employment in the regional economic area would increase by 8,000 12,000 persons during peak construction when collocating tritium sup and recycling. The increase by technology would be: HWR: 8,300 MHTGR: 8,000 ALWR: 12,000 APT: 9,700
		Socioeconomics-Collocated Tritium Su
Unemployment in the regional economic area would decrease from 6.4percent (the projected baseline) to 4.5 percent for all technologies during peak construction.	Unemployment in the regional economic area would decrease from 5percent (the projected baseline) to 3.9 percent for all technologies during peak construction.	Unemployment in the regional economic area would decrease from 6.2percent (the project baseline) to 5.2 percen 4.8 percent during peak construction. The

		estimated unemployment by technology would be: HWR: 5.2 percent MHTGR: 5.2 percent ALWR: 4.8 percent APT: 5 percent
Population and housing demand within the ROI would increase by 5 to 9percent during construction of a collocated tritium supply and recycling facility. The increase by technology would be: - - - - - - - - HWR: 5 percent MHTGR: 5 percent ALWR: 9 percent APT: 6.5 percent	Population and housing demand within the ROI would not increase by more than 2 percent over No Action during construction for all technologies during the first 3years. HWR and MHTGR would have a continued annual demand of less than 2 percent. ALWR and would have an annual demand growth of 1 percent until peak operation.	Population and housing demand within the ROI would not increase by more than 1 percent dur construction for all te nologies.
		Socioeconomics-Collocated Tritium Su
Employment in the regional economic area would increase by 4,100 to 4,900 persons during full operation. The increase by technology would be: HWR: 4,900 MHTGR: 4,900 ALWR: 4,700 APT: 4,100	Employment in the regional economic area would increase by 4,600 to 5,500 persons during full operation. The increase by technology would be: HWR: 5,500 MHTGR: 5,500 ALWR: 5,200 APT: 4,600	Employment in the regional economic area would increase by 4,300 5,200 persons during fu operation. The increase technology would be: HWR: 5,200 MHTGR: 5,100 ALWR: 4,900 APT: 4,300
Unemployment in the regional economic area would decrease from 6.4percent (the projected baseline) to 4.9 to 4.6percent during full operation. The estimated unemployment by technology would be: HWR: 4.6 percent MHTGR: 4.6 percent ALWR: 4.7 percent APT: 4.9 percent	Unemployment in the regional economic area would decrease from 5percent (the projected baseline) to 4.4 to 4.3percent during full operation. The estimated unemployment by technology would be: HWR: 4.3 percent MHTGR: 4.3 percent ALWR: 4.4 percent APT: 4.4 percent	Unemployment in the regional economic area would decrease from 6.2percent (the project baseline) to 5.7 to 5.6percent during full operation. The estimate unemployment by technol ogy would be: HWR: 5.6 percent MHTGR: 5.6 percent ALWR: 5.6 percent APT: 5.7 percent
Population and housing demand within the ROI would increase by 2percent for all technologies during operation.	Population and housing demand within the ROI would increase by no more than 1 percent for all technologies during operation.	Population and housing demand within the ROI would not increase by more than 1 percent for technologies during ope tion.

Socioeconomics-Collocated Tritium Su

Per capita income in the regional economic area would increase by an annual average of approximately 1 to 2 percent during peak construction and 1 percent during full operation.	Per capita income in the regional economic area would increase by an annual average of approximately 1 percent during peak construction and full operation for all technologies.	Per capita income in t regional economic area would increase by an annual average of 1percent during peak co struction and full oper for all technologies.
With a collocated tritium supply and recycling facility total revenues and expenditures for most ROI counties, cities, and school districts would increase by an annual average between 2 and less than 1 percent through the year 2005 and between 1 and 0 percent through the year 2010 for all technologies except ALWR. For the ALWR, total revenue and expenditure within the ROI would increase between 4 percent and less than 1 percent in the first 3 years of construction and decrease 1 to 2percent annually through the year 2010.	With a collocated tritium supply and recycling facility total revenues and expenditures for most ROI counties, cities, and school districts would increase by an annual average between 1 and 4 percent for all technologies in the first 3 years of construction. After the peak construction year, there would be increases of 1 to 2 percent annually until 2010. Total revenue and expenditure annual average increases of less than 1 percent to 2 percent between 2001 and 2005 would be expected for the MHTGR and APT. Annual average increases of less than 1 to 4percent between 2001 and 2005 would be expected for the ALWR.	With a collocated trit supply and recycling facility total revenues expenditures for most R counties, cities, and s districts would increas an annual average of approximately 1 percent less through 2010. Between 2010 and 2020 total revenue and expen tures are both expected increase by an annual average of less than 1percent for all techno gies.

Socioeconomics-Collocated Tritium Su

Total revenues and expenditures for all technologies would increase by annual averages of less than 1percent through the year 2020.	Revenue and expenditure annual average would increase 1 percent through the year 2020 for all technologies.	-
Traffic conditions would worsen slightly due to increased traffic and congestion on site access roads, particularly on U.S. Route 20/26, the primary access route.	Traffic conditions would worsen slightly due to increased traffic and congestion on site access roads, particularly on Mercury Highway, the primary access route.	Traffic conditions wou worsen slightly due to increased traffic and c gestion on site access roads, particularly on Creek Road, the primary access route.

Socioeconomics-Tritium Sup

The effects on employment and income for the tritium supply alone	The effects on employment and income for the tritium supply alone	The effects on employment and income for the tritium supply

would be slightly less than the effects of collocation with recycling for all technologies.	would be slightly less than the effects of collocation with recycling for all technologies.	would be slightly less the effects of collocat with recycling for all technologies.
Population and housing demands in the ROI during construction of the tritium supply alone would not increase by more than 1 to 8 percent over No Action. The increase by technology would be: - HWR: 4 percent MHTGR: 4 percent ALWR: 8 percent APT: 5.5 percent	Population and housing demands in the ROI during construction of the tritium supply alone would not increase by more than 2 percent over No Action for all technologies.	Population and housing demands in the ROI duri construction of the tri supply alone would not increase by more than 1 percent over No Action all technologies.
		Socioeconomics-Tritium Sup
Population and housing demands in the ROI during operation of the tritium supply alone would not increase by more than 1 percent over No Action for all technologies.	Population and housing demands in the ROI during operation of the tritium supply alone would not increase by more than 1 percent over No Action for all technologies.	Population and housing demands in the ROI duri operation of the tritiu supply alone would not increase by more than 1 percent over No Action all technologies.
Revenues and expenditures with the tritium supply alone would increase for all ROI county, city and school districts, but these increases would be less than collocating with recycling for all technologies.	Revenues and expenditures with the tritium supply alone would increase for all ROI county, city and school districts, but these increases would be less than collocating with recycling for all technologies.	Revenues and expenditures with the tritium supply alone would increase for all ROI county, city and school tricts, but these incre would be less than coll cating with recycling f all technologies.
The effects on site access routes for the tritium supply alone would be slightly less than collocation with recycling for all technologies.	The effects on site access routes for the tritium supply alone would be slightly less than collocation with recycling for all technologies.	The effects on site ac routes for the tritium supply alone would be slightly less than coll tion with recycling for technologies.
		Radiological and Hazardous Chemical Impacts Dur
Under No Action for emissions of radiation the dose to the maximally exposed member of the public from 1 year of operation is 6.0x10-3 mrem. The risk of fatal cancer to the maximally exposed members of the public from 40 years of operation is 1.2x10-7.	Under No Action for emissions of radiation the dose to the maximally exposed member of the public from 1 year of operation is 0.04 mrem. The risk of fatal cancer to the maximally exposed members of the public from 40 years of operation is 8.1 x10-7.	Under No Action for emissions of radiation dose to the maximally exposed member of the public from 1 year of operation is 3.9 mrem f atmospheric release and mrem from liquid releas The risk of fatal cance the maximally exposed members of the public from 40 years of operat is 7.8x10-5 and 2.7x10- respectively.

Radiological and Hazardous Chemical Impacts Dur

The population dose of 0.037 person-rem from total site operations in 2030 would result in 7.4x10-4 fatal cancer over 40 years of operation.	The population dose of 8.2x10-3 person-rem from total site operations in 2030 would result in 1.6x10-4 fatal cancer over 40 years of operation.	The population dose of person-rem from total s operations in 2030 woul result in 1.1 fatal can over 40 years of operat
Under No Action the average annual dose to a site worker is 30 mrem with a risk of fatal cancer of 4.8x10-4 from 40 years of operation. The annual dose of 220 person-rem to total site workforce would result in 3.5 fatal cancers over 40 years of operation.	Under No Action the average annual dose to a site worker is 5 mrem with a risk of fatal cancer of 7.8x10-5 from 40 years of operation. The annual dose of 3 person-rem to total site workforce would result in 0.048 fatal cancer over 40 years of operation.	Under No Action the average annual dose to site worker is 17 mrem with a risk of fatal ca of 2.8x10-4 from 40 yea of operation. The annua dose of 320 person-rem total site workforce wo result in 5.1 fatal can over 40 years of operat
Under No Action for emission of hazardous chemicals the chemical HI is 1.7x10-4 with no cancer risk to the maximally exposed member of the public. The site worker HI is 0.021 with no cancer risk.	Under No Action for emission of hazardous chemicals the chemical HI is 0 with no cancer risk to the maximally exposed member of the public or site worker.	Under No Action for emission of hazardous chemicals the chemical is 0.36 with no cancer to the maximally expose member of the public. T site worker HI is 0.26 no cancer risk.

Radiological and Hazardous Chemical Impacts During Normal Oper

The dose to the maximally exposed member of the public from total site operations with a collocated tritium supply and recycling facility for 1 year would range from 0.11 to 0.36 mrem from atmospheric releases. The associated risk of fatal cancer from 40 years of operation would range from 2.3x10-6 to 7.3x10-6. The annual dose and associated (risk of fatal cancer from 40 years of operation) by technology would be:	The dose to the maximally exposed member of the public from total site operations with a collocated tritium supply and recycling facility for 1 year would range from 0.13 to 0.40 mrem from atmospheric releases. The associated risk of fatal cancer from 40 years of operation would range from 2.6x10-6 to 8.0x10-6. The annual dose and associated (risk of fatal cancer from 40 years of operation) by technology would be:	The dose to the maxima exposed member of the public from total site ations with a collocate tritium supply and recycling facility for would range from 4.3 to 8.8 mrem from atmospheric release. The as ciated risk of fatal ca from 40 years of operat would range from 8.6x10 to 1.8x10-4. The annual dose and associated (ri of fatal cancer from 40 years of operation) by technology would be:
-	-	-
HWR: 0.29 mrem (5.9x10-6)	HWR: 0.31 mrem (6.2x10-6)	HWR: 7.1 mrem (1.4x10-4)

MHTGR: 0.19 mrem (3.8x10-6) Large and Small ALWR: 0.36 mrem (7.3x10-6) APT (He-3): 0.11 mrem (2.3x10-6) APT (SILC): 0.16 mrem (3.3x10-6)	MHTGR: 0.21 mrem (4.1x10-6) Large and Small ALWR: 0.40 mrem (8.0x10-6) APT (He-3): 0.13 mrem (2.6x10-6) APT (SILC): 0.18 mrem (3.6x10-6)	MHTGR: 5.7 mrem (1.1x10-4) Large ALWR: 8.8 mrem (1.8x10-4) Small ALWR: 7.6 mrem (1.5x10-4) APT (He-3): 4.3 mrem (8.6x10-5) APT (SILC): 5.0 mrem (1.0x10-4)

Radiological and Hazardous Chemical Impacts During Normal Oper

No liquid releases.	No liquid releases.	The dose to the maxima exposed member of the public from total site operation with a colloc tritium supply and recycling facility for would be 14 mrem from liquid release, the ass ated risk of fatal canc from 40 years of operat would be 2.7x10-4 for a technologies, except fo the ALWRs (2.8x10-4).

Radiological and Hazardous Chemical Impacts During Normal Oper

The 50-mile population annual dose from total site operations in 2030 would range from 23 to 73person-rem and could result in 0.45 to 1.5 fatal cancers from 40 years of operation. The annual dose and (fatal cancers from 40 years of operation) by technology wouldbe: HWR: 53 person-rem (1.1) MHTGR: 37 person-rem (0.73)	The 50-mile population annual dose from total site operations in 2030 would range from 0.08 to 0.25person-rem and could result in 1.6x10-3 to 5.1x10-3 fatal cancers from 40 years of operation. The annual dose and (fatal cancers from 40 years of operation) by technology would be: HWR: 0.20 person-rem (4.0x10-3) MHTGR: 0.13 person-rem (2.6x10-3)	The 50-mile population annual dose from total operations in 2030 woul range from 68 to 90person-rem and could result in 1.4 to 1.8 fa cancers from 40 years o operation. The annual dose and (fatal cancers from 40 years of operation) by technology wouldbe: HWR: 82 person-rem (1.6) MHTGR: 76 person-rem (1.5)

Large ALWR: 73 person-rem (1.5)
Small ALWR: 71 person-rem (1.4)
APT (He-3): 23 person-rem (0.45)
APT (SILC): 32 person-rem (0.64)

Large ALWR: 0.24 person-rem (4.9x10-3)
Small ALWR: 0.25 person-rem (5.1x10-3)
APT (He-3): 0.08 person-rem (1.6x10-3)
APT (SILC): 0.11 person-rem (2.3x10-3)

Large ALWR: 90 person-rem (1.8)
Small ALWR: 87 person-rem (1.7)
APT (He-3): 68 person-rem (1.4)
APT (SILC): 73 person-rem (1.5)

Radiological and Hazardous Chemical Impacts During Normal Oper

The average annual dose to a site worker that is associated with total site operations would range from 31 to 49 mrem with a resulting risk of fatal cancer from 40 years of operation ranging from 5.0x10-4 to 7.9x10-4. The dose and (fatal cancer risk) that are associated with total site operations, including the following technology, would be:
HWR: 33 mrem (5.2x10-4)
MHTGR: 31 mrem (5.0x10-4)
Large ALWR: 49 mrem (7.9x10-4)
Small ALWR: 41 mrem (6.6x10-4)
APT (for either target system): 33 mrem (5.2x10-4)

The average annual dose to a site worker that is associated with total site operations would range from 26 to 140 mrem with a resulting risk of fatal cancer from 40 years of operation ranging from 4.2x10-4 to 2.3x10-3. The dose and (fatal cancer risk) that are associated with total site operations, including the following technology, would be:
HWR: 34 mrem (5.4x10-4)
MHTGR: 26 mrem (4.2x10-4)
Large ALWR: 140 mrem (2.3x10-3)
Small ALWR: 92 mrem (1.5x10-3)
APT (He-3): 34 mrem (5.5x10-4)
APT (SILC): 36 mrem (5.7x10-4)

The average annual dos a site worker that is a ated with total site op tions would range from to 26 mrem with a resulting risk of fatal cancer from 40 years of operation ranging from 2.9x10-4 to 4.2x10-4. T dose and (fatal cancer that are associated wit total site operations, including the following technology, would be:
HWR: 19 mrem (3.0x10-4)
MHTGR: 18 mrem (2.9x10-4)
Large ALWR: 26 mrem (4.2x10-4)
Small ALWR: 22 mrem (3.6x10-4)
APT (He-3): 18 mrem (3.0x10-4)
APT (SILC): 19 mrem (3.0x10-4)

Radiological and Hazardous Chemical Impacts During Normal Oper

The annual dose to the total site workforce would range from 250 to 392person-rem and could result in 4 to 6.3 fatal cancers from 40 years of operation. The annual dose and (fatal cancers from 40years of operations) by technology would be:

HWR: 261 person-rem (4.2)
MHTGR: 250 person-rem (4.0)
Large ALWR: 392 person-rem (6.3)
Small ALWR: 322 person-rem (5.2)
APT (He-3): 260 person-rem (4.2)
APT (SILC): 262 person-

The annual dose to the total site workforce would range from 33 to 180person-rem and could result in 0.53 to 2.8 fatal cancers from 40 years of operation. The annual dose and (fatal cancers from 40years of operations) by technology would be:

HWR: 44 person-rem (0.70)
MHTGR: 33 person-rem (0.53)
Large ALWR: 180 person-rem (2.8)
Small ALWR: 100 person-rem (1.7)
APT (He-3): 43 person-rem (0.69)
APT (SILC): 45 person-

The annual dose to the total site workforce wo range from 350 to 490person-rem and could result in 5.6 to 7.9 fa cancers from 40 years o operation. The annual d and (fatal cancers from 40years of operations) technology would be:

HWR: 360 person-rem (5.8)
MHTGR: 350 person-rem (5.6)
Large ALWR: 490 person-rem (7.9)
Small ALWR: 420 person-rem (6.7)
APT (He-3): 360 person-rem (5.8)
APT (SILC): 362 person-

rem (4.2)	rem (0.72)	rem (5.8)
All doses to the public and site workers are within regulatory limits.	All doses to the public and site workers are within regulatory limits.	All doses to the publi site workers are within regulatory limits.

Radiological and Hazardous Chemical Impacts During Normal Oper

For chemicals the HI ranges from 1.8x10-4 to 6.3x10-4 with no cancer risk to the maximally exposed member of the public. The site worker HI ranges from 0.021 to 0.13 with no cancer risk. All values are within regulatory limits. The HIs by technology would be:	For chemicals the HI ranges from 1.8x10-7 to 7.7x10-5 with no cancer risk to the maximally exposed member of the public. The site worker HI ranges from 3.4x10-5 to 0.038 with no cancer risk. All values are within regulatory limits. The HIs by technology would be:	For chemicals the HI ranges from 0.36 to 0.3 with no cancer risk to maximally exposed member of the public. T site worker HI ranges f 0.35 to 0.26 with no ca risk. All values are wi regulatory limits. The by technology would be:
Public HWR: 2.1x10-4 MHTGR: 1.8x10-4 Large and Small ALWR: 6.3x10-4 APT (for either target system): 1.8x10-4 Worker HWR: 0.031 MHTGR: 0.021 Large and Small ALWR: 0.13 APT (for either target system): 0.021	Public HWR: 6.3x10-6 MHTGR: 2.2x10-7 Large and Small ALWR: 7.7x10-5 APT (for either target system): 1.8x10-7 Worker HWR: 3.2x10-3 MHTGR: 3.4x10-5 Large and Small ALWR: 0.038 APT (for either target system): 3.4x10-5	Public HWR: 0.36 MHTGR: 0.36 Large and Small ALWR: 0.38 APT (for either target system): 0.36 Worker HWR: 0.27 MHTGR: 0.32 Large and Small ALWR: 0.35 APT (for either target system): 0.26

Radiological and Hazardous Chemical Impacts During No

The annual dose to the maximally exposed member of the public from total site operations would range from 0.0048 to 0.25mrem. The associated risk of fatal cancer from 40 years of operation would range from 1.0x10-7 to 5.1x10-6. The dose and associated (risk of fatal cancer) by technology would be:	The annual dose to the maximally exposed member of the public from total site operations would range from 0.01 to 0.28mrem. The associated risk of fatal cancer from 40 years of operation would range from 2.0x10-7 to 5.6x10-6. The dose and associated (risk of fatal cancer) by technology would be:	The annual dose to the maximally exposed member of the public fr total site operations w range from 1.5 to 6 mre from atmospheric releas The associated risk of cancer from 40 years of operation would range from 3.0x10-5 to 1.2x10 The dose and associated (risk of fatal cancer) technology would be:
HWR: 0.18 mrem	HWR: 0.19 mrem	HWR: 4.3 mrem

(3.7x10-6) MHTGR: 0.08 mrem (1.6x10-6) Large and Small ALWR: 0.25 mrem (5.1x10-6) APT (He-3): 0.0048 mrem (1.0x10-7) APT (SILC): 0.05 mrem (1.1x10-6)	(3.8x10-6) MHTGR: 0.09 mrem (1.7x10-6) Large and Small ALWR: 0.28 mrem (5.6x10-6) APT (He-3): 0.01 mrem (2.0x10-7) APT (SILC): 0.06 mrem (1.2x10-6)	(8.4x10-5) MHTGR: 2.9 mrem (5.4x10-5) Large ALWR: 6 mrem (1.2x10-4) Small ALWR: 4.8 mrem (9.4x10-5) APT (He-3): 1.5 mrem (3.0x10-5) APT (SILC): 2.2 mrem (4.4x10-5)
	Radiological and Hazardous Chemical Impacts During No	
No liquid release.	No liquid release.	The dose to a maximall exposed member of the public from operation f 1year would be 14 mrem from liquid release for each technology, and th associated risk of fata cancer from 40 years of operation would be 2.8x10-4 for all techno gies.
The 50-mile population dose from total site operations in 2030 would range from 1.0 to 51 person-rem and could result in 0.01 to 1.1 fatal cancers over 40years of operation. The dose and (fatal cancers) by technology would be:	The 50-mile population dose from total site operations in 2030 would range from 0.01 to 0.18 person-rem and could result in 2.0x10-4 to 3.7x10-3 fatal cancers over 40 years of operation. The dose and (fatal cancers) by technology would be:	The 50-mile population dose from total site op tions in 2030 would ran from 57 to 79 person-re and could result in 1.2 1.6 fatal cancers over 40years of operation. T dose and (fatal cancers technology would be:
HWR: 31 person-rem (0.66) MHTGR: 15 person-rem (0.29) Large ALWR: 51 person-rem (1.1) Small ALWR: 49 person-rem (0.96) APT (He-3): 1.0 person-rem (0.01) APT (SILC): 10 person-rem (0.2)	HWR: 0.13 person-rem (2.6x10-3) MHTGR: 0.06 person-rem (1.2x10-3) Large ALWR: 0.17 person-rem (3.5x10-3) Small ALWR: 0.18 person-rem (3.7x10-3) APT (He-3): 0.01 person-rem (2.0x10-4) APT (SILC): 0.04 person-rem (9.0x10-4)	HWR: 71 person-rem (1.4) MHTGR: 65 person-rem (1.3) Large ALWR: 79 person-rem (1.6) Small ALWR: 76 person-rem (1.5) APT (He-3): 57 person-rem (1.2) APT (SILC): 62 person-rem (1.3)
	Radiological and Hazardous Chemical Impacts During No	
The average annual dose to a site worker that is associated with total site operations would range from 33to 52 mrem with a resulting risk of fatal cancer from 40 years of operation ranging from 5.3x10-4 to 8.3x10-4. The dose and (fatal cancer risk)	The average annual dose to a site worker that is associated with total site operations would range from 37to 220 mrem with a resulting risk of fatal cancer from 40 years of operation ranging from 6.0x10-4 to 3.5x10-3. The dose and (fatal cancer risk)	The average annual dos a site worker that is a ated with total site op tions would range from 19to 26 mrem with a resulting risk of fatal cancer from 40 years of operation ranging from 3.0x10-4 to 4.3x10-4. T dose and (fatal cancer

that are associated with total site operations, including the following technology, would be: HWR: 34 mrem (5.4x10-4) MHTGR: 33 mrem (5.3x10-4) Large ALWR: 52 mrem (8.3x10-4) Small ALWR: 43 mrem (6.9x10-4) APT (He-3): 34 mrem (5.4x10-4) APT (SILC): 34 mrem (5.5x10-4)	that are associated with total site operations, including the following technology, would be: HWR: 47 mrem (7.5x10-4) MHTGR: 37 mrem (6.0x10-4) Large ALWR: 220 mrem (3.5x10-3) Small ALWR: 130 mrem (2.2x10-3) APT (He-3): 48 mrem (7.7x10-4) APT (SILC): 51 mrem (8.2x10-4)	that are associated wit total site operations, including the following technology, would be: HWR: 19 mrem (3.0x10-4) MHTGR: 19 mrem (3.0x10-4) Large ALWR: 26 mrem (4.3x10-4) Small ALWR: 23 mrem (3.7x10-4) APT (for either target system): 19 mrem (3.0x10-4)
	Radiological and Hazardous Chemical Impacts During No	
The annual dose to the total site workforce would range from 250 to 390person-rem and could result in 4 to 6.3 fatal cancers over 40 years of operation. The dose and (fatal cancers) by each technology would be: HWR: 260 person-rem (4.2) MHTGR: 250 person-rem (4.0) Large ALWR: 390 person-rem (6.3) Small ALWR: 320 person-rem (5.2) APT (He-3): 258 person-rem (4.1) APT (SILC): 261 person-rem (4.2)	The annual dose to the total site workforce would range from 42 to 180person-rem and could result in 0.67 to 2.8 fatal cancers over 40 years of operation. The dose and (fatal cancers) by each technology would be: HWR: 42 person-rem (0.67) MHTGR: 31 person-rem (0.50) Large ALWR: 180 person-rem (2.8) Small ALWR: 98 person-rem (1.7) APT (He-3): 41 person-rem (0.66) APT (SILC): 44 person-rem (0.70)	The annual dose to the total site workforce wo range from 350 to 490person-rem and could result in 5.6 to 7.9 fa cancers over 40 years o operation. The dose and (fatal cancers) by each technology would be: HWR: 360 person-rem (5.8) MHTGR: 350 person-rem (5.6) Large ALWR: 490 person-rem (7.9) Small ALWR: 420 person-rem (6.7) APT (for either target system): 360 person-rem (5.8)
All radiological doses to the public and site workers are within regulatory limits.	All radiological doses to the public and site workers are within regulatory limits.	All radiological doses the public and site wor are within regulatory limits.
	Radiological and Hazardous Chemical Impacts During No	
For collocation relative percent reduction of the HI to the maximally exposed member of the public and the site worker HI with no cancer risk would be reduced by the below listed percentages for each technology (all values are within regulatory limits): - - -	For collocation relative percent reduction of the HI to the maximally exposed member of the public and the site worker HI with no cancer risk would be reduced by the below listed percentages for each technology (all values are within regulatory limits): - - -	For collocation relati percent reduction of th to the maximally expose member of the public an the site worker HI with cancer risk would be reduced by 0.01 percent for all technologies (a values are within regul tory limits): - - -

-
-
-
-
Public
HWR: 0.26
MHTGR: 0.3
ALWR: 0.09
APT: 0.3
-
Worker
HWR: 0.16
MHTGR: 0.23
ALWR: 0.04
APT: 0.23

-
-
-
-
Public
HWR: 1.4
MHTGR: 41.4
ALWR: 0.12
APT: 50.6
-
Worker
HWR: 0.53
MHTGR: 50
ALWR: 0.04
APT: 50

-
-
-
-
Public
HWR: 0.007
MHTGR: 0.007
ALWR: 0.007
APT: 0.007
-
Worker
HWR: 0.015
MHTGR: 0.013
ALWR: 0.011
APT: 0.015

Radiological Impacts from Accidents-Collocate

The estimated increase in likelihood of cancer fatality and the cancer risk to a maximally exposed individual at the site boundary for a low-to-moderate consequence/ high probability accident associated with operation of a collocated tritium supply and recycling facility would be:
-
Cancer Risk (per year)
HWR: 8.1x10-9
MHTGR: 1.3x10-10
Large ALWR: 5.0x10-11
Small ALWR: 6.8x10-11
APT: negligible
-
Cancer Fatality
HWR: 8.1x10-6
MHTGR: 5.1x10-9
Large ALWR: 5.0x10-6
Small ALWR: 6.8x10-6
APT: negligible

The estimated increase in likelihood of cancer fatality and the cancer risk to a maximally exposed individual at the site boundary for a low-to-moderate consequence/ high probability accident associated with operation of a collocated tritium supply and recycling facility would be:
-
Cancer Risk (per year)
HWR: 4.2x10-9
MHTGR: 5.5x10-11
Large ALWR: 2.2x10-11
Small ALWR: 3.0x10-11
APT: negligible
-
Cancer Fatality
HWR: 4.2x10-6
MHTGR: 2.2x10-9
Large ALWR: 2.2x10-6
Small ALWR: 3.0x10-6
APT: negligible

The estimated increase likelihood of cancer fatality and the cancer to a maximally exposed individual at the site boundary for a low-to-moderate consequence/ high probability accide associated with operati of a collocated tritium supply and recycling facility would be:
-
Cancer Risk (per year)
HWR: 6.8x10-8
MHTGR: 1.1x10-9
Large ALWR: 4.3x10-10
Small ALWR: 5.8x10-10
APT: negligible
-
Cancer Fatality
HWR: 6.8x10-5
MHTGR: 4.4x10-8
Large ALWR: 4.3x10-5
Small ALWR: 5.8x10-5
APT: negligible

Radiological Impacts from Accidents-Tri

The estimated cancer risk (fatalities per year) and, if the accident occured, the total cancer fatalities for the populations residing within 50 miles for a low-to-moderate consequence/ high probability accident of a tritium supply technology would be:
-
Cancer Risk
HWR: 7.4x10-5
MHGTR: 5.0x10-7
Large ALWR: 3.8x10-7

The estimated cancer risk (fatalities per year) and, if the accident occured, the total cancer fatalities for the populations residing within 50 miles for a low-to-moderate consequence/ high probability accident of a tritium supply technology would be:
-
Cancer Risk
HWR: 1.2x10-6
MHTGR: 1.7x10-8
Large ALWR: 7.3x10-9

The estimated cancer r (fatalities per year) a the accident occured, t total cancer fatalities the populations residin within 50 miles for a l to-moderate consequence high probability accide of a tritium supply tec ogy would be:
-
Cancer Risk
HWR: 7.5x10-4
MHTGR: 1.1x10-5
Large ALWR: 4.6x10-6

Small ALWR: 6.2x10-7
APT: negligible
-
Cancer Fatality
HWR: 0.074
MHGTR: 2.0x10-5
Large ALWR: 0.038
Small ALWR: 0.062
APT: negligible

Small ALWR: 1.0x10-8
APT: negligible
-
Cancer Fatality
HWR: 1.2x10-3
MHTGR: 6.8x10-7
Large ALWR: 7.3x10-4
Small ALWR: 1.0x10-3
APT: negligible

Small ALWR: 6.4x10-6
APT: negligible
-
Cancer Fatality
HWR: 0.75
MHTGR: 4.3x10-4
Large ALWR: 0.46
Small ALWR: 0.64
APT: negligible

Radiological Impacts from Accidents-Tri

The estimated cancer risk to a worker located 1,000meters from the release and, if the accident occured, the increase in likelihood of cancer fatality for a low-to-moderate consequence/ high probability accident of a tritium supply technology would be:
-
Cancer Risk (per year)
HWR: 1.1x10-7
MHTGR: 3.3x10-9
Large ALWR: 1.0x10-9
Small ALWR: 1.3x10-9
APT: negligible
-
Cancer Fatality
HWR: 1.1x10-4
MHTGR: 1.3x10-7
Large ALWR: 1.0x10-4
Small ALWR: 1.3x10-4
APT: negligible

The estimated cancer risk to a worker located 1,000meters from the release and, if the accident occured, the increase in likelihood of cancer fatality for a low-to-moderate consequence/ high probability accident of a tritium supply technology would be:
-
Cancer Risk (per year)
HWR: 2.8x10-8
MHTGR: 8.3x10-10
Large ALWR: 3.1x10-10
Small ALWR: 3.9x10-10
APT: negligible
-
Cancer Fatality
HWR: 2.8x10-5
MHTGR: 3.3x10-8
Large ALWR: 3.1x10-5
Small ALWR: 3.9x10-5
APT: negligible

The estimated cancer r to a worker located 1,000meters from the release and, if the acc occured, the increase i likelihood of cancer fatality for a low-to-moderate consequence/ high probability accide of a tritium supply tec ogy would be:
-
Cancer Risk (per year)
HWR: 1.6x10-7
MHTGR: 4.8x10-9
Large ALWR: 1.6x10-9
Small ALWR: 2.1x10-9
APT: negligible
-
Cancer Fatality
HWR: 1.6x10-4
MHTGR: 1.9x10-7
Large ALWR: 1.6x10-4
Small ALWR: 2.1x10-4
APT: negligible

Radiological Impacts from Accidents-Tri

The estimated cancer risk and, if the accident ocurred, the increase in likelihood of cancer fatality to a maximally exposed individual at the site boundary for a high consequence/low probability accident of a tritium supply technology would be:
-
Cancer Risk (per year)
HWR: 6.5x10-9
MHTGR: 9.4x10-10
Large ALWR: 3.5x10-10
Small ALWR: 3.6x10-10
APT (He-3): 4.4x10-15
APT (SILC): 9.2x10-14
-
Cancer Fatality
HWR: 7.1x 10-4

The estimated cancer risk and, if the accident ocurred, the increase in likelihood of cancer fatality to a maximally exposed individual at the site boundary for a high consequence/low probability accident of a tritium supply technology would be:
-
Cancer Risk (per year)
HWR: 1.8x10-8
MHTGR: 2.7x10-9
Large ALWR: 8.3x10-10
Small ALWR: 9.8x10-10
APT (He-3): 1.2x10-14
APT (SILC): 2.3x10-13
-
Cancer Fatality
HWR: 2.0x10-3

The estimated cancer r and, if the accident ocurred, the increase i likelihood of cancer fatality to a maximally exposed individual at t site boundary for a hig consequence/low probability accident of a tr supply technology would be:
-
Cancer Risk (per year)
HWR: 1.4x10-7
MHTGR: 2.4x10-8
Large ALWR: 3.1x10-9
Small ALWR: 6.6x10-9
APT (He-3): 9.5x10-14
APT (SILC): 1.6x10-12
-
Cancer Fatality
HWR: 0.015

MHTGR: 5.9x10-5
Large ALWR: 2.3x10-3
Small ALWR: 2.3x10-3
APT (He-3): 6.2x10-9
APT (SILC): 1.3x10-7

MHTGR: 1.7x10-4
Large ALWR: 5.5x10-3
Small ALWR: 6.3x10-3
APT (He-3): 1.7x10-8
APT (SILC): 3.3x10-7

MHTGR: 1.5x10-3
Large ALWR: 0.02
Small ALWR: 0.042
APT (He-3): 1.3x10-7
APT (SILC): 2.2x10-6

Radiological Impacts from Accidents-Tri

The estimated cancer risk (fatalities per year) and, if the accident ocurred, the total cancer fatalities for the population residing within 50 miles for a high consequence/ low probability accident of a tritium supply technology would be:
-
Cancer Risk (per year)
HWR: 1.4x10-5
MHTGR: 2.9x10-6
Large ALWR: 5.5x10-8
Small ALWR: 6.4x10-7
APT (He-3): 7.4x10-12
APT (SILC): 6.7x10-11
-
Cancer Fatality
HWR: 1.6
MHTGR: 0.18
Large ALWR: 0.36
Small ALWR: 4.1
APT (He-3): 1.0x10-5
APT (SILC): 9.4x10-5

The estimated cancer risk (fatalities per year) and, if the accident ocurred, the total cancer fatalities for the population residing within 50 miles for a high consequence/ low probability accident of a tritium supply technology would be:
-
Cancer Risk (per year)
HWR: 1.4x10-6
MHTGR: 2.8x10-7
Large ALWR: 5.3x10-9
Small ALWR: 6.1x10-8
APT (He-3): 7.0x10-13
APT (SILC): 6.4x10-12
-
Cancer Fatality
HWR: 0.15
MHTGR: 0.017
Large ALWR: 0.035
Small ALWR: 0.39
APT (He-3): 9.9x10-7
APT (SILC): 9.0x10-6

The estimated cancer r (fatalities per year) a the accident ocurred, t total cancer fatalities the population residing within 50 miles for a h consequence/ low probability accident of a tr supply technology would be:
-
Cancer Risk (per year)
HWR: 1.2x10-4
MHTGR: 2.3x10-5
Large ALWR: 9.4x10-7
Small ALWR: 5.1x10-6
APT (He-3): 6.8x10-11
APT (SILC): 7.4x10-10
-
Cancer Fatality
HWR: 13
MHTGR: 1.4
Large ALWR: 6.2
Small ALWR: 33
APT (He-3): 9.6x10-5
APT (SILC): 1.0x10-3

Radiological Impacts from Accidents-Tri

The estimated cancer risk to a worker located 1,000meters from the release and, if the accident ocurred, the increase in likelihood of cancer fatality for a high consequence/low probability accident of a tritium supply technology would be:
-
Cancer Risk (per year)
HWR: 3.2x10-7
MHTGR: 1.1x10-7
Large ALWR: 5.0x10-9
Small ALWR: 1.5x10-8
APT (He-3): 4.4x10-13
APT (SILC): 6.7x10-12
-
Cancer Fatality
HWR: 0.034
MHTGR: 6.7x10-3
Large ALWR: 0.033
Small ALWR: 0.094

The estimated cancer risk to a worker located 1,000meters from the release and, if the accident ocurred, the increase in likelihood of cancer fatality for a high consequence/low probability accident of a tritium supply technology would be:
-
Cancer Risk (per year)
HWR: 2.8x10-7
MHTGR: 8.1x10-8
Large ALWR: 4.5x10-9
Small ALWR: 1.4x10-8
APT (He-3): 3.2x10-13
APT (SILC): 4.8x10-12
-
Cancer Fatality
HWR: 0.031
MHTGR: 5.0x10-3
Large ALWR: 0.03
Small ALWR: 0.087

The estimated cancer r to a worker located 1,000meters from the release and, if the acc ocurred, the increase i likelihood of cancer fatality for a high con quence/low probability accident of a tritium supply technology would be:
-
Cancer Risk (per year)
HWR: 3.2x10-7
MHTGR: 1.1x10-7
Large ALWR: 4.9x10-9
Small ALWR: 1.6x10-8
APT (He-3): 4.3x10-13
APT (SILC): 6.2x10-12
-
Cancer Fatality
HWR: 0.035
MHTGR: 7.1x10-3
Large ALWR: 0.032
Small ALWR: 0.10

APT (He-3): 6.1x10-7 APT (SILC): 9.4x10-6	APT (He-3): 4.5x10-7 APT (SILC): 6.7x10-6	APT (He-3): 6.0x10-7 APT (SILC): 8.7x10-6
The impacts of tritium extraction and recycling are presented in appendixI.	The impacts of tritium extraction and recycling are presented in appendixI.	The impacts of tritium extraction and recyclin are presented in appendixI.
		Waste Management-No Ac
Under No Action, INEL would continue to manage spent nuclear fuel and the following waste types: high-level, TRU, low-level, mixed TRU and low-level, hazardous, and non-hazardous.	Under No Action, NTS would continue to manage the following waste types: TRU, low-level, mixed TRU and low-level, haz-ardous, and nonhazardous.	Under No Action, ORR would continue to manag spent nuclear fuel and following waste types: TRU, low-level, mixed TRU and low-level, haz-ardous, and nonhazardou
		Waste Management-Collocated Tritium S
For collocated tritium supply and recycling facil-ities, spent nuclear fuel would be generated by all technologies, except APT. New spent fuel storage facilities would be required. For tritium recycling phaseout at SRS, no change for spent nuclear fuel.	For collocated tritium supply and recycling facil-ities, spent nuclear fuel would be generated by all technologies, except APT. New spent fuel storage facilities would be required. For tritium recycling phaseout at SRS, no change for spent nuclear fuel.	For collocated tritium supply and recycling fa ities, spent nuclear fu would be generated by a technologies, except AP New spent fuel storage facilities would be required. For tritium recycling phaseout at S no change for spent nuclear fuel.
		Waste Management-Collocated Tritium S
For collocated tritium supply and recycling facil-ities, liquid LLW would be generated by all technolo-gies except APT in the following quantities: - - HWR: 2,100,000 GPY MHTGR: 525,000 GPY Large ALWR: 5,000,000 GPY Small ALWR: 790,000 GPY - Existing/planned treatment facilities may be adequate for all technolo-gies, except the Large ALWR, which would require a new treatment facility. For tritium recycling phaseout at SRS, no change for liquid LLW.	For collocated tritium supply and recycling facil-ities, liquid LLW would be generated for all technolo-gies except APT in the following quantities: - - HWR: 2,100,000 GPY MHTGR: 525,000 GPY Large ALWR: 5,000,000 GPY Small ALWR: 790,000 GPY - New treatment facilities would be required. For tritium recycling phaseout at SRS, no change for liquid LLW.	For collocated tritium supply and recycling fa ities, liquid LLW gener tion would increase for technologies except APT The increase over No Action (587,000 GPY) would be: HWR: 2,100,000 GPY MHTGR: 525,000 GPY Large ALWR: 5,000,000 GPY Small ALWR: 790,000 GPY - New treatment facilitie would be required. For tritium recycling phase at SRS, no change for liquid LLW.

Waste Management-Collocated Tritium S

For collocated tritium supply and recycling facilities, solid LLW generation would increase and require additional onsite LLW disposal area. The increase over No Action (5,100 yd3 per year) and the additional LLW disposal area would be:

HWR: 5,550 yd3 per year - 0.6 acres per year
MHTGR: 1,650 yd3 per year - 0.2 acres per year
-
Large ALWR: 1,060 yd3 per year - 0.2 acres per year
Small ALWR: 1,010 yd3 per year - 0.1 acres per year
APT: 894 yd3 per year - 0.1 acres per year
-
For tritium recycling phaseout at SRS, 350 yd3 per year decrease in solid LLW at SRS. LLW disposal facility life extended.

For collocated tritium supply and recycling facilities, solid LLW generation would increase and require additional onsite LLW disposal area. The increase over No Action (42,400 yd3 per year) and the additional LLW disposal area would be:

HWR: 5,550 yd3 per year - 0.6 acres per year
MHTGR: 1,650 yd3 per year - 0.2 acres per year
-
Large ALWR: 1,060 yd3 per year - 0.2 acres per year
Small ALWR: 1,010 yd3 per year - 0.1 acres per year
APT: 894 yd3 per year - 0.1 acres per year
-
For tritium recycling phaseout at SRS, 350 yd3 per year decrease in solid LLW at SRS. LLW disposal facility life extended.

For collocated tritium supply and recycling fa ities, solid LLW genera tion would increase and require additional onsi LLW disposal area. The increase over No Action (9,300 yd3 per year) an the additional LLW disposal area would be:

HWR: 5,550 yd3 per yea 1.2 acres per year
MHTGR: 1,650 yd3 per year - 0.35 acre per ye
-
Large ALWR: 1,060 yd3 per year - 0.4 acres pe year
Small ALWR: 1,010 yd3 per year - 0.2 acres pe year
APT: 894 yd3 per year - 0.2 acres per year
-
For tritium recycling phaseout at SRS, 350 yd per year decrease in so LLW at SRS. LLW disposal facility life extended.

Waste Management-Collocated Tritium S

For collocated tritium supply and recycling facilities, small quantity (6GPY) of liquid mixed LLW from recycling facility would be generated. Existing/planned treatment facilities would be adequate. For tritium recycling phaseout at SRS, 6 GPY of liquid mixed LLW no longer generated at SRS.

For collocated tritium supply and recycling facilities, small quantity (6GPY) of liquid mixed LLW from recycling facility would be generated. Organic mixed waste treatment capability would be required. For tritium recycling phaseout at SRS, 6 GPY of liquid mixed LLW no longer generated at SRS.

For collocated tritium supply and recycling fa ities, small quantity (6GPY) in liquid mixed LLW generation over No Action (470,000 GPY) would be generated from recycling facility. Exi ing/planned treatment facilities would be adequate. For tritium recycling phaseout at S 6 GPY of liquid mixed LLW no longer generated at SRS.

For collocated tritium supply and recycling facilities, solid mixed LLW generation would increase. The increase over No Action (655 yd3 per year) would be:

For collocated tritium supply and recycling facilities, solid mixed LLW generation would increase. The increase over No Action (5,460 yd3 per year) would be:

For collocated tritium supply and recycling fa ities, solid mixed LLW generation would increa The increase over No Action (11,100 yd3 per year) would be:

HWR: 122 yd3 per year MHTGR: 3 yd3 per year Large ALWR: 8 yd3 per year Small ALWR: 8 yd3 per year APT: 9 yd3 per year	HWR: 122 yd3 per year MHTGR: 3 yd3 per year Large ALWR: 8 yd3 per year Small ALWR: 8 yd3 per year APT: 9 yd3 per year - Organic mixed waste treatment capability would be required. For tritium recycling phaseout at SRS, 2 yd3 per year decrease in solid mixed LLW at SRS.	HWR: 122 yd3 per year MHTGR: 3 yd3 per year Large ALWR: 8 yd3 per year Small ALWR: 8 yd3 per year APT: 9 yd3 per year - Existing/planned treatment facilities wo be adequate. For tritiu recycling phaseout at S 2 yd3 per year decrease solid mixed LLW at SRS.

Waste Management-Collocated Tritium S

HWR may require new or expanded treatment and storage facilities. For tritium recycling phaseout at SRS, 2 yd3 per year decrease in solid mixed LLW at SRS.	-	-
For collocated tritium supply and recycling facilities, hazardous waste generation would increase. The increase over No Action (308 yd3 per year) would be: HWR: 41 yd3 per year MHTGR: 101 yd3 per year Large ALWR: 36 yd3 per year Small ALWR: 36 yd3 per year) APT: 4 yd3 per year	For collocated tritium supply and recycling facilities, hazardous waste generation would increase. The increase over No Action (20 yd3 per year) would be: HWR: 41 yd3 per year MHTGR: 101 yd3 per year Large ALWR: 36 yd3 per year Small ALWR: 36 yd3 per year) APT: 4 yd3 per year	For collocated tritium supply and recycling fa ities, solid hazardous waste generation would increase. The increase No Action (1,150 yd3 pe year) would be: HWR: 41 yd3 per year MHTGR: 101 yd3 per year Large ALWR: 36 yd3 per year Small ALWR: 36 yd3 per year) APT: 4 yd3 per year
Use of existing/planned hazardous waste facilities may be feasible. For tritium recycling phaseout at SRS, 1 yd3 per year decrease in hazardous waste at SRS. Decrease in offsite hazardous waste shipments.	Additional hazardous waste storage facilities may be required except for APT. APT may require expansion of existing/planned hazardous waste storage facilities. For tritium recycling phaseout at SRS, 1 yd3 per year decrease in hazardous waste at SRS. Decrease in offsite hazardous waste shipments.	Existing/planned hazardous waste facilit would be adequate. For tritium recycling phase at SRS, 1 yd3 per year decrease in hazardous waste at SRS. Decrease offsite hazardous waste shipments.

Waste Management-Collocated Tritium S

For collocated tritium supply and recycling facilities, liquid sanitary waste would be generated (260MGY) and require	For collocated tritium supply and recycling facilities, liquid sanitary waste would be generated (260MGY) and require	For collocated tritium supply and recycling fa ities, liquid sanitary generation would increa The increase over No

new treatment facilities. For tritium recycling phaseout at SRS, 32 MGY decrease in liquid sanitary waste at SRS. Decrease would occur over time as recycling facilities are transitioned.	new treatment facilities. For tritium recycling phaseout at SRS, 32 MGY decrease in liquid sanitary waste at SRS. Decrease would occur over time as recycling facilities are transitioned.	Action (483 MGY) would be: - - - - - - - HWR: 2,380 MGY MHTGR: 1,660 MGY Large ALWR: 6,320 MGY Small ALWR: 2,880 MGY APT: 269 MGY - New treatment facilitie would be required. For tritium recycling phase at SRS, 32 MGY decrease in liquid sanitary wast SRS. Decrease would occur over time as recycling facilities ar transitioned.
		Waste Management-Collocated Tritium S
For collocated tritium supply and recycling facilities, solid sanitary waste generation would increase. The increase over No Action (68,000 yd3 per year) would be: - HWR: 15,000 yd3 per year MHTGR: 14,800 yd3 per year Large ALWR: 14,300 yd3 per year Small ALWR: 11,600 yd3 per year APT: 8,640 yd3 per year Onsite landfill design life would be reduced or require expansion. For tritium recycling phaseout at SRS, 7,800 yd3 per year decrease in solid sanitary waste at SRS. Decrease would occur over time as recycling facilities are transitioned. Landfill life would be extended.	For collocated tritium supply and recycling facilities, solid sanitary waste generation would increase. The increase over No Action (7,000 yd3 per year) would be: - HWR: 15,000 yd3 per year MHTGR: 14,800 yd3 per year Large ALWR: 14,300 yd3 per year Small ALWR: 11,600 yd3 per year APT: 8,640 yd3 per year Onsite landfill design life would be reduced or require expansion. For tritium recycling phaseout at SRS, 7,800 yd3 per year decrease in solid sanitary waste at SRS. Decrease would occur over time as recycling facilities are transitioned. Landfill life would be extended.	For collocated tritium supply and recycling fa ities, solid sanitary w generation would increa The increase over No Action (77,000 yd3 per year) would be: - HWR: 15,000 yd3 per yea MHTGR: 14,800 yd3 per year Large ALWR: 14,300 yd3 per year Small ALWR: 11,600 yd3 per year APT: 8,640 yd3 per year Onsite landfill design would be reduced or require expansion. For tritium recycling phase at SRS, 7,800 yd3 per y decrease in solid sanit waste at SRS. Decrease would occur over time a recycling facilities ar transitioned. Landfill would be extended.
For collocated tritium supply and recycling facilities, other solid nonhazardous waste would be recycled. For tritium recycling phaseout at SRS, 6,800 yd3 per year	For collocated tritium supply and recycling facilities, other solid nonhazardous waste would be recycled. For tritium recycling phaseout at SRS, 6,800 yd3 per year	For collocated tritium supply and recycling fa ities, other solid nonh ardous waste would be recycled. For tritium recycling phaseout at S 6,800 yd3 per year

decrease in other solid nonhazardous waste at SRS. Decrease in shipments to offsite recyclers.	decrease in other solid nonhazardous waste at SRS. Decrease in shipments to offsite recyclers.	decrease in other solid nonhazardous waste at SRS. Decrease in shipments to offsite re clers.
		Waste Management-Tritium Su
For tritium supply alone there would be no change to the impacts for spent nuclear fuel. For tritium recycling upgrade at SRS there would be no change over No Action for spent nuclear fuel.	For tritium supply alone there would be no change to the impacts for spent nuclear fuel. For tritium recycling upgrade at SRS there would be no change over No Action for spent nuclear fuel.	For tritium supply alo there would be no chang to the impacts for spen nuclear fuel. For triti recycling upgrade at SR there would be no chang over No Action for spen nuclear fuel.
For tritium supply alone there would be no change to the impacts for liquid LLW. For tritium recycling upgrade at SRS there would be no change over No Action for liquid LLW.	For tritium supply alone there would be no change to the impacts for liquid LLW. For tritium recycling upgrade at SRS there would be no change over No Action for liquid LLW.	For tritium supply alo there would be no chang to the impacts for liqu LLW. For tritium recycl upgrade at SRS there would be no change over No Action for liquid LL
For tritium supply alone solid LLW generation would increase and require additional onsite LLW disposal area. The increase over No Action (5,100 yd3 per year) and the additional LLW disposal area would be: HWR: 5,200 yd3 per year - 0.6 acres per year MHTGR: 1,300 yd3 per year - 0.2 acres per year - Large ALWR: 710 yd3 per year -0.2 acres per year - Small ALWR: 660 yd3 per year -0.08 acres per year - APT: 544 yd3 per year - 0.07 acres per year	For tritium supply alone solid LLW generation would increase and require additional onsite LLW disposal area. The increase over No Action (42,400 yd3 per year) and the additional LLW disposal area would be: HWR: 5,200 yd3 per year - 0.6 acres per year MHTGR: 1,300 yd3 per year - 0.15 acres per year - Large ALWR: 710 yd3 per year -0.2 acres per year - Small ALWR: 660 yd3 per year -0.09 acres per year - APT: 544 yd3 per year - 0.07 acres per year	For tritium supply alo solid LLW generation would increase and requ additional onsite LLW disposal area. The increase over No Action (9,300 yd3 per year) an the additional LLW disposal area would be: HWR: 5,200 yd3 per year 1.1 acres per year MHTGR: 1,300 yd3 per year - 0.3 acres per ye - Large ALWR: 710 yd3 per year -0.3 acres per yea - Small ALWR: 660 yd3 per year -0.2 acres per yea - APT: 544 yd3 per year - 0.1 acres per year
		Waste Management-Tritium Su
For tritium recycling upgrade at SRS there would be no change over No Action for solid LLW.	For tritium recycling upgrade at SRS there would be no change over No Action for solid LLW.	For tritium recycling upgrade at SRS there would be no change over No Action for solid LLW
For tritium supply alone liquid mixed LLW would no longer be generated.	For tritium supply alone liquid mixed LLW would no longer be generated.	For tritium supply alo liquid mixed LLW would no longer be generated.

For tritium recycling upgrade at SRS there would be no change over No Action for liquid mixed LLW.

For tritium supply alone, solid mixed LLW generation would increase. The increase over No Action (655 yd3 per year) would be:
HWR : 120 yd3 per year
MHTGR: 1 yd3 per year
Large ALWR: 6 yd3 per year
Small ALWR: 6 yd3 per year
APT: 7 yd3 per year
-
Impacts would remain the same as collocated tritium supply and recycling. For tritium recycling upgrade at SRS there would be no change over No Action for solid mixed LLW.

For tritium recycling upgrade at SRS there would be no change over No Action for liquid mixed LLW.

For tritium supply alone, solid mixed LLW generation would increase. The increase over No Action (5,460 yd3 per year) would be:
HWR : 120 yd3 per year
MHTGR: 1 yd3 per year
Large ALWR: 6 yd3 per year
Small ALWR: 6 yd3 per year
APT: 7 yd3 per year
-
Impacts would remain the same as collocated tritium supply and recycling. For tritium recycling upgrade at SRS there would be no change over No Action for solid mixed LLW.

For tritium recycling upgrade at SRS there would be no change over No Action for liquid mi LLW.

For tritium supply alo solid mixed LLW generation would increase. Th increase over No Action (11,100 yd3 per year) would be:
HWR : 120 yd3 per year
MHTGR: 1 yd3 per year
Large ALWR: 6 yd3 per year
Small ALWR: 6 yd3 per year
APT: 7 yd3 per year
-
Impacts would remain th same as collocated trit supply and recycling. F tritium recycling upgra at SRS there would be n change over No Action f solid mixed LLW.

Waste Management-Tritium Su

For tritium supply alone, hazardous waste generation would increase. The increase over No Action (308 yd3 per year) would be:
HWR: 40 yd3 per year
MHTGR: 100 yd3 per year
Large ALWR: 35 yd3 per year
Small ALWR: 35 yd3 per year
APT: 3 yd3 per year
Impacts would remain the same as collocated tritium supply and recycling. For tritium recycling upgrade at SRS there would be no change over No Action for hazardous waste.

For tritium supply alone liquid sanitary waste would be generated (245 MGY). Impacts would remain the same as collocated tritium supply and recycling. For tritium recycling upgrade at SRS there would be no change over No Action for liquid sanitary waste.

For tritium supply alone, hazardous waste generation would increase. The increase over No Action (20 yd3 per year) would be:
HWR: 40 yd3 per year
MHTGR: 100 yd3 per year
Large ALWR: 35 yd3 per year
Small ALWR: 35 yd3 per year
APT: 3 yd3 per year
Impacts would remain the same as collocated tritium supply and recycling. For tritium recycling upgrade at SRS there would be no change over No Action for hazardous waste.

For tritium supply alone liquid sanitary waste would be generated (245 MGY). Impacts would remain the same as collocated tritium supply and recycling. For tritium recycling upgrade at SRS there would be no change over No Action for liquid sanitary waste.

For tritium supply alo hazardous waste generation would increase. Th increase over No Action (1,150 yd3 per year) wo be:
HWR: 40 yd3 per year
MHTGR: 100 yd3 per year
Large ALWR: 35 yd3 per year
Small ALWR: 35 yd3 per year
APT: 3 yd3 per year
Impacts would remain th same as collocated trit supply and recycling. F tritium recycling upgra at SRS there would be n change over No Action f hazardous waste.

For tritium supply alo liquid sanitary waste g eration would increase. The increase over No Action (483 MGY) would be:
HWR: 2,350 MGY
MHTGR: 1,630 MGY
Large ALWR: 6,290 MGY
Small ALWR: 2,850 MGY
APT: 245 MGY
-

		Impacts would remain th same as collocated trit supply and recycling. F tritium recycling upgra at SRS there would be n change over No Action f liquid sanitary waste.
		Waste Management-Tritium Su
For tritium supply alone solid sanitary waste generation would increase. The increase over No Action (68,000 yd3 per year) would be: HWR: 7,600 yd3 per year MHTGR: 7,400 yd3 per year Large ALWR: 6,900 yd3 per year Small ALWR: 4,200 yd3 per year APT: 1,240 yd3 per year Proportionately decreasing impacts to landfill from collocated tritium supply and recycling. For tritium recycling upgrade at SRS there would be no change over No Action for solid sanitary waste.	For tritium supply alone solid sanitary waste generation would increase. The increase over No Action (7,000 yd3 per year) would be: HWR: 7,600 yd3 per year MHTGR: 7,400 yd3 per year Large ALWR: 6,900 yd3 per year Small ALWR: 4,200 yd3 per year APT: 1,240 yd3 per year Proportionately decreasing impacts to landfill from collocated tritium supply and recycling. For tritium recycling upgrade at SRS there would be no change over No Action for solid sanitary waste.	For tritium supply alo solid sanitary waste ge ation would increase. T increase over No Action (77,000 yd3 per year) would be: HWR: 7,600 yd3 per year MHTGR: 7,400 yd3 per year Large ALWR: 6,900 yd3 per year Small ALWR: 4,200 yd3 per year APT: 1,240 yd3 per year Proportionately decreas impacts to landfill fro collocated tritium supp and recycling. For trit recycling upgrade at SR there would be no chang over No Action for soli sanitary waste.
For tritium supply alone other solid nonhazardous waste would be recycled. For tritium recycling upgrade at SRS there would be no change over No Action for other solid nonhazardous waste.	For tritium supply alone other solid nonhazardous waste would be recycled. For tritium recycling upgrade at SRS there would be no change over No Action for other solid nonhazardous waste.	For tritium supply alo other solid nonhazardou waste would be recycled For tritium recycling upgrade at SRS there would be no change over No Action for other sol nonhazardous waste.
		Intersite Transport-No
Under No Action negligible tritium transport.	Under No Action negligible tritium transport.	Under No Action neglig ble tritium transport.
		Intersite Transport-Collocated Tritium
The relative transportation risk of tritium for collocat-	The relative transportation risk of tritium for collocat-	The relative transport risk of tritium for col

ing supply and recycling is 29 percent lower than the existing No Action case for all technologies.	ing supply and recycling is 30 percent lower than the existing No Action case for all technologies.	ing supply and recyclin 13 percent lower than t existing No Action case all technologies.
The potential cancer fatalities per year for transporting tritiated heavy water for collocated supply and recycling is 3.57x10-5 for the HWR and 6.63x10-6 for APT.	The potential cancer fatalities per year for transporting tritiated heavy water for collocated supply and recycling is 3.57x10-5 for the HWR and 6.63x10-6 for APT.	The potential cancer f ties per year for trans ing tritiated heavy wat for collocated supply a recycling is 3.57x10-5 the HWR and 6.63x10-6 for APT.
		Intersite Transport-Collocated Tritium
No intersite transport of LLW.	No intersite transport of LLW.	No intersite transport LLW.
		Intersite Transport-Tritium S
The risk of transporting new tritium for a tritium supply alone is about 2percent greater than No Action due to transporting virgin tritium to SRS.	The risk of transporting new tritium for a tritium supply alone is about 2percent greater than No Action due to transporting virgin tritium to SRS.	The risk of transporti new tritium for a triti supply alone is about 2percent greater than N Action due to transport virgin tritium to SRS.
		Intersite Transport-Tritium S
-	-	-

The potential cancer fatalities per year for transporting tritiated heavy water for tritium supply alone is 1.4x10-5 for the HWR and 6.63x10-6 for APT.	The potential cancer fatalities per year for transporting tritiated heavy water for tritium supply alone is 1.4x10-5 for the HWR and 6.63x10-6 for APT.	The potential cancer f ities per year for tran ing tritiated heavy wat for tritium supply alon 1.4x10-5 for the HWR an 6.63x10-6 for APT.
The annual risk from transporting highly enriched uranium fuel feel material for the HWR and MHTGR alternatives from ORR to INEL is 5.1x10-4.	The annual risk from transporting highly enriched uranium fuel feel material for the HWR and MHTGR alternatives from ORR to NTS is 5.1x10-4.	No intersite transport highly enriched uranium fuel feed material.

Table 3.6-2.-Summary Comparison of Environmental Impacts of the Commercial Light Wa Reactor Alternative [Page 1 of 2]

Advanced Light Water Reactor	Complete Construction of a Commercial Reactor	Purchase or Single
		Construction
Construction would result in short-term exceedance of 24-hour PM10 and TSP standards.	Construction related air emissions would increase but would be smaller than ALWR and of shorter duration. Emissions would be temporary and would not be expected to significantly affect air quality in the project site area.	There wo to constr at the pl and targe be constr would be be expect air quali
Total employment would be 12,600	Employment would require 3,530	Construc

worker-years over a 6-year period.	to 5,730 worker-years over 5 years of construction for a 45 percent or 85 percent complete reactor, respectively.	facility facility years ove
Hazardous waste generated from construction activities would be approximately 930 yd3.	Hazardous waste generated from construction activities would be substantially less than an ALWR.	The annu hazardous construct target fa be approx
Advanced Light Water Reactora	Complete Construction of a Commercial Reactor	Purchase or Single
		Operation
Operation would require approximately 16 billion gallons of water per year. No substantial impacts to surface water are expected.	Operation would require approximately the same amount of water as the ALWR.	Adding t mission t reactor w water con
Operation would require approximately 830 workers.	Operation would require approximately 830workers.	Operatio 72additio existing
Approximately 193 dry storage assemblies of spent fuel would be generated and: - 710 yd3 of LLW - 6 yd3 of mixed waste.	Approximately 193 dry storage assemblies of spent fuel would be generated and: - 490 yd3 of LLW -the amount of mixed waste would be similar to the ALWR.	Approxim assemblie generated - 160 yd3 - no addi be genera
Worker exposure for all personnel would be approximately 170person-rem per year.	Worker exposure for all personnel would be approximately 240person-rem.	Worker e for all p
Tritium production would result in the emission of approximately 6,840 curies per year of gaseous tritium and 1,740 curies per year of liquid tritium.	Gaseous and liquid tritium emissions would be similar to ALWR.	Tritium the emiss year of g 1,460curi tritium o sions.
Radiological releases associated with production of tritium would result in an annual dose of 90person-rem to the 50-mile population.	Radioactive releases associated with production of tritium would be similar to the ALWR.	Radioact with prod result in 0.5person ulation.
For a high consequence/low probability accident, approximately 1.7cancer fatalities and a risk of 2.6x10-7 cancer fatalities per year could result.	Similar to ALWR.	No subst quences o expected.

3.7 Agency Preferred Alternative

The Council on Environmental Quality (CEQ) Regulations require an agency to identif preferred alternative(s) in the Final Environmental Impact Statement (40 CFR 1502.1 The preferred alternative is the alternative which the agency believes would fulfil statutory mission, giving consideration to environmental, economic, technical, and factors. Consequently, to identify a preferred alternative, the Department has deve information on potential environmental impacts, costs, technical risks, and schedul risks for the alternatives under consideration.

This PEIS provides information on the environmental impacts. Cost, schedule, and technical analyses have also been prepared, and are summarized in the Tritium Suppl Recycling Technical Reference Report which is available in the appropriate DOE Read Rooms for public review.

Based upon the analysis presented in the documents identified above, the Department preferred alternative is a acquisition strategy that assures tritium production for the nuclear weapons stockpile rapidly, cost-effectively, and safely. The preferred strategy is to begin work on the two most promising production alternatives: (1) pu an existing commercial light water reactor or irradiation services with an option t purchase the reactor for conversion to a defense facility; (2) design, build, and t critical components of an accelerator system for tritium production. Within a three period, the Department would select one of the alternatives to serve as the primary of tritium. The other alternative, if feasible, would be developed as a back-up tri source.

Savannah River Site has been designated as the preferred site for an accelerator, s one be built. The preferred alternative for tritium recycling and extraction activi to remain at the Savannah River Site with appropriate consolidation and upgrading o current facilities, and construction of a new extraction facility.Tritium Supply. A the new facility alternatives, the accelerator has the highest probability to meet production requirements because of less regulatory uncertainty. It also has the lea environmental impact because it does not use fissile material, generates no high-le wastes, and while the risk from a severe accident is very small for all of the alternatives, the risk for the accelerator is the smallest. While all of the compon of the accelerator have been proven, the entire system needs to be demonstrated to the components work together as a complete system.

If the Department should select the accelerator as its primary production option, t is the preferred site for the new facility because of its existing mission and infrastructure for tritium recycling. The principal discriminator among sites is mi related: of the four sites that have continuing defense missions (NTS, Pantex, ORR, SRS) only SRS has a current tritium mission and an existing tritium recycling infrastructure. It should be noted that the analysis found all of the sites accepta an accelerator from a cost and environmental perspective.

Policy and regulatory issues regarding the use of a commercial reactor(s) must be r including, for example, nonprolification and licensing. Since commercial reactors a already constructed and operating, adding the tritium mission to an existing reacto not significantly increase any existing environmental impact. Using existing commer reactors appears to offer the least expensive approach.

In light of these uncertainties and the advantages of both alternatives a dual trac proving feasibility of both, is the preferred strategy. After proof of feasibility alternative would be pursued as the primary means of production. The other alternat determined feasible, would be developed to the point where it would provide a fall alternative or be available to meet increased production requirements at some futur In any case, tritium targets for a commercial reactor would be developed and qualif support the use of an existing commercial reactor as a contingency in the event of national emergency.

The dual track strategy for meeting tritium supply requirements with these two alternatives provides the following advantages:

Major uncertainties resolved (technical with accelerator, policy and regulatory for commercial reactor, cost for both) over the next three years, before selection of t primary alternative;

For a new facility, lowest estimated environmental impacts for an accelerator and m increase in environmental impact for an operating commercial reactor;

Lessens programmatic risk by

- providing fall back through use of two technically different and independent alternatives in the event either alternative develops significant problems,

- providing proven independent capability to increase production,

- developing and protecting the ability to support a contingency in the event of a national emergency,

- selecting a strategy providing for production alternatives that include the great probability to meet earlier production requirements (accelerator), and the least co option (irradiation services);

Preserves an option for simultaneous reactor "burning" of excess weapons plutonium, the Storage and Disposition of Weapons - Usable Fissile Materials Record of Decisio selects reactor burning of that material.

Tritium Recycling. Analysis of siting for the tritium recycling and extraction faci led to the conclusion that keeping both of these functions at the SRS provides both lowest cost and least environmental impact. Therefore, both of these functions rema the SRS with appropriate consolidation and upgrading of current recycling facilitie a new extraction facility.

PAGE TOC FIGURES TABLES PAGE

CHAPTER 4: AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

Chapter 4 describes the affected environment and the environmental impacts associat construction and operation of tritium supply and recycling alternatives. The chapte begins with a brief introduction, followed by an overview of applicable environment assessment methodologies. The affected environment and environmental impacts of tri supply and recycling facilities are then discussed for each of the following sites: Idaho National Engineering Laboratory, Nevada Test Site, Oak Ridge Reservation, Pan Plant, and Savannah River Site. Each discussion begins with a brief site descriptio overview of the tritium supply technologies and recycling facilities being consider that site, continues with a description of the affected environment at the site, an concludes with a description of environmental impacts and potential mitigation of e alternative. The commercial reactor alternative affected environment and potential environmental impacts are discussed in a section by itself. Following the sections address individual sites are discussions of potential impacts from intersite transp tion, sale of steam, power plant for the Accelerator Production of Tritium, and multipurpose reactor. Lastly, this section discusses cumulative impacts and several issues that are common to all sites: unavoidable adverse environmental impacts; relationship between local short-term uses of man's environment and the maintenance enhancement of long-term productivity; irreversible and irretrievable commitments o resources; facility transition; and environmental justice.

Discussions of the environment that may be affected at each candidate site, and the associated environmental impacts that would result from the proposed action make up core of this chapter. In accordance with Council on Environmental Quality (CEQ) regulations (40 CFR 1508.14), the affected environment is "interpreted comprehensiv to include the natural and physical environment and the relationship of people with environment." The environmental impacts sections provide the analytical basis for t comparisons of potential impacts of the various tritium supply technologies and recycling facilities and No Action that are presented in chapter 3.

Affected Environment. The descriptions of the affected environment provide a basis understanding the direct, indirect, and cumulative effects of the proposed action a alternatives. The localities and characteristics of each potentially affected envir mental resource are described for each site. The scope of the discussions varies by resource to ensure that all relevant issues are included.

For land resources, geology and soils, biotic resources, and cultural and paleontol resources, discussions of each Department of Energy (DOE) site and its surroundings included along with descriptions of the representative area within that site that c affected by the proposed action. This information provides a basis for understandin direct effects and the overall resource base that could be affected by ancillary activities that may be defined in later stages of program development.

Ambient conditions are described for air, noise, and water resources. Discussions f air and noise conditions at site boundaries and the surface water bodies and ground aquifers that could be affected. This information serves as a basis for analyzing k and water quality parameters to obtain results that can then be compared to regulat standards.

Socioeconomic conditions are described for the counties and communities that could affected by regional population changes associated with the proposed tritium supply technologies and recycling facilities. The affected environment discussions include projections of regional growth and related socioeconomic indicators. Each region is enough to account for growth related to direct project employment as well as second jobs that may be induced by the project.

In addition to those natural and human environmental resources discussed above, the

affected environment sections include a number of issues related to ongoing DOE act at each site. These issues involve facility operations/site infrastructure, intersi transport of tritium, waste management, and radiological and hazardous chemical imp during normal operation and accidents. Where reasonably foreseeable changes to any these factors can be predicted, they are discussed.

Environmental Impacts. In accordance with CEQ regulations, the environmental conseq discussions provide the analytical detail for comparisons of environmental impacts associated with the various tritium supply technologies and recycling facilities. Discussions are provided for each DOE site and each environmental resource and rele issues that could be affected.

For comparison purposes, environmental concentrations of emissions and other potent environmental effects are presented with appropriate regulatory standards or guidel However, the compliance with regulatory standards is not necessarily an indication the significance or severity of the environmental impact for National Environmental Policy Act of 1969 (NEPA) purposes.

The purpose of the analysis of environmental consequences is to identify the potent for environmental impacts. The environmental assessment methods used and the factor considered in assessing environmental impacts are discussed in section 4.1, environ mental resource methodologies and in the appropriate appendixes. The potential for to a given resource or relevant issue is described in the introduction to each sect within the site discussions (sections 4.2 through 4.6) that follow.

The site-specific impacts to site infrastructure, air quality, water resources, bio resources, socioeconomics, and waste management of a conceptual dedicated gas-fired power plant to support the Accelerator Production of Tritium (APT) is also presente sections 4.2 through 4.6.

4.1 Environmental Resource Methodologies

The environmental impact assessment methodologies discussed in this section address full range of natural and human resource and issue areas pertinent to the sites con for constructing and operating tritium supply and recycling facilities. These resou areas are: land resources, air quality and acoustics, water resources, geology and biotic resources, cultural and paleontological resources, and socioeconomics. Also included in the discussion are additional issue areas that, although not specifical resources, are important to consider in assessing the environmental effects of the alternative tritium facilities. These issue areas are facilities operation/site infrastructure, intersite transport of tritium, waste management, radiological and hazardous chemical effects during normal operation and accidents, and cumulative effects.

As part of the impact assessment process, each analysis provides mitigation measure could be used to reduce and minimize potential impacts. Detailed mitigation strateg that might be needed would be addressed in site-specific tiered NEPA documents.

4.1.1 Land Resources

This section considers land use plans and policies, zoning regulations, specially protected lands, and existing land use as appropriate for all sites. In addition, t visual character of each site is described. The potential impacts associated with c to land use and visual resources as a result of the alternatives arediscussed.

Land Use. Land use changes associated with the tritium supply technologies and recy facilities could occur in both rural and urban settings and could affect both devel and undeveloped land. The analysis of land use considers impacts that could result the modification of existing facilities or the construction of new facilities on or adjacent to each site. Changes in land use are expected to occur within the existin boundaries of most, if not all, DOE sites. However, the use of lands adjacent to or vicinity of the DOE sites (i.e., non-DOE land) could be affected by these changes, including new or expanded safety zones.

The degree to which the alternatives affect future use or development of land at ea site are considered. Land use impacts are assessed based on the extent and type of that would be affected. The land use analysis also considers potential direct impac resulting from the conversion of, or the incompatibility of, land use changes with status lands such as prime and unique farmlands, and other protected lands such as Federal- and state-controlled lands (e.g., public land administered by the Bureau o Land Management or other government agencies).

Visual Resources. Visual resources are defined as natural and human-created feature give a particular landscape its visually aesthetic qualities. Visual resource assessments are conducted to identify and evaluate the impacts on the aesthetics of landscape from tritium supply technologies and recycling facilities. Visual impacts assessed based on whether changes in existing facilities or construction of new fac would appear uncharacteristic in each site's visual setting and, if so, how noticea those changes would be.

The qualitative visual resource analysis, adapted from the Bureau of Land Managemen Visual Contrast Rating System (BLM Manual 8431), is conducted to: identify key view positions, such as public travel routes, nearby residential/commercial areas, and p uses such as parks, recreation areas, and scenic areas; assess the degree of visibi new or modified facilities from these key viewing positions; and assess the compati of such facilities with the existing physical setting. Classification of the physic settings, existing and modified, for each proposed site was based on the Bureau of Management Visual Resource Management (VRM) classes. Class 1 would apply to wildern areas and similar situations; Class 2 would apply to areas with very limited land development activity resulting in visual contrasts which do not attract attention, solitary small buildings or dirt roads; Class 3 would apply to areas where contrast caused by development activity are evident, but the natural landscape still dominat buildings, utility lines, and secondary roads; Class 4 would apply to areas where contrasts caused by human activities attract attention and are a dominant feature o landscape, such as a small cluster of two-story buildings, primary roads, and limit clear cutting for utility lines. Class 5 would apply to areas where contrasts cause cultural activities are the dominant feature of the landscape, such as large industrial/office complexes, landfills, and large expanses of clear cutting or grou disturbance. The analysis provides a qualitative comparison of the characteristics the existing landscape with those of the proposed facilities and a determination of resulting level of contrast. Facility characteristics examined include buildings, s access roads, parking areas, facility and perimeter lighting, and steam and emissio plumes. Impacts are assessed based on the sensitivity of the affected environment t changes in its visual character. Sensitivity is assessed based on the potential for public concern regarding adverse effects on specific views within the affected environment. More detailed analysis of visual impacts would be conducted in site-sp tiered NEPA documents.

4.1.2 Site Infrastructure

Changes to site infrastructure are assessed by overlying the support requirements o respective tritium supply technologies and recycling facilities upon the projected infrastructure capacities. These assessments focus upon power requirements, road ne rail interfaces, and fuel requirements. Projections of electricity availability, si development plans, and other DOE mid- and long-range planning documents are utilize

project site infrastructure conditions. Tables are presented that depict the additi infrastructure requirements to be generated by the alternatives. Mitigation conside ations are identified that could reduce impacts due to changes in infrastructure on site-by-site basis.

Detailed assessments of the tritium facilities' electrical power requirements in th 2010 time-frame are not considered practical. Electric utilities would not be expec reliably project how they would meet the needs of these facilities (i.e., whether b power generation, power imports, or demand side management). Therefore, the basis f PEIS assessment is the supply and demand projections of the U.S. electric utilities published annually by the North American Electric Reliability Council.

For purposes of analysis, electricity generation is based on the assumption that electricity would be supplied by the power pool currently supplying the facility in question by using a mix of fuels and generating sources representative of those projected. These data are used to determine whether or not there would be enough re margin within a particular power pool to accommodate electrical requirements, or wh additional power is required. A detailed quantitative analysis, based on the propor contributions from each fuel source, would be conducted in site-specific tiered NEP documents.

Two of the technologies in question, specifically the Modular High Temperature Gas-Reactor (MHTGR) and the Advanced Light Water Reactor (ALWR), have the ability to pr electricity from steam as well as tritium. The environmental effects of this steam production is included in the analysis of the basic technologies since designs of t reactors include steam turbines for electrical production. The environmental impact additional power line construction to distribute this electrical production to the are not addressed in detail for each site but are discussed in general in section 4

The electricity required for the APT would be provided by the power pool which serv each site or a dedicated power plant. The environmental effects of each option are included in the analysis. A separate cost analysis of buying this power versus the of building a dedicated power plant to provide it is considered in the cost study b prepared to support the Record of Decision (ROD).

4.1.3 Air Quality and Acoustics

Potential effects on the environment associated with air pollutant emissions and no from normal operations are evaluated for tritium supply technologies and recycling facilities. The assessment of air quality and acoustic impacts includes identificat applicable criteria for assessing impacts, the development of emission inventories, the estimation of air pollutant concentrations. The assessment of impacts is based estimated concentrations, data on the existing environment, and assessment criteria health effects due to air pollutant emissions are discussed in a separate section a include consideration of airborne radioactive chemical releases.

Air Quality. The assessment of potential impacts to air quality is based on the com of proposed project effects with applicable state, local, or national ambient air q standards, or the potential exceedance of prevention of significant deterioration i ments for particulate matter of aerodynamic diameter less than 10 micrometers, sulf dioxide, or nitrogen dioxide.

Assessment criteria for pollutants include the Environmental Protection Agency (EPA primary and secondary ambient air quality standards for criteria pollutants and tho established by each state. The more stringent of either the EPA or state standards as the assessment criteria. The assessment criteria for toxic pollutants include guidelines or standards adopted or proposed by each state.

Ambient air monitoring data are used to determine maximum background concentrations pollutants for each DOE site. Baseline concentrations of pollutants from DOE sites calculated by modeling site emissions during the baseline year and adding to these

calculated concentrations the maximum background concentration for a given pollutan averaging time. The baseline concentration is a conservative estimate of pollutant concentrations at each DOE site during a period considered representative of recent activity.

No Action concentrations of pollutants from DOE site emissions are calculated by mo projected site emissions for 2010 and adding to these calculated concentrations the maximum background concentration for a given pollutant and averaging time. Both the baseline and No Action concentrations are compared to applicable Federal and state standards for criteria pollutants and state guidelines and regulations for air toxi provide an estimate of the potential effects on air quality.

Pollutant concentrations associated with tritium supply technologies and recycling facilities are added to the NoAction concentration. These pollutant concentrations then compared to applicable Federal and state guidelines or standards.

Modeling of site-specific emissions using the EPA-recommended Industrial Source Com Short-Term model was performed in accordance with the EPA's Guideline on Air Qualit Models (EPA-450/2-78-027R). The air quality modeling analysis performed for the can sites is a "screening level" analysis incorporating conservative assumptions applie each of the sites such that the impacts associated with the respective alternatives be compared among the sites. These conservative assumptions will overestimate the pollutant concentrations at each of the sites.

The assumptions incorporated into the air quality modeling at each site are as foll major source criteria pollutant emissions were modeled using actual source location stack parameters to determine environmental baseline and No Action criteria polluta concentrations; toxic/hazardous pollutant emissions were modeled from a single sour centrally located within the complex of facilities on each site assuming a 10 meter stack height, a stack diameter of 1 foot, stack exit temperature equal to ambient temperature, and a stack exit velocity equal to 0.01 meters per second.

Emissions from the tritium supply and recycling facilities were located at the trit supply site (TSS) identified for each site assuming a single stack 10meters in heig stack diameter of 1 foot, stack exit temperature equal to ambient temperature, and exit velocity equal to 0.01 meters per second. Onsite and/or representative Nationa Weather Service meteorological data is used to define the dispersion characteristic the site. Actual terrain heights are used for those sites not considered "flat." Th potential effects on air quality are described by comparing expected concentrations quality standards.

Acoustics. Acoustic impacts are assessed on the basis of the potential degree of ch noise levels at sensitive receptors (i.e., residences near the DOE site boundary) w respect to ambient conditions. Most nontraffic noise sources associated with the fi candidate site facilities are located at sufficient distances from offsite noise-se receptors that the contribution to offsite noise levels is expected to be small. Therefore, a qualitative discussion of construction and operation noise sources and potential for onsite and offsite noise impacts is provided. The analysis uses avail information on the potential types of noise sources and the location of proposed alternative facilities relative to the site boundary and noise-sensitive locations. potential for exposure of workers to noise and the measures taken to protect worker hearing are included. Quantitative analysis of noise impacts is deferred to the site-specific tiered NEPA documents, including noise impacts associated with traffi

Uncertainties. The performance of the Industrial Source Complex Short-Term model ha been validated with field data. However, the performance of the Industrial Source C Short-Term model has been evaluated with field data for its point source submodel (1977a; EPRI 1983a; EPRI 1985a; EPRI 1988a) and for its special features, such as gravitational settling/dry deposition option (EPA 1981a; EPA 1982a) and building do option (APCA 1986a; EPA 1981a). The Industrial Source Complex Short-Term model is a extended version of the Single Source (CRSTER) model. From the validation studies f the Single Source (CRSTER) model, based on field data measured at four large power it was concluded that the model acceptably predicts the upper percentile of the frequency distributions of 1-hour concentrations and of the corresponding distribut

of 24-hour concentrations. The second-highest 1-hour concentrations were predicted a factor of 2 at two-thirds of the field sampling sites for elevated power plant pl The second-highest 24-hour concentration tended to be underpredicted by the model, the ratio of predicted concentration to measured concentration ranging from about 0 2.7 at about 90 percent of the sampling sites (EPA 1977a:F-31).

In other validation studies for the point source model, the CRSTER model predicted short-term (1-,3-,and 24-hour) concentration values within 30to 70 percent at a pla (EPRI 1983a:7-1). The CRSTER model predicted peak 1-hour concentrations within 2 pe and underpredicted peak 3-hour concentrations by about 30 percent at a moderately complex terrain site (EPRI 1985a:7-1). The Industrial Source Complex Short-Term mod overpredicted 1-hour concentrations by about 60 percent with better predictions for longer time periods at an urban site (EPRI 1988a:5-2). Uses of gravitational settli deposition and building downwash options were found to improve the model performanc significantly over that of the model without such features (APCA 1986a; EPA 1981a; 1982a).

The concentrations presented in this document are the highest concentrations predic the model in order to present conservative estimates of pollutant concentrations.

4.1.4 Water Resources

The quality and quantity of surface water and groundwater resources are described u available data. Potential effects on surface water and groundwater availability and quality are assessed.

Surface Water. Local surface water resources in the project region, flow characteri and relationships, and stream classifications are used to describe current conditio Data used for impact assessments include rates of water consumption and wastewater discharge for both construction and operation phases. Changes in the annual low flo surface water resulting from proposed withdrawals and discharges are determined. In where low flow data are unavailable, average flow data are used. The existing water is evaluated to determine if sufficient quantities are available to support an incr demand by comparing projected increases with the capacity of the supplier and exist water rights, agreements, or allocations.

The water quality of potentially affected receiving waters is determined by reviewi current monitoring data for nonradiological parameters. Potential impacts from radiological parameters are discussed in the radiological and hazardous chemical im during normal operation and accidents section. Focus is given to parameters that ex applicable water quality criteria, as determined by the individual states. Monitori reports for discharges permitted under the National Pollutant Discharge Elimination (NPDES) program are examined for compliance with permit limits and requirements. Th performance of each candidate DOE site in complying with the permit requirements is presented. In most cases, current design data do not include information on the constituents present or the rate of discharge. The assessment of water quality impa from wastewater (sanitary and process) and stormwater runoff qualitatively addresse potential impacts to the receiving waters' minimum or average flow, as available an appropriate. Suitable mitigation measures for potential impacts such as stream chan erosion and sedimentation, stream bank flooding, and thermal impacts are identified quality management practices are also reviewed. If effluent constituent data are available, parameters with the potential to further degrade existing receiving wate quality along with parameters exceeding existing NPDES permit limits are identified

Floodplains are identified to determine whether any of the proposed tritium supply technologies and recycling facilities are located within a floodplain. Where possib proposed location is compared with the 500-year floodplain. Where these data are unavailable, potential impacts associated with the 500-year floodplain are addresse terms of design and siting mitigation measures. Specific facility locations will be addressed in site-specific tiered NEPA documents.

Groundwater. Groundwater resources are analyzed for effects on aquifers, groundwate

usage, and groundwater quality within the regions. Groundwater resources are define the aquifers underlying the site and their extensions down the hydraulic gradients including, discharge points and/or the first major users. The affected environment cussion includes a description of the potentially affected groundwater basins. The aquifers are described in terms of the extent, thicknesses, character of rock forma and quality of the groundwater. Recharge areas are also noted. Total baseline groun use at the facility is compiled using the best available data. Groundwater usage is described and projections of future usage are made based on changing patterns of us anticipated growth patterns, whenever site-specific groundwater availability issues identified.

Drawdown estimates are made both onsite and offsite. Short- and long-term impacts associated with construction withdrawals and dewatering are estimated. Both propose facilities and existing facilities are considered in determining cumulative impacts

Available data on existing groundwater quality conditions are compared to Federal a state groundwater quality standards, effluent limitations, and safe drinking water standards. Additionally, Federal and state permitting requirements for groundwater drawal and discharge are identified. Impacts of groundwater withdrawals on existing contaminant plumes because of construction and facility operation are assessed to determine the potential for changes in their rates of migration and the effects of changes in the plumes on groundwater users. Impacts are assessed by the degree to w groundwater quality, drawdown of groundwaterlevels, and groundwater availability to otherusers would be affected. Impacts on groundwater quality are presented when eff constituent data are available.

4.1.5 Geology and Soils

Geology. Impacts to the geological environment considers destruction of or damage t unique geological features, subsidence caused by groundwater withdrawal, and landsl or shifting caused by loading or removal of supporting rock or soil. The local geol that could affect the alternatives including geomorphology, stratigraphy, structura attitude of rocks, faults and seismicity, general foundation, and boring conditions described as appropriate for each candidate site. The locations of capable faults a identified and an overview of the seismicity of the site areas, including the histo significance of earthquakes, along with their intensity and ground acceleration, is presented. Areas of potentially unstable slopes and impacts to the stability of slo the removal or addition of large volumes of earth in construction are characterized

Soils. Soil types at the proposed project sites are described and the capability of supporting construction of the proposed facilities assessed. Shrinking or swelling ground as a result of landscaping, irrigation, or construction dewatering and soil erosion susceptibility associated with construction is also addressed.

4.1.6 Biotic Resources

Potential impacts to biotic resources are addressed for the following categories: terrestrial resources, wetlands, aquatic resources, and threatened and endangered s During construction, impacts may result from land-clearing activities, erosion and sedimentation, human disturbance and noise, and dewatering of foundations. Operatio affect biotic resources as a result of changes in land use, emission of salt drift (residual salts left behind as a result of the evaporation of cooling tower water) radionuclides, water withdrawal, wastewater discharge, and human disturbance and no In general, the potential impacts are assessed based on the degree to which various habitats or species could be affected by the project. Where appropriate, impacts ar evaluated with respect to Federal and state protection regulations and standards.

Terrestrial Resources. Potential impacts to terrestrial resources include loss and disturbance of wildlife and wildlife habitats as well as exposure of flora and faun

emissions of salt drift. Two considerations in assessing the impact of habitat loss the presence and regional importance of affected habitats, and size of habitat area temporarily disturbed by construction activities and permanently disturbed during t operational phase. The loss of important or sensitive habitats is considered more important than the loss of a regionally abundant type. Impacts to wildlife are base large extent on plant community loss, which is closely associated with animal habit Also evaluated is the disturbance, displacement, or loss of wildlife in accordance wildlife protection laws such as the Migratory Bird Treaty Act and Bald and Golden Protection Act. Cooling tower deposition rates are not calculated; however, potenti effects of salt drift are addressed in a qualitative manner.

Very small concentrations of radionuclides would be released into the atmosphere du operation of the proposed tritium supply and recycling facilities. These releases, added to those associated with other site activities, would be well below natural background levels and would also be within regulatory limits established to protect workers and the public. Since humans have been shown to be the most sensitive organ radiation, these levels should also be protective of biota (AEC 1968a:220; NAS 1972 Studies conducted at Idaho National Engineering Laboratory (INEL) have detected sub effects in individual animals at contaminated areas; however, no population or community-level impacts resulting from radionuclides have been identified. Monitori radionuclide levels outside the boundaries of various INEL facilities and off the I site has detected radionuclide concentrations above background levels in individual plants and animals, but the data suggest that the exposed populations are not at ri 1995v: 4.9-6,4.9-7). Thus, based on expected releases and the results of past studi impacts of radionuclides on site biota were not evaluated.

Impacts to biota from hazardous chemicals during normal operations are unlikely sin hazardous and toxic materials will be handled, stored, transported, and disposed of accordance with the requirements of the Resource Conservation and Recovery Act (RCR Thus, since biota are unlikely to be exposed to hazardous chemicals, impacts are no discussed.

Wetlands. Most construction impacts on wetlands are related to displacement of wetl filling, draining, or clearing activities. Other impacts could potentially occur fr construction activities conducted outside of wetland areas. Operational impacts to wetlands may occur from effluents, surface or groundwater withdrawals, or creation wetlands. Wetlands on each candidate site are identified using best available publi information such as Federal and state wetland reports, National Wetland Inventory m aerial photographs, and topographic maps.

The direct loss of wetlands resulting from construction and operation is addressed similar fashion as for terrestrial plant communities, by comparing data on site wet to proposed land requirements. Sedimentation impacts are evaluated based on the nea of wetlands to project areas and with the knowledge that standard construction eros sedimentation control measures would be implemented. Impacts resulting from increas flows are evaluated based on a comparison of expected discharge rates with present flow rates. Impacts resulting from the introduction of thermal and chemical polluti a wetland system are evaluated recognizing that effluents will be required to meet and state standards.

Aquatic Resources. Aquatic resources could be impacted as a result of sedimentation increased flows, effluent discharge, impingement, and entrainment. Impacts to aquat resources, such as loss of spawning habitat resulting from sedimentation, increased and the introduction of waste heat and chemicals, are evaluated as described for we

Impingement and entrainment impacts are evaluated based on a comparison of stream f intake volumes, recognizing that when intake volumes represent a large percentage o stream flow, the possibility of impingement and entrainment impacts exists. Complia with protective measures, such as the Anadromous Fish Protection Act, are addressed

Although aquatic species could be exposed to radionuclides from cooling tower blowd at wet sites, previous studies of a proposed tritium reactor at the Savannah River (SRS) that was larger than the proposed current design have shown that calculated d were well below limits established by DOE Order 5400.5, Radiation Protection of the

and the Environment for the protection of aquatic organisms (DOE 1992e:5-220). Alth impacts to aquatic life are unlikely based on the conservative nature of the calcul and the size difference between the previous and current reactor designs, further assessments may be required in site-specific NEPA documentation.

Threatened and Endangered Species. Impacts to threatened and endangered species of wildlife and plants, including critical habitat, state-listed species, and species proposed for listing, are determined. A list of species potentially present on each is developed using information obtained from the U.S. Fish and Wildlife Service (US National Marine Fisheries Service, and appropriate state agencies. This list, along site environmental and engineering data, is used to evaluate whether the various tr supply technologies and recycling facilities would impact any plant or animal (or i habitat). Impacts are determined in a manner similar to that described for terrestr aquatic resources since the sources of potential impacts are similar.

Uncertainties. Due to the nature of this Programmatic Environmental Impact Statemen (PEIS), a number of factors which may impact biotic resources are not known with certainty. These include site location, placement and performance of wet cooling to routing of rights-of-way, and wastewater discharge characteristics and location. Ea these factors introduced uncertainties in the analysis of impacts to biotic resourc example, not knowing the exact location of the proposed tritium supply site (TSS) p an exact analysis of impacts on terrestrial habitat and wetlands, as well as threat and endangered species. When more information becomes available as this PEIS projec planning progresses, analyses presented in tiered NEPA documentation at a selected will not be so limited by uncertainties.

4.1.7 Cultural and Paleontological Resources

Included in these sections are evaluations of the impacts of the tritium supply technologies and recycling facilities on prehistoric, historic, Native American, an paleontological resources. The effects considered include those resulting directly land disturbance during construction, visual intrusion to the settings or environme context of historic structures, visual and audio intrusions on Native American sacr sites, reduced access to Native American traditional use areas, unauthorized artifa collecting, and vandalism.

Prehistoric Resources. Prehistoric resources are physical properties resulting from activities that predate written records. They are generally identified as either isolated artifacts or sites. Sites may contain concentrations of artifacts (e.g., s tools and ceramic sherds), features (e.g., campfires and houses), and plant and ani remains. Depending on their age, complexity, integrity, and relationship to one ano sites may be important for and capable of yielding information about past populatio adaptive strategies. The affected environment section for prehistoric resources inc brief overview of the number and types of prehistoric sites in the project areas, i known, and their status on both the National Register of Historic Places (NRHP) and appropriate state registers. The overview consists of a summary of existing informa about prehistoric resources in the region and a discussion of types of sites that a likely to occur.

Impact assessments for prehistoric resources focus mainly on those properties likel eligible for the NRHP. Impacts are assessed by considering whether the proposed act could substantially add to existing disturbance of resources in the project areas, adversely affect NRHP-eligible resources, or cause loss of or destruction to import prehistoric resources.

Historic Resources. Historic resources consist of physical properties that postdate existence of written records. Historic resources include architectural structures (buildings, dams, and bridges) and archaeological features (e.g., foundations, trail trash dumps). Ordinarily, sites less than 50 years old are not considered historic analytical purposes, but exceptions can be made for younger properties if they are exceptional importance; i.e., structures associated with World War II, the Manhatta

Project, or Cold War themes (36CFR60.4). The affected environment section for histo resources includes a brief overview, the number and types of historic sites in the areas, if known, and their status on both the NRHP and appropriate state registers. overview consists of a summary of existing information about historic resources in region and a discussion of the types of sites that likely exist.

Impact assessments for historic resources focus mainly on those properties likely t eligible for the NRHP. Impacts are assessed by considering whether the proposed act could substantially add to existing disturbance of resources in the project areas, adversely affect NRHP-eligible resources, or could cause loss of or destruction to important historic resources.

Native American Resources. Native American resources are sites, areas, and material important to Native Americans for religious or heritage reasons. In addition, cultu values are placed on natural resources such as plants, which have multiple purposes various Native American groups. Of primary concern are concepts of sacred space tha create the potential for land use conflicts. Native American concerns would be iden through direct consultation with tribal representatives and field visits with triba religious specialists during site-specific tiered NEPA documents. Contacts will be identified by reference to the ethnographic literature, by state and national pantr organizations, and by agency and academic anthropologists.

The individual resource type, the proximity of impact areas to the resources, and t likely duration of impacts are considered in the analysis of Native American resour Specific concerns include the relative importance of the resource in the Native Ame physical universe or belief system; the distance at which activities in the vicinit sacred area constitute a disturbance; the extent to which affected resources may be restored; and the extent to which alternative sources for raw materials are availab and/or suitable. Impacts to Native American resources are assessed by considering w the proposed action has the potential to affect sites important for their position Native American physical universe or belief system, or the possibility of reducing to traditional use areas or sacred sites.

Paleontological Resources. Paleontological resources are the physical remains, impressions, or traces of plants or animals from a former geological age. They incl casts, molds, and trace fossils such as burrows or tracks. Fossil localities typica include surface outcrops, areas where subsurface deposits are exposed by ground disturbance, and special environments favoring preservation, such as caves, peat bo tar pits. Paleontological resources are important mainly for their potential to pro scientific information on paleoenvironments and the evolutionary history of plants animals. The affected environment section for paleontological resources includes a description of known paleontological localities and geological formations in the pr areas that may be fossil bearing.

Impact assessments for paleontological resources are based on the numbers and kinds resources that could be affected as well as the quality of fossil preservation in a given deposit, particularly in deposits with high research potential. Such deposits include poorly known fossil forms; well-preserved terrestrial vertebrates; unusual depositional contexts; assemblages containing a variety of fossil forms, particular associations of vertebrates, invertebrates, and plants; or deposits recovered from studied regions or in unusual concentrations.

4.1.8 Socioeconomics

Potential impacts are assessed for local and regional socioeconomic conditions and including population, employment, economy, housing, public finance, and transportat This PEIS assesses the socioeconomic impacts of both the gains and losses of missio each site. Geographically, the potential for socioeconomic effects is greatest in t local jurisdictions immediately adjacent to each site and those that are the reside locations of the majority of DOE site employees. A region of influence (ROI), compr those local jurisdictions likely to experience the greatest socioeconomic impacts, defined for each site. The ROI is defined as those areas where approximately 90 per

the current DOE and contractor employees reside. The evaluation of impacts is based degree to which changes in employment and population affect the local economy, hous market, public finance, and transportation. The changes to these factors are projec 2030 because it is assumed that after 2030 the impacts associated with the alternat are negligibly different from the 2030 conditions. The following sections discuss e the socioeconomic conditions and factors considered.

Employment. The construction and operation of tritium supply technologies and recyc facilities could affect employment at DOE sites. Changes in site employment would, turn, directly affect local and regional populations, economies, housing, public fi and transportation. Current employment at each site is described as well as project employment associated with other planned DOE initiatives. Socioeconomic trends and relationship of site employment to these trends are examined for each potentially a socioeconomic region. Emphasis is placed on evaluating total direct and indirect employment changes and impacts associated with potential mission relocations.

Economy. The regional economies surrounding each site are characterized. Emphasis i placed on the measurement of the relative contribution and importance of each site' employment payroll and purchases to the economy. Changes to local economic conditio evaluated based on each site's relative contribution and changes to employment. Emp is placed on the economic effects of mission changes associated with the tritium su technologies and recycling facilities.

Population. The demographic changes in the regions surrounding each site are descri assessed. Demographic characteristics are presented for the site's ROI to support t assessment of socioeconomic impacts. Trends are identified and used to project demographic changes over the environmental baseline period. Cumulative population i include the population impacts of other DOE actions under consideration, including environmental restoration activities.

Housing. Changes in employment at each site would affect the demand and supply of h units, including the need for temporary housing (e.g., rental units) to support in-migrating construction workers. Trends in the housing availability within each s socioeconomic ROI are characterized and evaluated. Numbers of in-migrating and out-migrating site employees associated with each of the tritium facility alternati then used to evaluate housing impacts.

Public Finance. Each site is located on land owned by the Federal government; this these lands from state and local taxation. However, all employee income, property, purchases are subject to applicable Federal, state, and local taxation requirements

Changes in community finances as a result of the alternatives could affect the comm need and ability to provide community infrastructure and services that include util water, and sewage facilities, as well as education, health care, and police and fir protection. The fiscal impacts of the alternatives on the counties, cities, and sch districts within the site's ROI are assessed.

Local Transportation. The transportation systems in the region surrounding each sit including roads and highways, rail systems, and airports, are characterized. Major planned improvements to regional transportation systems are identified as part of t environmental baseline characterization. Changes in site employment associated with alternatives are used to identify potential impacts to the existing traffic conditi each site.

4.1.9 Radiation and Hazardous Chemical Environment

Nuclear facilities use a broad variety of processes involving both radioactive and chemical materials that can be hazardous to people who may be exposed to them. The of hazard is directly related to the type and quantity of the particular radioactiv chemical material to which the person may be exposed. The health effects are determ for tritium supply and recycling facilities by identifying the types and quantities material to which one is exposed, estimating doses, and then calculating the result

health effects.

The impacts on human health for workers and the public during normal operation and postulated accidents from the various alternatives are assessed. Models are used to project the impacts on the health of workers and the public due to normal operation postulated accidents. These models include: GENII and Melcor Accident Consequence C System (MACCS) for airborne and liquid radioactive releases; CHEM-PLUS for fire and explosions; and ISCST for hazardous chemical releases. Atmospheric dispersion model performed for the air quality section is also utilized in the evaluation of impacts workers from radiological and hazardous chemicals.

Health Impacts on Plant Workers During Normal Operation. Because radiation workers individually monitored, experience from past and current operation that are similar future operation are used to estimate the radiological health impacts to workers. H impacts from chemicals are discussed qualitatively. There are no individual exposur on workers for chemicals; therefore, models are used to estimate the worker's chemi exposure dose.

General Health Impacts on the Public During Normal Operation. Public health impacts result from exposure to radioactive or hazardous chemical materials released during operation. The effect is the sum of internal exposure resulting from breathing air, food, and drinking water. External exposure could be from standing on contaminated ground, being exposed to the air, and being submerged in water.

Modeling is used to estimate the type and amount of material released and the assoc radiological and chemical doses. These doses are converted to health effects using appropriate health risk estimators.

Epidemiological Studies. In March 1990, the Secretary of Energy announced that DOE turn over responsibility to the Department of Health and Human Services for analyti epidemiologic research on long-term health effects on workers at DOE facilities and public in surrounding communities. Further, DOE directed that this worker and publi health and exposure data be released. A Memorandum of Agreement with the Department Health and Human Services was signed in January 1991. The Department of Health and Services is now conducting the ongoing health effects research program. The Nationa Institute for Occupational Safety and Health also initiated a study in 1994 but doe expect the results before 1997.

Emergency Preparedness. Emergency preparedness and planning has the effect of mitig the consequences of facility accidents. Emergency preparedness plans exist for all and are summarized for each site.

Accident Analysis for Postulated Accident Scenarios. The relative consequences of postulated accidents in the evaluation of each alternative are considered. In evalu the magnitude and consequences of each alternative, a suitable accident analysis is performed to produce results for decisionmaking purposes. Although the concepts use analogous to a formal Probabilistic Risk Assessment, which would be appropriate for project-level analysis, the accident analysis involves considerably less detail and addresses a representative spectrum of beyond design-basis accidents (high conseque low probability) and a representative spectrum of possible operational accidents (l sequence but high probability of occurrence). The technical approach for the select accidents is consistent with the DOE Office of NEPA Oversight Recommendations for t Preparation of Environmental Assessments and Environmental Impact Statements guidan which recommends consideration of two major categories of accidents: within design- accidents and beyond design-basis accidents.

For the purpose of this assessment, risk is defined as the mathematical product of probability and consequences of an accident. Both probability and consequences are presented in this PEIS. The risk-contributing scenarios consider both design-basis severe accidents. The specific accidents consider the types of facilities. Examples accidents include those resulting from operator errors, spills, criticality, fire, explosions, airplane crash, common-cause failures, collocated facilities, severe we earthquakes, and transportation. Information on potential accidents includes those have been postulated and analyzed for similar facilities. The risks of the various

supply technologies and recycling facilities are evaluated in terms of the incremen increase in risk and the cumulative effect of that risk with respect to normal day-risks to which the general population is exposed.

Accident risk to collocated workers was calculated for a hypothetical worker at 1,0 meters and 2,000meters from the facility. The estimated number of collocated worker may be similarly exposed is also provided. Risk to workers from radiological accide would be addressed in greater detail in site-specific tiered NEPA documents when mo detailed information is available.

Uncertainties. The sequence of analyses performed to generate the radiological impa estimates from normal operation and facility accidents include: (1)selection of nor operational modes and accident sequences, (2) estimation of source terms, (3) estim of environmental transport and uptake of radionuclides, (4) calculation of radiatio to exposed individuals, and (5) estimation of health effects. There are uncertainti associated with each of these steps. Uncertainties exist in the way the physical sy being analyzed are represented by the computational models and in the data required exercise the models (due to measurement errors, sampling errors, or natural variabi

In principle, one can estimate the uncertainty associated with each source and pred the remaining uncertainty in the results of each set of calculations. Thus, one can propagate the uncertainties from one set of calculations to the next and estimate t uncertainty in the final results. However, conducting such a full-scale quantitativ uncertainty analysis is neither practical nor a standard practice for a study of th type. Instead, the analysis is designed to ensure-through judicious selection of re scenarios, models, and parameters-that the results represent the potential risks. T is accomplished by making conservative assumptions in the calculations at each step models, parameters, and release scenarios used in the calculations are selected in way that most intermediate results and consequently, the final estimates of impacts greater than what would be expected. As a result, even though the range of uncertai a quantity might be large, the value calculated for the quantity is close to one of extremes in the range of possible values, so that the chance of the actual quantity greater than the calculated value is low (or the chance of the quantity being less the calculated value if the criteria are such that the quantity has to be maximized This has been the goal of the radiological assessment for normal operation and faci accidents in this study (i.e., to produce results that are conservative).

The degree of conservatism in the calculated results is closely related to the rang possible values the quantity can have. This range is determined by what can be expe realistically occur. Thus, the only processes, events, and accidents considered are credible for the conditions under which the physical system being modeled operates. consideration has also been employed for both normal operation and facility acciden analyses.

Uncertainties are also derived from the lack of engineering design data for facilit that are only conceptual. Uncertainties are also introduced when accident analyses performed for similar existing facilities have been used as a major source of data. Although the radionuclide composition of source terms are reasonable estimates, the are uncertainties in the radionuclide inventory and release reactions which affect estimated consequences. Accident frequencies for low probability sequences of event always difficult to estimate, even for operating facilities, because there is littl record of historical occurrences. For a new facility, such as the Heavy Water React (HWR), MHTGR, ALWR, and APT any use of accident frequencies that are estimated from similar existing facilities would tend to further compound the effects of uncertain

There are also uncertainties attributed to differences in information sources. For and MHTGR a considerable amount of information on source terms and accident scenari based on 1992 documentation from the New Production Reactor program. For the ALWR, are four technologies with documentation and analyses prepared independently by different vendors. For the APT, there are two technologies with documentation and a prepared by a team led by Sandia National Laboratories, New Mexico, Los Alamos Nati Laboratory, Brookhaven Laboratory, and private contractors.

The risk analysis presented in this PEIS is not a complete risk assessment in the s

identifying and analyzing all physically possible accidents including those high consequence accidents whose probability is so remote as to render them not reasonab foreseeable. The accident analyses do include, however, a spectrum of reasonably foreseeable accidents including high consequence accidents and their associated ris the technologies and facilities. These severe accidents have low accident frequenci often less than 1.0x10-6 per year. The accident analyses also include higher freque accidents (design-basis and other operational accidents) that typically have lower consequences. These design-basis and other operational accidents have accident freq that are greater than 1.0x10-6 per year.

In summary, the radiological and hazardous chemical impact estimates presented in t document were obtained by:

Using the best available data.

Using state-of-the-art computational tools.

Considering the processes, events, and accidents that are reasonably foreseeable fo tritium supply and recycling facilities described in this study and the environment

Making conservative assumptions when there is doubt about the exact nature of the processes and events taking place.

4.1.10 Waste Management

A major thrust of the Tritium Supply and Recycling Program effort has been, and wil continue to be, the minimization of wastes. The proposed action would consider and incorporate waste minimization and pollution prevention practices. Alternative proc and technologies used in the production and recycling of tritium are being reviewed determine whether proven technologies could accomplish significant reductions in th generation of waste. Waste minimization efforts and the management of tritiumrelate wastes are discussed for each DOE site. Tritium facilities would treat and package into forms that would enable long-term storage or disposal. Pantex is the only site consideration that does not have existing or planned onsite low-level waste (LLW) disposal; the number of additional shipments required to transport LLW from Pantex DOE LLW disposal facility is estimated. The risks associated with additional shipme addressed as part of the intersite transport assessment (section4.7). Long-term disposition of wastes and other methods of waste minimization is expected to be add by the DOE Office of the Assistant Secretary for Environmental Management (EM) as p an overall waste management strategy. The PEIS prepared by EM will evaluate the environmental impacts of transporting wastes. Both this document and the PEIS prepa by EM are intended to provide environmental input into development of long-term str that, when decided on, provide a basis for assessing and implementing site-specific facility-specific actions.

The construction and operation of tritium facilities could generate spent nuclear f several types of wastes. Generation points are different dependent upon siting of v facilities. Construction wastes are similar to those generated by any construction of comparable scale. Wastes generated during the operation of tritium supply and re facilities consist of four primary types: low-level radioactive waste, low-level mi waste, hazardous waste, and nonhazardous waste. The types and amounts of waste and nuclear fuel vary according to the tritium supply technology.

The nuclear weapons mission provides for the shortterm management and onsite storag wastes and spent nuclear fuel, including the means to minimize waste generation, un either disposes of the wastes or places them in long-term storage. To provide a fra for addressing the impacts of waste management for tritium supply technologies and recycling facilities, descriptive information is presented on waste management acti anticipated for each DOE site and tritium facility combination. The volumes of each waste type generated are estimated by facility and DOE site for tritium supply

technologies and recycling facilities and vary according to technologies analyzed f facilities. These estimates include consideration of concepts for waste minimizatio impact assessment addresses the waste types and projected waste volumes from the va tritium supply technologies and recycling facilities at each site versus No Action. Impacts are assessed in the context of site practices for treatment, storage, and d including the applicable regulatory setting.

The volumes of wastes to be generated by tritium supply technologies and recycling facilities were provided for inclusion, consideration, and evaluation of alternativ management configurations in the PEIS being prepared by EM. The evaluation of waste management for tritium supply and recycling facility-generated waste are presented documents.

D&D activities are greatly dependent upon the final disposition of a facility and i design. D&D could range from performing a simple radiological survey to completely dismantling and removing a radioactively-contaminated facility. Because the tritium supply technology and recycling facility designs are preconceptual, estimates of D& volumes have not been made; however, a relative comparison between the tritium supp technologies was made.

4.1.11 Intersite Transportation

The intersite transport assessment addresses the transport of tritium, highly-enric uranium, plutonium, and heavy water since these materials pose the primary health concern in this PEIS. A transportation baseline, using historical and projected shi information, is established for evaluating potential environmental impacts. The exi transportation modes that serve each candidate site and the transportation links to those modes for the intersite transport of hazardous materials are described. The p ings required for the shipment of materials is also described. Risks are also calcu for transporting LLW generated from tritium activities.

The potential environmental impacts of transporting tritium, highly-enriched uraniu plutonium, heavy water, and LLW are qualitatively determined using existing health accident risk data. Quantitative data are included, as appropriate. For evaluating the following elements are considered: transport mode, weight of material, curies, proximity dose rates (transport index), type of package, number of shipments, and/o distance. Transportation health impacts are summarized for the alternatives.

4.1.12 Cumulative Impacts

Cumulative impacts address the incremental effects of the action when added to othe present, and reasonably foreseeable future actions regardless of what agency (Feder non-Federal) or person undertakes such other actions (43 FR 55978; 40CFR1500-1508).

Other DOE programs (including environmental management missions) and other Federal, state, and local development programs all have the potential to contribute to cumul effects on DOE sites. "Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7 the extent information was available for these other actions at a given site, the cumulative impacts are presented.

Continuing Department of Energy Missions. Continuing DOE missions and any reasonabl foreseeable changes to these missions are addressed as part of the affected environ baseline. Continuing missions at each site are discussed in the Site Infrastructure section of the affected environment discussion for each DOE site. These missions pr the baseline against which the tritium supply technologies and recycling facilities compared. For example, water requirements for the tritium supply technologies and recycling facilities are combined with requirements of continuing missions to asses total impact to water resources.

Environmental Management Missions. Any planned and reasonably foreseeable new or mo waste handling facilities are discussed in the waste management section for each si addition, to the extent that other environmental management missions or strategies planned and defined, they are also discussed as are bounding environmental impacts waste management actions. Specific waste management activities will be addressed in PEIS being prepared by EM.

Other Federal and State Programs. Other Federal and state programs are identified b planned, reasonably foreseeable programs are considered. Typical programs in this c include public works projects and military base closures and reuse projects. Potent consequences of any major programs that accumulate effects when combined with the t supply and recycling alternatives are presented.

Local Development Programs. Local development programs are not specifically identif However, socioeconomic projections take into account anticipated regional growth. L development programs are a part of this growth and are addressed collectively using growth as a surrogate. Socioeconomic projections form the baseline for much of the ronmental analysis presented in this document.

Approach for Cumulative Impact Assessments. There is no generic methodology for the assessment of cumulative impacts. Therefore, the following approach represents a de for analyzing programmatic cumulative impacts relative to past, present, and probab future activities. It incorporates a wide ranging view of DOE defense programs, env mental management, and other outside interactions. This strategy is integrated with detailed resource-specific assessment methods where appropriate, and can be develop further in tiered project-specific NEPA documentation to ensure compatibility acros defense programs, environmental management, and other programs.

The rationale for this approach reflects that this PEIS is a programmatic document. reference condition for cumulative effects is the No Action alternative. The strate four major components:

Focus analysis primarily on the impacts at each tritium supply candidate site where defense programs and/or environmental management activities are reasonably anticipa Past, baseline, and future defense programs and environmental management activities more clearly defined and have a higher degree of certainty than offsite activities. activities tend to be much more speculative the further into the future they are planned.

Address quantitatively cumulative impact analyses associated with offsite activitie tiered, site-specific NEPA documentation.

Coordinate efforts between defense programs and environmental management activities through the Memorandum of Agreement between defense programs and environmental mana activities.

Focus on site-specific cumulative effects from tritium supply and recycling, addres them in terms of both the temporal and spatial aspects of defense programs activiti well as, the level, phasing, and site-specific locations of proposed environmental management facilities and activities. This is appropriate due to the uncertainty an lack of specificity associated with offsite activities that could result in signifi incremental, indirect, or synergistic cumulative impacts; these activities are more effectively addressed in tiered site-specific NEPA documentation.

The method is flexible and allows for the assessment of cumulative impacts to regul resources at a lower level of analysis due to the protection afforded to them throu applicable regulations. In addition, the method recognizes that the focus on a give resource may vary according to site-specific characteristics of the local environme Where these type of variations are identified, a level of analysis would be perform commensurate to the importance of the potential cumulative impacts on that resource

4.1.13 Environmental Justice

This PEIS assesses the potential disproportionately high and adverse human health o environmental effects on minority and low income populations in accordance with Exe Order 12898 Federal Action to Address Environmental Justice in Minority Populations Low Income Populations. Because both the Federal Working Group on Environmental Jus and DOE are still in the process of developing guidance on criteria for identifying effects to these populations, the approach taken in the PEIS analysis may somewhat from whatever guidance may be issued.

The PEIS environmental justice analysis addressed selected demographic characterist region of influence (50-miles) for each of the five candidate sites. The analysis identified census tracts where people of color comprise 50 percent, or simple major the total population in the census tract, or where people of color comprise less th percent but greater than 25 percent of the total population in the census tract. Th analysis also identified low-income communities where 25 percent or more of the population is characterized as living in poverty (yearly income of less than $8,076 family of two based on 1990 census data). Impacts are assessed based on the analysi presented for each resource and issue area for each tritium supply technology at ea site. Any disproportionately high and adverse human health or environmental effects minority and low-income populations are discussed.

4.2 Idaho National Engineering Laboratory

The Idaho National Engineering Laboratory (INEL) was established in 1949, and curre occupies approximately 570,000 acres near Idaho Falls, ID. As discussed in section INEL performs research and development activities on reactor performance; conducts materials testing and environmental monitoring activities; performs research and de ment activities for the processing of waste; conducts breeder reactor development; a naval reactor training site. There are currently no DOE defense program missions INEL. The DOE property boundaries for INEL are illustrated in figure 4.2-1.

4.2.1 Description of Alternatives

Under the proposed action, any one of the four tritium supply technologies (Heavy W Reactor (HWR), Modular High Temperature Gas-Cooled Reactor (MHTGR), Advanced Light Reactor (ALWR), or Accelerator Production of Tritium (APT)) alone or collocated wit tritium recycling facility could be sited at INEL. Section 3.4.2 provides a descrip the tritium supply technologies and section 3.4.3.1 describes the tritium recycling facility. Figure 4.2.1-1 shows the location of existing facilities within INEL and proposedTSS.

Under No Action, INEL would continue to perform the missions described in section 3 There are no facilities at INEL that would be phased out as a result of any of the proposed action alternatives discussed in this PEIS.

4.2.2 Affected Environment

The following sections describe the affected environment at INEL for land resources quality and acoustics, water resources, geology and soils, biotic resources, cultur and paleontological resources, and socioeconomics. In addition, the infrastructure INEL, the radiation and hazardous chemical environment, and the waste management conditions are described.

4.2.2.1 Land Resources

The discussion of land resources at INEL includes land use and visual resources.

Land Use. INEL is located within Bingham, Bonneville, Butte, Clark, and Jefferson Counties, 22miles west of downtown Idaho Falls in southeastern Idaho. The site cove approximately 570,000acres, all of which is owned by the Federal government and is administered, managed, and controlled by DOE. The Federal government also owns approximately 75percent of the land bordering INEL; this land is administered by th Bureau of Land Management. Twenty-four percent of adjacent land is privately owned, the remaining 1percent held by the State of Idaho. Generalized land uses at INEL an the vicinity are shown in figure 4.2.2.1-1. Only 2 percent of the land within INEL been developed for the nine operating areas and facilities. The developed INEL faci are sited within a central core area of 225,000 acres designated as open space.

A buffer zone consisting of 345,000acres surrounding the central core area has been created within INEL boundaries. The Bureau of Land Management has entered into a Memorandum of Understanding with DOE to permit private individuals to graze livesto the buffer zone rangeland. However, the grazing of livestock is prohibited within t central core area and within 2 miles of any nuclear facilities. Other agricultural activities consist of approximately 140 acres of irrigated cropland located adjacen State Routes 28 and 33, and just west of the Mud Lake community. No prime farmland within the INEL boundaries.

In 1975, DOE designated most of INEL as a National Environmental Research Park. It by the national scientific community as an outdoor laboratory for environmental sci research on changes to the natural environment caused by human activities.

The proposed 600-acre TSS would be located within INEL's Prime Development Land Zon designation applies to land most suitable for development due to an absence of phys constraints such as steep slopes, faults, and floodplains, and because of the land' proximity to site infrastructure such as roads, utilities, and INEL support facilit

Figure (Page 4-18)
Figure 4.2-1.-Idaho National Engineering Laboratory, Idaho, and Region.

Figure (Page 4-19)
Figure 4.2.1-1.-Primary Facilities and Proposed Tritium Supply Site at Idaho Nation Engineering Laboratory.

Figure (Page 4-20)
Figure 4.2.2.1-1.-Generalized Land Use at Idaho National Engineering Laboratory and Vicinity.

Offsite land use within 2 miles of INEL is shown in figure 4.2.2.1-1. This offsite primarily used for livestock and agricultural purposes. The closest residence to th boundary is 1,000feet east of the facility (approximately 7 miles northwest of the unincorporated community of Mud Lake).

Two National Natural Landmarks border INEL: Big Southern Butte, 1.5 miles south and Half Acre Lava Field, 1.6miles southeast. The Bureau of Land Management has also recommended that Congress consider designating Hell's Half Acre Lava Field as a wil area (BLM 1986a:388).

Visual Resources. INEL generally consists of open desert land containing sagebrush. surrounding volcanic cones, domes, and mountain ranges are visible throughout INEL. proposed TSS consists of the typical open, undeveloped desert landscape characteris the Snake River Plain. The Bureau of Land Management has classified the acreage wit INEL as VRM Class3 (mixed use) and Class4 (industrial use). INEL facilities and ope areas maintain industrial uses consistent with these classifications.

The Lost River State Rest Area, located along U.S. Route 20/26 (figure 4.2.2.1-1), approximately 3 miles southwest of the Test Reactor Area, the closest INEL facility viewpoint provides the public the best view of the proposed TSS. The Black Canyon Wilderness Study Area is located adjacent to INEL and 9.4 miles west-northwest of T Area North (figure 4.2.2.1-1). Views from this Wilderness Study Area include agricu land use and the facilities of INEL, including the proposed TSS. Views of the facil from these points are distant and therefore the facilities have a minor effect on t

overall natural appearance of the area. Craters of the Moon National Monument and Wilderness Study Area are both approximately 12.5 miles southwest from the closest boundary and 34 miles from the proposed TSS.

4.2.2.2 Site Infrastructure

Section 3.3.2 describes the current missions at INEL. To support these missions, an extensive infrastructure exists as shown in table 4.2.2.2-1. Of critical importance the proposed action is the electrical power infrastructure at each potential site. located in the Western Systems Coordinating Council Regional Power Pool and draws i power from the Northwest Power Pool Subregion. Characteristics of this subregion ar listed in table 4.2.2.2-2.

Table 4.2.2.2-1.-Baseline Characteristics for Idaho National Engineering Laboratory

Current Characteristics	Value
Land	-
Area (acres)	570,000
Roads (miles)	277
Railroads (miles)	30
Electrical	-
Energy consumption (MWh per year)	232,500
Peak load (MWe)	42
Fuel	-
Natural gas (ft3 per year)	0
Oil (GPY)	1,538,800
Coal (ton per year)	12,500
Steam (lb per hour)	90,000

Table 4.2.2.2-2.-Subregional Power Pool Electrical Summary for Idaho National Engin Laboratory

Type Fuel	Production (percent)
Coal	34
Nuclear	3
Hydro/geothermal	46
Oil/gas	7
Other	11

Total Annual Production: 256,404,000 MWh Total Annual Load: 250,045,000 MWh Energy Exported Annually: 6,359,000 MWh Generating Capacity: 53,206 MWe Peak Demand: 33,32 Capacity Margin: 13,655 MWe

4.2.2.3 Air Quality and Acoustics

The following describes existing air quality and acoustics and includes a review of meteorology and climatology in the vicinity of INEL. More detailed discussions of t quality and acoustics methodologies, input data, and atmospheric dispersion characteristics are presented in appendix section B.1.3.2.

Meteorology and Climatology. The climate at INEL and in the surrounding region is characteristically that of a semiarid steppe (Trewartha 1954a). The annual average temperature is 42F; average daily temperatures vary from 16F in January to 68F in J The average annual precipitation is 8.7inches (IN DOE 1989b:55,77). Prevailing wind from the southwest through west-northwest with a secondary maximum frequency from t north-northeast to northeast. The annual average wind speed is 7.5mph. Additional information related to meteorology and climatology at INEL is presented in appendix section B.1.3.2.

Ambient Air Quality. INEL is located within the Eastern Idaho Intrastate Air Qualit Control Region (AQCR) 61. None of the areas within INEL and its surrounding countie designated as nonattainment areas (40 CFR 81.313) with respect to any of the NAAQS criteria pollutants (40 CFR 50). The nearest nonattainment area for particulate mat in Pocatello, about 50 miles to the south. A nonattainment area is an area that has quality worse than the NAAQS for one or more criteria pollutant. Applicable NAAQS a Idaho State ambient air quality standards are presented in appendix table B.1.3.1-1

Three Prevention of Significant Deterioration (40CFR 52.21) Class I areas have been designated in the vicinity of INEL: Craters of the Moon National Monument, ID, approximately 33 miles west-southwest from the center of the site; Yellowstone Nati Park, Idaho-Wyoming, approximately 89 miles east-northeast from the center of the s and Grand Teton National Park, WY, approximately 90 miles east from the center of t (IN DOE 1991b:4-11).

Since the promulgation of Prevention of Significant Deterioration regulations (40 C 52.21) in 1977, Prevention of Significant Deterioration permits were obtained by IN two major emission sources: the Coal-Fired Steam-Generating Facility next to the Id Chemical Processing Plant (IN DOE 1980a) and the Fuel Processing Restoration Facili ES 1988a), which is not expected to be operated.

Historically, the primary emission sources of criteria air pollutants at INEL are: calcination of liquid waste, the combustion of coal for steam generation at the Ida Chemical Processing Plant, and the combustion of fuel oil for heating at various IN facilities. Other emissions and sources include fugitive particulates from waste-bu activities and coal piles, other processes, vehicles, and temporary emissions from construction activities. Emission estimates for these sources are presented in appe table B.1.3.2-2.

Ambient air quality monitoring data collected during the last few years are summari appendix table B.1.3.2-1. Data indicate that ambient air concentrations are in compliance with applicable guidelines and regulations. The Idaho Department of Heal Welfare no longer monitors ambient O3, NO2, and lead (Pb) in the vicinity of INEL b previous monitoring indicated that ambient concentrations were very low (IN DHW 1988a:3-4).

The annual emission rates of hazardous/toxic air pollutants from existing INEL facilities during 1989 and estimates of maximum annual average ground-level concent at the INEL boundary are listed in appendix table B.1.3.2-4. These concentrations a compliance with respective acceptable ambient concentrations listed in Rules for th Control of Air Pollution in Idaho.

Table 4.2.2.3-1 presents the baseline ambient air concentrations for criteria pollu and other pollutants of concern at INEL. With the exception of the 24-hour TSP standards, baseline concentrations are in compliance with applicable guidelines and regulations.

Acoustics Conditions. Major noise emission sources within INEL include various indu facilities, equipment, and machines. At the site boundary, away from most of the industrial facilities, noise emitted from the site is barely distinguishable from background noise levels.

Table 4.2.2.3-1.-Comparison of Baseline Ambient Air Concentrations with Most String Applicable Regulations and Guidelines at Idaho National Engineering Laboratory, 198

Pollutant	Averaging Time	Most Stringent Reg Guideline (g/m3)
Criteria Pollutant	-	-
Carbon monoxide (CO)	8-hour	10,000
-	1-hour	40,000a
Lead (Pb)	Calendar quarter	1.5a
Nitrogen dioxide (NO2)	Annual	100a
Ozone (O3)	1-hour	235a
Particulate matter (PM10)	Annual	50a
-	24-hour	150a
Sulfur dioxide (SO2)	Annual	80a
-	24-hour	365a
-	3-hour	1,300a
Mandated by Idaho	-	-
Total suspended particulates (TSP)	Annual 24 -hour	60 150c
Hazardous and Other Toxic Compounds	-	-
Acetaldehyde	Annual	0.45c,
Ammonia	Annual	180c,d
Arsenic	Annual	2.3x10-4c,d
Benzene	Annual	0.12c,d
Butadiene	Annual	3.6x10-3c,d

Carbon tetrachloride	Annual	0.067c,d
Chloroform	Annual	0.043c,d
Cyclopentane	Annual	17,000c,d
Formaldehyde	Annual	0.077c,d
Hexavalent chromium	Annual	8.3x10-5c,d
Hydrazine	Annual	3.4x10-4c,d
Hydrochloric acid	Annual	7.5c,d
Mercury	Annual	1c,d
Methylene chloride	Annual	0.24c,d
Naphalene	Annual	500c,d
Nickel	Annual	4.2x10-3c,d
Nitric acid	Annual	50c,d
Perchloroethylene	Annual	2.1c,d
Phosphorus	Annual	1c,d
Potassium hydroxide	Annual	20c,d
Proprionaldehyde	Annual	4.3c,d
Styrene	Annual	1,000c,d
Toluene	Annual	3,750c,d
Trichloroethylene	Annual	0.077c,d
Trimethylbenzene	Annual	1,230c,d
Trivalent chromium	Annual	5c,d

The acoustic environment along the INEL boundary is assumed to be that of a rural l with typical residual noise levels of 35 to 50dBA (EPA1974a:B-4). Along highways, t contributes to ambient noise levels, especially during peak hours, resulting in significantly higher noise levels than at remote locations. Except for the prohibit nuisance noise, neither the State of Idaho nor its local governments have establish specific numerical environmental noise standards applicable to INEL.

4.2.2.4 Water Resources

This section describes the surface water and groundwater resources at INEL.

Surface Water. Flowing surface water in the INEL area consists of three intermitten streams that drain the adjacent mountains: Big Lost River, Little Lost River, and B Creek. The streams usually begin to flow in the spring and are dry by early to mid-summer. The Big Lost River and Birch Creek are the only surface waters that enter t on a regular basis. The Little Lost River does not enter the site under normal flow conditions. Since much of the flow in these streams is diverted upstream for irriga

it is possible that several years can pass without any flow entering the INEL bound (DOE1991a). There has been no onsite flow of the three streams since 1987 (USGS 199 The U.S. Geological Survey (USGS) is responsible for monitoring the streams; howeve the only onsite monitoring station is for the Big Lost River. Surface waters near I are depicted in figure 4.2.2.4-1.

The proposed TSS lies within the drainage basin of the Big Lost River. The Big Lost flows onto the site at the southern part of its western boundary and flows northeas to the Big Lost River sinks (Playas 1 through 3) (IN DOE 1985a). Water flow in the Lost River is controlled by the MacKay Dam located approximately 45 miles upstream INEL. Local rainfall and snowmelt are the primary contributors to the surface water Most precipitation is rapidly infiltrated into the soil.

Surface water is not used on INEL as a source of water, nor is it used for wastewat discharge. Non-radioactive liquid effluents are disposed of primarily to a waste di lined evaporation pond, an industrial waste pond, five different seepage ponds, and sewage treatment facilities (IN DOE 1992d).

Several areas, such as Test Area North, Test Reactor Area, and Central Facilities A currently divert stormwater into drainage ditches and discharge flow into soils awa the work area. A large drainage ditch equipped with an automatic sampler surrounds Radioactive Waste Management Complex to ensure that radionuclides are not transport the area by stormwater (DOE 1991a).

Flooding at INEL by the Big Lost River has been averted by a flood diversion system constructed in 1958 and upgraded in 1984. The flood diversion system consists of a dam to direct flow through a diversion channel into four spreading areas. The flood diversion system is designed to contain a 300-year flood.

Surface Water Quality. The Big Lost River (from its source to the playas) is design the Idaho Department of Health and Welfare's Water Quality Standards and Wastewater Treatment Requirements for the following uses: agricultural and domestic water supp cold water biota, salmonid spawning, primary and secondary contact recreation, and resource waters (IN DHW 1992a).

The USGS is responsible for monitoring the surface water quality at INEL. The most water samples collected within the facility boundaries were collected from the Big River below the diversion dam in 1985. The results of the analysis and the Idaho Wa Quality Standards for the Protection of Domestic Water Supplies are presented in ta 4.2.2.4-1. More recent samples are not available because of the intermittent nature these water bodies. The analytical results indicate that there are no parameters in exceedance of the water quality criteria.

Surface Water Rights and Permits. Surface water rights are not an issue because INE facilities do not withdraw surface water for use, nor do they discharge effluents d to natural surface waters.

Figure (Page 4-25)
Figure 4.2.2.4-1.-Surface Water Features at Idaho National Engineering Laboratory.

Table 4.2.2.4-1.-Summary of Surface Water Quality Monitoring Data for Big Lost Rive Idaho National Engineering Laboratory, 1985

Parameter	Unit of Measure	Water Quality Criteria	Maximum Water Body Concentration
Arsenic	mg/l	0.05	0.002
Barium	mg/l	1	0.2
Cadmium	mg/l	0.01	0.003
Chromium	mg/l	0.05	0.001

Lead	mg/l	0.05	0.001
Mercury	mg/l	0.002	<0.0001
pH	pH units	6.5 to 8.5a	8.3
Selenium	mg/l	0.01	<0.001
Silver	mg/l	0.05	<0.001
Temperature	C	22	20

Groundwater. The Snake River Plain aquifer, classified by EPA as a Class I sole-sou aquifer, is located beneath the entire INEL site and covers a total area of approxi 9,600square miles in Southeastern Idaho. The aquifer serves as a primary source for drinking water and crop irrigation in the Snake River Basin. It is composed of 2,00 10,000feet of lava flows, rhyolite, and interbedded sediments (IN Barraclough 1978a is believed to contain 1 to 2 billion acre-feet of water.

Groundwater underflow from the Henry's Fork of the Snake River supplies a significa amount of water to the Snake River Plain aquifer below INEL. Additional recharge to aquifer comes from the Big Lost River, Little Lost River, and Birch Creek, which or in the mountains to the northwest of INEL, flow onto the site during a few months o year during wet years, and sink into its porous soils. Precipitation and snow melt contribute to its recharge. Local groundwater movement is complicated, but overall groundwater flows laterally at an average rate of 5 to 20 feet per day to the south west as shown in figure 4.2.2.4-2. The groundwater emerges in springs (6.5 million acre-feet annually) along the Snake River from Milner to Bliss, ID, and from Blackf American Falls Reservoir in the region west of Pocatello, ID (DOE 1992e). Depth to water table ranges from 200 feet below the ground surface in the northeast corner o to 1,000 feet in the southeast corner and approximately 476 feet below the ground s of the proposed TSS (IN DOE 1986a).

Perched water tables occur in the INEL area. The presence of these perched water bo believed to be beneficial to water quality in the Snake River Plain aquifer. These water bodies slow waste migration, allow for radioactive decay, and spread any wast plumes over a wider area for greater dilution (DOE 1992e).

Groundwater Quality. There are several "networks" of monitoring wells drilled and maintained by USGS. These include the INEL-wide facility groundwater monitoring gro well networks for RCRA- and CERCLA-required monitoring. Groundwater beneath INEL is monitored by groups including USGS, DOE's site contractor, LITCO, other DOE contrac and the State of Idaho. USGS has drilled more than 120 wells in the Snake River Pla aquifer and 100 in the perched zone on the site and near INEL. Water supply wells, that monitor the migration of constituents from INEL facilities, and offsite water wells are routinely sampled for chemical and radiological constituents.

Figure (Page 4-27)
Figure 4.2.2.4-2.-Generalized Groundwater Flow and Groundwater Contamination in Ida National Engineering Laboratory Area.

Historically, there has been radionuclide contamination of the Snake River Plain aquifer. Between 1952 and 1988, approximately 30,900 curies (Ci) of tritium were di of into wells and infiltration ponds at INEL (mainly from Idaho Chemical Processing and Test Reactor Area). No tritium is currently disposed of to the groundwater at I however, tritium plumes are present in the Snake River Plain aquifer and in perched groundwater under these sites (figure 4.2.2.4-2). Tritium occurs at elevated levels some monitoring wells and has been detected in groundwater near the southern bounda INEL, 9miles south of the Idaho Chemical Processing Plant and Test Reactor Area. Th average concentration of tritium in water from 26 wells decreased from 250,000 pico per liter (pCi/l) in 1961 to 18,000pCi/l in 1988. In 1990, the highest tritium

concentrations occurring in INEL drinking water were in the area of the Central Fac Area; the concentration ranged from 16,000 to 18,000pCi/l. The elimination of triti disposal, radioactive decay, and dilution and dispersion within the groundwater reservoir are factors contributing to a 93-percent decrease in tritium concentratio levels from 1961 to 1988 (IN USGS 1990a).

Other radionuclides of significance include strontium-90, cesium-137, and iodine-12 first two, especially cesium-137, are strongly held on mineral grains in the soils is unlikely that either will reach the aquifer in significant amounts. As shown in 4.2.2.4-2, plumes have been delineated for strontium and iodine (INEL 1990b).

Samples from four offsite USGS wells beyond the southern and western site boundarie taken in 1990. Gross alpha and gross beta concentrations of 3and 5pCi/l, respective were measured (DOE1990a). The concentrations are within the values expected due to leaching of natural radionuclides in the local soil and rock. None of the samples s detectable concentrations of tritium or gamma-emitting radionuclides.

Nonradioactive wastes, including sodium chloride, sulfuric acid, sodium hydroxide, organics, have also been discharged to ponds within many of the operating areas. In past, wastewater also has been injected into deep disposal wells at the Test Reacto and Idaho Chemical Processing Plant. The total dissolved solids concentrations of t injected wastewaters were approximately twice those present in the natural groundwa (IN USGS 1988a). There are no plans to use injection wells for disposal. Monitoring Snake River Plain aquifer for nonradiological constituents, including sodium chlori total chromium, trace metals, and nitrates, showed concentrations for these contami to be at or below background levels at least 2.5 miles inside the nearest site boun (DOE 1992e).

Only nonradioactive and nonhazardous liquid wastes are currently discharged into th sanitary and service waste disposal systems. All hazardous and radioactive wastes a stored or disposed of in approved facilities designed to preclude groundwater contamination.

The 1991 groundwater data indicate that water quality at the proposed TSS is good w significant radionuclide or nonradionuclide contamination as shown in table 4.2.2.4

Groundwater Availability, Use and Rights. The Snake River Plain aquifer is the sour all water used at INEL (IN DOE 1991b). The combined pumpage of the 27 onsite produc wells average approximately 2,000 MGY (IN DOE 1991b). This is 0.3 percent of the 64 MGY of groundwater withdrawn from the aquifer in the Eastern Snake River Plain. Mos the water withdrawn from the aquifer in the Eastern Snake River Plain (619,114MGY) for agriculture (INDOE1986a). After use, approximately 63 percent of the quantity o groundwater withdrawn at INEL is disposed of in wells and ponds.

In the INEL ROI, Idaho Falls, Pocatello, and Rigby maintain water supply systems. A the community drinking water systems draw their raw water from the Snake River Plai aquifer. In 1991, the combined water supply capacity for these systems was approxim 142MGD. The combined demand averaged about 54MGD (38percent of capacity).

DOE has negotiated with the Idaho Department of Water Resources for water rights of MGD, not to exceed 11,360 MGY, under the Federal Reserve Doctrine. Currently, INEL' water usage is 5.7MGD, representing 11 percent of the 51.7MGD current INEL negotiat water rights.

Table 4.2.2.4-2.-Groundwater Quality Monitoring Data at Idaho National Engineering Laboratory, 1990-1991

Parameter	Unit of Measure	Water Quality Criteria and Standards	Well
1,1-Dichloroethylene	mg/l	0.007	< 0.
1,1,2-Trichloroethane	mg/l	0.005	< 0.

Alpha (gross)	pCi/l	15 d	3.1
Beta (gross)	pCi/l	50 d	2.2
Barium	mg/l	2 d	0.08
Beryllium	mg/l	0.004d	< 0.
Carbon tetrachloride	mg/l	0.005d	< 0.
Chromium	mg/l	0.1d	0.00
Tritium	pCi/l	20,000 d	74
Radon	pCi/l	NA	160
Strontium	mg/l	NA	300
Tetrachloroethylene	mg/l	0.005d	< 0.
Trichloroethylene	mg/l	0.005d	< 0.

4.2.2.5 Geology and Soils

Geology. INEL occupies a relatively flat area on the northwestern edge of the Easte Snake River Plain. The INEL area consists of a broad plain that has been built up f eruptions of multiple flows of basaltic lava. It is bordered by mountains on the no the overthrust belt on the east. The Eastern Snake River Plain consists of Miocene younger volcanic rocks that probably rest upon older sedimentary and plutonic rocks well as faulted remains of Eocene volcanic rocks.

The oldest faults in the region occur both to the north and south of INEL and are approximately 40 to 65million years old. The Arco segment of the Lost River fault a Howe segment of the Lemhi fault are range-front normal faults associated with the B and Range Province and have been active during recent geologic time (100,000 to 15, years ago). They are considered to be the closest capable faults to INEL within the definition of 10 CFR 100, Appendix A. These faults terminate approximately 19 miles the INEL boundary (figure 4.2.2.5-1).

INEL is located in Seismic Zone 2 (figure 4.2.2.5-2). Historically there have been earthquakes in the region surrounding INEL (figure 4.2.2.5-1). However, none of the occurred within approximately 30 miles of the site. The largest historic earthquake that has occurred near INEL took place in 1983, approximately 67 miles to the north near Borah Peak in the Lost River Range. The earthquake had a Richter magnitude of a modified Mercalli intensity of VI, with ground acceleration of 0.022 to 0.078 g a (table 4.2.2.5-1) (IN DOE 1991e; INEL 1985a). An earthquake of greater than 5.5magn is to be expected approximately every 10 years within a 200-mile radius of INEL.

No major earthquake activity has occurred on the Eastern Snake River Plain. The onl recorded earthquake on the Eastern Snake River Plain with a magnitude greater than was the 1905 event that had a magnitude of 5.7. Recent interpretations of the event however, have suggested that its epicenter was more likely to have been in Utah or

The Snake River Plain region has been volcanically active for 400,000 years. The mo recent volcanism in the region consisted of lava flows that occurred approximately to 2,000 years ago at the present site of Craters of the Moon National Monument. Th Hell's Half Acre lava flow, which crosses INEL east of the proposed TSS, dates to 4

years ago.

Possible future volcanic occurrences are postulated to be of the same type that too in the recent past, mainly lava flows. The mean recurrence interval for all types o volcanic activity in the Arco-Big Southern Butte area is suggested to be 3,000years (INUSGS1978a).

Figure (Page 4-30)
Figure 4.2.2.5-1.-Major Fault Systems and Historic Earthquakes in Idaho National Engineering Laboratory Region.

Figure (Page 4-31)
Figure 4.2.2.5-2.-Seismic Zone Map of the United States.

Table 4.2.2.5-1.-The Modified Mercalli Scale of 1931, with Approximate Correlations Richter Scale and Maximum Ground Acceleration

Modified Mercalli Intensity	Observed Effects of Earthquake
I	Usually not felt
II	Felt by persons at rest, on upper floors or favorably placed
III	Felt indoors; hanging objects swing; vibration like passing of light truck occurs; might not be recognized as earthquake
IV	Felt noticeably by persons indoors, especially in upper floors; vibration occurs like passing of heavy truck; jolting sensation; standing automobiles rock; windows, dishes, and doors rattle; wooden walls and frames may creak
V	Felt by nearly everyone; sleepers awaken; liquids disturbed and may spill; some dishes break; small unstable objects are displaced or upset; doors swing; shutters and pictures move; pendulum clocks stop or start
VI	Felt by all; many are frightened; persons walk unsteadily; windows and dishes break; objects fall off shelves and pictures fall off walls; furniture moves or overturns; weak masonry cracks; small bells ring; trees and bushes shake
VII	Difficult to stand; noticed by car drivers; furniture breaks; damage moderate in well built ordinary structures; poor quality masonry cracks and breaks; chimneys break at roof line; loose bricks, stones, and tiles fall; waves appear on ponds and water is turbid with mud; small earthslides; large bells ring
VIII	Automobile steering affected; some walls fall; twisting and falling of chimneys, stacks, and towers; frame houses shift if on unsecured foundations; damage slight in specially designed structures, considerable in ordinary substantial buildings; changes in flow of wells or springs; cracks appear in wet ground and steep slopes
IX	General panic; masonry heavily damaged or destroyed; foundations damaged; serious damage to frame structures, dams and reservoirs; underground pipes break; conspicuous ground cracks
X	Most masonry and frame structures destroyed; some well built wooden structures and bridges destroyed; serious damage to dams and dikes; large landslides; rails bent

XI	Rails bent greatly; underground pipelines completely out of service
XII	Damage nearly total; large rocks masses displaced; objects thrown into air; lines of sight distorted

Soils. INEL soils are derived from volcanic and clastic rocks from nearby highlands DOE 1986a). In the southern part of INEL, the soils are gravelly to rocky and gener shallow. The northern portion is composed mostly of unconsolidated clay, silt, and There is no Soil Conservation Service soil survey of Butte County. Consequently, th few data available for the soils found at the proposed TSS. Generally, the soils ar acceptable for standard construction techniques and consist of wind-blown sand and lying in patches over a bedrock of basaltic lava. These soils have a low-to-moderat erosion hazard and a moderate-to-high wind erodibility. Shrink-swell potential is generally low-to-moderate.

4.2.2.6 Biotic Resources

The following describes biotic resources at INEL including terrestrial resources, wetlands, aquatic resources, and threatened and endangered species. Within each bio resource area, the discussion focuses first on INEL as a whole and then on the prop TSS. Scientific names of species identified in the text are presented in appendix C presented in appendix C is a list of threatened and endangered species that may be on the site or in the vicinity of INEL.

Terrestrial Resources. INEL lies in a cool desert ecosystem dominated by shrub-step communities. Most land within the site is relatively undisturbed and provides impor habitats for species native to the region. Facilities and operating areas occupy 2p of INEL; approximately 60 percent of the areas around the periphery of the site is by sheep and cattle (DOE 1992e:4-76). Although sagebrush communities occupy about 80percent of INEL, a total of 20 plant communities have been identified (figure 4.2.2.6-1). The interspersion of low and big sagebrush communities in the northern of INEL, and the juniper communities located in the northwestern and southeastern p of the site, are considered sensitive habitats (INDOE1986a:4,8). The former provide critical winter and spring range for sage grouse and pronghorn, while the latter is important to nesting raptors and songbirds. These sensitive habitats are located no than 8 miles from the proposed TSS. Riparian vegetation, primarily cottonwood and w along the Big Lost River and Birch Creek also provides nesting habitat for hawks, o and songbirds (DOE 1992e:4-76). In total, 399 plant species have been documented on (IN DOE 1978a:129-223; INDOE 1984a).

Within the proposed TSS, shallow soils (which occupy most of the area) are dominate big sagebrush. In low-lying areas of deep soil, the dominant vegetation is perennia grasses. Isolated stands of juniper also exist in the area (DOE 1992e:4-76). Cheatg an aggressive European annual which readily replaces native species in disturbed ar also present.

INEL supports numerous animal species, including 1amphibian, 9 reptile, 184 bird, a 37mammal species (DOE 1992e:4-76). Common animals on INEL include the short-horned gopher snake, sage sparrow, Townsend's ground squirrel, and blacktailed jackrabbit. Important game animals include the sage grouse, mule deer, elk, and pronghorn. Duri winters 4,500 to 6,000 pronghorn, or about 30 percent of Idaho's total population, found on INEL. Pronghorn wintering areas are located in the northeastern portion of site, in the area of the Big Lost River sinks, in the west central portion of the s along the Big Lost River, and in the south central portion of the site (IN DOE 1978 The latter two areas are both about 4 miles from the proposed TSS. Hunting is permi only within one-half mile of the northern site boundary. Pronghorn, which is the on species taken, are hunted in order to control damage to agricultural land (INEL1992 Numerous raptors and carnivores are also found on INEL and include the golden eagle prairie falcon, and coyote and mountain lion, respectively (INDOE1986a:7). A variet

migratory birds has been found at INEL. Migratory birds, their nests and eggs, are protected by the Migratory Bird Treaty Act. Eagles are similarly protected by the B Golden Eagle ProtectionAct.

Extensive wildlife surveys of the proposed TSS have not been conducted. However, du the similarity of habitat conditions on the site to other areas of INEL, animal spe composition would be expected to closely resemble that of the rest of INEL. Prongho of the area is relatively low (DOE 1992h:4-76).

Wetlands. The Big Lost River spreading areas and Big Lost River sinks are seasonal wetlands and are located approximately 10miles southwest and 12miles north of the p TSS, respectively (figure 4.2.2.4-1). These areas can provide more than 2,000acres wetland habitat during wet years. Riparian wetland vegetation exists along the Big River and along Birch Creek. Plants found along the Big Lost River, which is locate miles west of the proposed TSS, are in poor condition due to recent years of only intermittent flows. The river has flowed onsite most recently in 1986 and 1993.

National Wetland Inventory maps prepared by the U.S. Fish and Wildlife Service (USF have been completed for most of INEL. The National Wetland Inventory maps indicate the primary wetland areas are associated with the Big Lost River, the Big Lost Rive Spreading Areas, and the Big Lost River sinks (figure 4.2.2.4-1), although smaller than 1acre) isolated wetlands also occur. Wetlands associated with the Big Lost Riv are classified as riverine/intermittent, indicating a defined stream channel with flowing water during only part of the year. The National Wetland Inventory maps ind that there are no designated wetlands in the area of the proposed TSS.

Figure (Page 4-34)
Figure 4.2.2.6-1.-Distribution of Plant Communities at Idaho National Engineering Laboratory.

Aquatic Resources. Aquatic habitat is limited to the Big Lost River, Little Lost Ri Birch Creek, and a number of liquid-waste disposal ponds (figure4.2.2.4-1). All thr streams are intermittent and drain into 4 sinks in the north-central part of INEL. species of fish have been observed in the Big Lost River including trout, mountain whitefish, speckled dace, shorthead sculpin, and kokanee salmon (DOE 1992e:4-78; DO 1992h:6-11). Due to drought and upstream diversions, the Big Lost River has flowed the site only once since 1986 (i.e., in 1993).

The Little Lost River, located west of the site, and Birch Creek, located north of proposed TSS, enter INEL only during periods of high flow (IN DOE nda:22). Surveys in these surface water bodies have not been conducted. The liquid waste disposal po INEL, while considered aquatic habitat, do not support fish (INEL 1992a:4). No aqua habitat occurs on the proposed TSS, located about 1.5 miles east of the Big Lost Ri

Threatened and Endangered Species. Twenty-five Federal- and state-listed threatened endangered, and other special status species have been identified on and in the vic of INEL (appendix table C-2). Five of these species may occur in the vicinity of th proposed TSS (table 4.2.2.6-1). Nocritical habitat for threatened or endangered spe as defined in the Endangered Species Act (50 CFR 17.11; 50CFR17.12), exists on INEL 1992e:4-78).

Table 4.2.2.6-1.-Federal- and State-Listed Threatened, Endangered, and Other Specia Status Species That May Be Found On the Site or In the Vicinity of the Proposed Tri Supply Site at Idaho National Engineering Laboratory

Species	Status		Known or Potential
-	Federal	State	-
Mammals	-	-	-
Pygmy rabbit	C2	NL	Tall sagebrush clum

Townsend's western big-eared bat	C2	SSC	Cave roost, forage
Birds	-	-	-
Ferruginous hawk	C2	SSC	Dry, open country -
Loggerhead shrike	C2	NL	Semi-open areas wit
Plants	-	-	-
Tree-like oxytheca	NL	S	Sandy areas in sage

The pygmy rabbit is common on INEL, but its distribution is patchy (DOE 1994e:4.9-4 The Townsend's western big-eared bat, which roosts in caves on INEL, has not been o in the area of the proposed TSS, but could potentially occur. The ferruginous hawk expected to use the proposed site area on a regular basis (DOE 1992e:5-137, 5-138). Nesting habitat exists for the loggerhead shrike, which is found throughout the sit Federal candidate species do not receive legal protection under the Endangered Spec Act, but USFWS recommends that impacts to these species be considered in project pl since these species may become listed in the future.

The State of Idaho does not maintain a list of threatened or endangered plant speci Plants that are considered rare in Idaho are included in a State Watch List. Only t tree-like oxytheca, listed by the state as a sensitive species, has been found in t of the proposed TSS (DOE 1992e:4-79).

4.2.2.7 Cultural and Paleontological Resources

Prehistoric Resources. Prehistoric site types identified on INEL include residentia bases, campsites, rockshelters, hunting blinds, rock alignments, lithic quarries, a limited activity locations including lithic and ceramic scatters, hearths, and conc tions of fire-affected rock. Since 1984, 93 cultural resource surveys have been con and approximately 4percent of INEL has been inventoried for cultural resources. Of 803 prehistoric sites that have been recorded, approximately 95 percent are lithic scatters or locations. Most have not been formally evaluated and are considered potentially eligible for the NRHP.

Cultural resources surveys of the proposed TSS and potential access corridors have identified 14sites with buried remains, 3 stone circle sites, 42 lithic scatters, a 1prehistoric/historic site (INEL1991a:4). Approximately 19 percent of the proposed been intensively surveyed and the remaining area has received only reconnaissance-l study. Based on current studies, additional sites are likely to occur and are regar potentially eligible for the NRHP, pending further evaluation.

Historic Resources. About 30 historic resources have been identified; most are rela either agriculture (e.g., homesteads and canals) or ranching (e.g., sheep and cattl camps). The Experimental Breeder Reactor I, the first reactor to achieve a self-sustaining chain reaction using plutonium instead of uranium as the principal fuel component, is listed on the NHRP and is designated a National Historic Landmark. Go Cutoff, a spur of the Oregon Trail, is still recognizable in the southwestern corne INEL. Various other nuclear reactors and associated buildings, such as those at Auxiliary Reactor Area-I, -II, -III, the Borax Reactor, Materials Test Reactor, Engineering Test Reactor, and the Hot Shop, are considered eligible for the NRHP (INEL1991a:1). Although such facilities are not 50 years old, they are of exception scientific and engineering significance and have played major roles in the developm of nuclear science since World War II.

Only one site with historic content has been identified on the proposed TSS. The hi content consists of early household debris and may be potentially eligible for the pending further evaluation. Based on current studies, additional historic sites are

to occur in unsurveyed portions of the proposed TSS.

Native American Resources. At the time of Euro-American contact, the area was inhab by nomadic hunters and gatherers consisting of two linguistically distinct groups: Shoshone and the Bannock. Horses enabled the Shoshone and the Bannock to increase t foraging range, congregate in larger groups, and protect their possessions from oth groups. Winter camps were reportedly scattered along major river drainages. Groups dispersed during the other seasons, probably moving across what is now INEL as they utilized floral and faunal resources and obsidian from Big Southern Butte or Howe P

Important Native American resources that might be found in the proposed TSS include buttes, caves, village shrines, rock art, burials, and vision quest sites. It is wo noting that many natural resources at INEL are viewed as cultural resources by Nati Americans. As one example, sagebrush is used as a tool, and for clothing and medici purposes. INEL recently initiated general consultation with the Shoshone and Bannoc tribes. While specific sites or traditional use areas have not yet been identified, Shoshone and Bannock tribes consider INEL part of their ancestral homeland and have expressed support for the use of scientific methods to preserve cultural resources.

Paleontological Resources. No paleontological localities have been identified withi proposed TSS. No lava tubes, caves, or rock shelters that might be expected to cont fossils are visible on the surface. However, lava tubes and caves containing paleontological materials may be buried beneath the aeolian sediments. Because thes assemblages may contain both vertebrate and floral remains, such localities would h high research potential.

4.2.2.8 Socioeconomics

Socioeconomic characteristics described for INEL include employment and local econo population, housing, public finance, and local transportation. Statistics for econo characteristics are presented for the regional economic area that encompasses 13cou around INEL (appendix table D.2.1-2). The regional economic area is a broad labor a product market-based region linked by trade among economic sectors within the regio Statistics for population and housing, public finance, and local transportation are presented for the ROI, a 5-county area in which 98 percent of all INEL employees re Bannock County (5 percent), Bingham County (9 percent), Bonneville County (76 perce Butte County (2 percent), and Jefferson County (6percent). (See figure 4.2-1 for a counties and cities.) Fiscal characteristics of the jurisdictions in the INEL ROI a presented in the public finance section in appendix tables D.3-11 and D.3-12. The s districts most likely to be affected by the proposed action include Arco, Blackfoot Bonneville, Idaho Falls, Jefferson, Pocatello, Ririe, Shelley, Snake River, and Wes Jefferson. Assumptions, assessment methodologies, and supporting data are presented appendix D.

Regional Economy Characteristics. Employment and local economy statistics for the I regional economic area are presented in appendix table D.3-2 and summarized in figu 4.2.2.8-1. Between 1970 and 1990, the civilian labor force in the regional economic increased 53 percent. The unemployment rate in the regional economic area in 1990 w slightly higher than the State of Idaho rate and the 1990 per capita income was sli lower than the state per capita income.

As shown in figure 4.2.2.8-1, the percentage of total employment involving farming governmental activities in the regional economic area was approximately the same as the state. Nonfarm private sector activities of manufacturing, retail trade, and se were similar in the regional economic area and the state overall, except that the s had a higher percentage of employment in manufacturing while the regional economic had a higher percentage in services.

In 1990, INEL employed 11,100 persons (8.7 percent of the total regional economic a employment), increasing from 6,755 persons in 1970. Historical and future employmen INEL and the distribution of INEL employees by place of residence in the ROI are pr in appendix tables D.2.1-1 and D.3.-1, respectively.

Population and Housing. Population and housing distribution in the ROI is presented appendix tables D.3-5 and D.3-8 and summarized in figure 4.2.2.8-2. Overall, the pe increase in population in the ROI from 1970 to 1990 was 9 percent lower than the st population increase.

The counties of Bonneville and Jefferson experienced population increases between 1 and 1990 approximately equal to that of the state, while the counties of Bannock an Bingham experienced a growth rate 15 percent lower than that of the state. Butte Co experienced a slight population decrease (less than 1 percent) between 1970 and 199

Between 1970 and 1990, housing units in the ROI experienced a slightly lower (8 per increase compared to state housing unit increases. Homeowner and rental vacancy rat the ROI in 1990 were similar to those of the state.

Public Finance. Financial characteristics of the local jurisdictions in the ROI tha most likely to be affected by the proposed action include total revenues and expend of each jurisdiction's general fund, special revenue funds, and, as applicable, deb service, capital project, and expendable trust funds. School district boundaries ma may not coincide with county or city boundaries, but the districts are presented un county where they primarily provide services. Major revenue and expenditure fund categories for counties, cities, and school districts are presented in appendix tab D.3-11 and D.3-12, and figure 4.2.2.8-3 summarizes local governments' revenues less expenditures.

Local Transportation. Vehicular access to INEL is provided by U.S. Routes 20 and 26 south and State Routes 22 and 33 to the north. Both U.S. Routes 20 and 26 and State 22 and 33 share rights-of-way adjacent to INEL (figure 4.2-1). Road segments provid access to INEL experience varying levels of traffic congestion. Potential disruptio the traffic flow caused by accidents or maintenance activities are usually minor. N major improvements are scheduled for those roadway segments providing immediate acc INEL (figure 4.2.1-1) (IN DOT 1991a).

Figure (Page 4-38)
Figure 4.2.2.8-1.-Economy for Idaho National Engineering Laboratory Regional Econom Area.

Figure (Page 4-39)
Figure 4.2.2.8-2.-Population and Housing for Idaho National Engineering Laboratory of Influence [Page 1 of 2].

Figure (Page 4-40)
Figure 4.2.2.8-2.-Population and Housing for Idaho National Engineering Laboratory of Influence [Page 2 of 2].

Figure (Page 4-41)
Figure 4.2.2.8-3.-1992 Local Government Public Finance for Idaho National Engineeri Laboratory Region of Influence.

A fleet of government-owned, contractor-operated passenger buses operates between I facilities and communities within the ROI. Approximately 4,000 employees use this transportation daily. The major railroad in the ROI is the Union Pacific Railroad. railroad's MacKay branch provides rail service to the southern portion of INEL. A DOE-owned spur connects the Union Pacific Railroad to INEL by a junction at Scovill Siding. There are no navigable waterways within the ROI capable of accommodating waterborne transportation of material shipments to INEL.

Fanning Field in Idaho Falls and Pocatello Municipal Airport in Pocatello provide j passenger and cargo service from both national and local carriers. Numerous smaller private airports are located throughout the ROI (IN DOT 1991a).

4.2.2.9 Radiation and Hazardous Chemical Environment

The following provides a description of the radiation and hazardous chemical enviro at INEL. Also included are discussions of health effects studies, emergency prepare considerations, and an accident history.

Radiation Environment. Major sources of background radiation exposure to individual the vicinity of INEL are shown on table 4.2.2.9-1. All annual doses to individuals background radiation are expected to remain constant over time. Accordingly, the incremental total dose to the population would result only from changes in the size population. Background radiation doses are unrelated to INEL operations.

Releases of radionuclides to the environment from INEL operations provide another s of radiation exposure to individuals in the vicinity of INEL. The radionuclides and quantities released from INEL operations in 1992 are listed in The Idaho National Laboratory Site Environmental Report for Calendar Year 1992 (DOE/ID-12082 (92)). Th to the public resulting from these releases are presented in table 4.2.2.9-2. These fall within radiological limits (DOE Order 5400.5) and are small in comparison to background radiation. The releases listed in the 1992 report were used in the development of the reference environment (No Action) radiological releases at INEL year 2010 (section 4.2.3.9).

Table 4.2.2.9-1.-Sources of Radiation Exposure to Individuals in the Vicinity, Unre to Idaho National Engineering Laboratory Operations, 1992

Source	Committed Effective Dose Equivalent (mrem/yr)
Natural Background Radiation	-
Cosmic radiation	39
External terrestrial radiation	74
Internal terrestrial radiation	40
Radon in homes (inhaled)	200
Other Background Radiation	-
Diagnostic x-rays and nuclear medicine	53
Weapons test fallout	<1
Air travel	1
Consumer and industrial products	10
Total	418

Based on a risk estimator of 500 cancer deaths per 1million person-rem to the publi (appendix sectionE.2), the fatal cancer risk to the maximally exposed member of the due to radiological releases from INEL operations in 1992 is estimated to be approx 2.0x10-9. That is, the estimated probability of this person dying of cancer at some in the future from radiation exposure associated with 1year of INEL operations is a chances in 1billion. (Note that it takes several to many years from the time of exp to radiation for a cancer to manifest itself.) Approximately 1.5x10-5 excess fatal were estimated from normal operations in 1992 to the population living within 50 mi INEL. To place this number into perspective, it can be compared with the number of cancers expected in this population from all causes. The 1990 mortality rate, assoc

with cancer, for the entire U.S. population was 0.2 percent per year (Almanac 1993a Based on this national mortality rate, the number of fatal cancers from all causes expected during 1992 in the population living within 50 miles of INEL was 243. This of expected fatal cancers is much higher than the estimated 1.5x10-5 fatal cancers could result from INEL operations in 1992.

Table 4.2.2.9-2.-Doses to the General Public from Normal Operations at Idaho Nation Engineering Laboratory, 1992 (committed effective dose equivalent)

-	Atmospheric Releases		Liquid Releases	
Affected Environment	Standard	Actual	Standarda	Actualb
Maximally exposed individual (mrem)	10	0.004	4	0
Population within 50 miles (person-rem)	None	0.03	None	0
Average individual within 50 miles (mrem)	None	0.00025	None	0

Workers receive the same dose as the general public from background radiation, but receive an additional dose from working in the facilities. Table 4.2.2.9-2 includes average, maximum, and total occupational doses to INEL workers from operations in 1 These doses fall within radiological limits (10 CFR 835). Based on a risk estimator fatal cancers per 1million person-rem among workers (appendix section E.2), the num excess fatal cancers to INEL workers from operations in 1992 is estimated to be 0.0

A more detailed presentation of the radiation environment, including background exposures and radiological releases and doses, is presented in The Idaho National Laboratory Site Environmental Report for Calendar Year 1992 (DOE/ID-12082(92)). The centrations of radioactivity in various environmental media (air, water, and soil) site region (onsite and offsite) are also presented in that document. INEL operatio contribute negligible radioactivity to these media.

Table 4.2.2.9-3.-Doses to the Worker Onsite from Normal Operations at Idaho Nationa Engineering Laboratory, 1992 (committed effective dose equivalent)

-	Onsite Releases and Direct Radiation	
Affected Environment	Standard	Actual
Average worker (mrem)	None	14.2
Maximally exposed worker (mrem)	5,000	1,000
Total workers (person-rem)	None	75

Chemical Environment. The background chemical environment important to human health consists of: the atmosphere, which may contain toxic chemicals which can be inhaled drinking water, which may contain toxic chemicals that can be ingested; and other environmental media with which people may come in contact (e.g., surface waters dur swimming and soil through direct contact or via the food pathway). The baseline dat assessing potential health impacts from the chemical environment are those presente sections 4.2.2.3 and 4.2.2.4.

Health impacts to the public can be minimized through effective administrative and

controls for decreasing pollutant releases to the environment and achieving complia with permit requirements, (e.g., air emissions and NPDES permit requirements). The effectiveness of these controls is verified through the use of monitoring informati inspection of mitigation measures. Health impacts to the public may occur during no operation via inhalation of air containing pollutants released to the atmosphere by operations. Risks to public health from other possible pathways, such as ingestion contaminated drinking water or direct exposure, are low relative to the inhalation pathway. The risk to public health from water ingestion and direct exposure pathway low because the surface water resource (Big Lost River) is not used either for drin as a receptor for wastewater discharges and because monitoring of groundwater conta nated from INEL operations indicates contamination is generally below threshold lev concentration. If concentrations are above threshold levels of concentration, appropriate treatment is performed.

Baseline air emission concentrations for hazardous/toxic air pollutants and their applicable standards are presented in section 4.2.2.3. These concentrations are estimates of the highest existing offsite concentrations and represent the highest concentrations to which members of the public could be exposed. These concentration in compliance with applicable guidelines and regulations. Information about estimat health impacts from hazardous/toxic chemicals is presented in appendix section E.3.

Health impacts to INEL workers during normal operation may include those from: inha of the workplace atmosphere, drinking INEL potable water, and possible other contac hazardous materials associated with work assignments. The potential for health impa varies from facility to facility and from worker to worker, and available informati not sufficient to allow a meaningful estimation and summation of these impacts. How workers are protected from hazards specific to the workplace through appropriate tr protective equipment, monitoring, and management controls. INEL workers are also pr by adherence to occupational standards that limit workplace atmospheric and drinkin water concentrations of potentially hazardous chemicals. Monitoring ensures that th standards are not exceeded. Additionally, DOE requirements (DOE Order 3790.1B) ensu conditions in the workplace are as free as possible from recognized hazards that ca or are likely to cause illness or physical harm. Therefore, worker health condition INEL are expected to be substantially better than required by the standards.

Health Effects Studies. Two epidemiological studies have been conducted on the comm that surround INEL to determine if there are any excess cancers in the general popu no occupational epidemiological studies have been conducted at INEL to date. No exc cancer mortality was reported, although excess cancer incidence was observed. Howev association of the excess cancer incidence with INEL was established. For a more de description of the study findings reviewed, refer to appendix section E.4.2.

Accident History. A recent study was conducted by DOE Idaho National Engineering Laboratory Historical Dose Evaluation (DOE/ID-12119) to estimate the potential offs radiation doses for the entire operating history of INEL. Releases resulted from a of tests and experiments as well as a few accidents at INEL. The study concluded th these releases have made a substantial contribution to the total radiation dose dur test programs of the 1950s and early 1960s. The frequency and size of releases has declined since that time. Based on information reported in the study, there have be serious unplanned or accidental releases of radioactivity or other hazardous substa INEL facilities in the last 10 years of operation.

Emergency Preparedness. In the event of an accident, each DOE site has established emergency management program. This program has been developed and maintained to ens adequate response for most accident conditions and to provide response efforts for accidents not specifically considered. The emergency management program incorporate activities associated with emergency planning, preparedness, and response. Section provides a description of DOE's emergency preparedness program.

Participating government agencies whose plans are interrelated with the INEL Emerge Plan for Action include the State of Idaho, Bingham County, Bonneville County, Butt County, Clark County, Jefferson County, the Bureau of Indian Affairs, and Fort Hall Reservation. INEL contractors are responsible for responding to emergencies that oc their facilities. When an emergency condition exists at a contractor facility, the

Emergency Action Director is responsible for recognition, classification, notificat and protective action recommendations. At INEL, emergency preparedness resources in fire protection from onsite and offsite locations and radiological and hazardous ch material response. Emergency response facilities include an emergency control cente each facility, the INEL warning communication center, and the INEL site emergency operations center. There are also seven INEL medical facilities available to provid routing and emergency service (INEL 1991a:2).

4.2.2.10 Waste Management

This section outlines the major environmental regulatory structure and ongoing wast management activities for INEL. A more detailed discussion of the ongoing waste management operations is provided in appendix section H.2.1. Table 4.2.2.10-1 prese summary of waste management activities at INEL for 1992.

The Department is working with Federal and state regulatory authorities to address compliance and cleanup obligations arising from its past operations at INEL. The Department is engaged in several activities to bring its operations into full regul compliance. These activities are set forth in negotiated agreements that contain schedules for achieving compliance with applicable requirements, and financial pena for nonachievement of agreed upon milestones.

Table 4.2.2.10-1.-Spent Nuclear Fuel and Waste Management at Idaho National Enginee Laboratory [Page 1 of 2]

Category	1992 Generation (yd3)	Treatment Method	Treatment Capacity (yd3/yr)	Storage Method
Spent Nuclear Fuel	0.4 metric ton heavy metal	Conditioning and stabilization	Under assessment	Pools, dry
High-level	-	-	-	-
Liquid	1,570 (317,059 gal)	Evaporation, calcination	3,000 (606,000 GPY)	Tank farm, evaporatio to calcina
Solid	None	Under development	Planned	Bins insid concrete v
Transuranic	-	-	-	-
Liquid	None	NA	NA	NA
Solid	1	Under development	Expandable as required	Asphalt pa vaults in ground or earthen co tarps
Low-level	-	-	-	-
Liquid	None	Evaporation	15,993 (3,230,365 GPY)	Tank farm evaporatio to calcina
Solid	14,757	Incineration and compaction	2,300	NA

Mixed	-	-	-	-
Liquid	6.6 (1,341 gal)	Evaporation, fractionation, and calcination	14,400 (2,900,000 GPY)	Tank farm
Solid	67	Incineration and compaction	64,900	Mixed wast WERF stora facilities radioactiv sodium sto facilities
Hazardous	-	-	-	-
Liquid	Included in solid	Offsite and percolation ponds	Under assessmentb	Percolatio
Solid	1,092	Offsite	NA	Hazardous storage fa
Nonhazardous (Sanitary)	-	-	-	-
Liquid	66,446 (13,422,173 gal)	Percolation ponds	NA	NA
Nonhazardous (Other)	-	-	-	-
Liquid	Included in sanitary	Recycle	NA	NA
Solid	81,058	Segregate and recycle	NA	NA

EPA placed INEL on the NPL on December21,1989. DOE has entered into a Federal Facil Agreement and Consent Order with EPA and the State of Idaho to coordinate cleanup activities at INEL under a comprehensive strategy. This agreement integrates DOE's response obligations with RCRA and Hazardous Waste Management Act corrective action obligations. In this process, INEL has been divided into 10 waste area groups. Each is subdivided into separate operable units which are groupings of potential release that are considered together for assessment and cleanup activities. Ongoing assessm are characterizing the nature and extent of contamination. Aggressive plans are in to achieve early remediation of sites that represent the greatest risk to workers a public. The goal is to complete remediation of contaminated sites at INEL to suppor delisting from the NPL by 2019.

INEL manages spent nuclear fuel and the following waste categories: high-level, transuranic (TRU), low-level, mixed, hazardous, and nonhazardous. A discussion of t waste management operations associated with each of these categories follows.

Spent Nuclear Fuel. Spent nuclear fuel had been stored and processed at the Idaho C Processing Plant. Processing was terminated with DOE's decision not to reprocess sp nuclear fuel to recover useful isotopes. INEL has received spent fuel from Three Mi Island, reactor tests, and the gas-cooled reactor and naval reactors programs. Spen nuclear fuel from these programs and from reactor experiments at INEL is in storage various locations. The bulk of the fuel is stored at the Idaho Chemical Processing Plant. Interim management of the spent nuclear fuel (pending the availability of a geologic repository) will be in accordance with the ROD published in the Federal Re

(60 FR 28680) on June 1, 1995, for the DOE Programmatic Spent Nuclear Fuel Manageme INEL Environmental Restoration and Waste Management Programs EIS (DOE/EIS-0203-F). Preparations will be made to implement the ROD and consolidate nonaluminum clad spe nuclear fuel at INEL on a basis consistent with risk priorities and budget constrai

High-Level Waste. High-level waste (HLW) at INEL was generated in the process of extracting useful isotopes from spent nuclear fuel at the Idaho Chemical Processing Most of this fuel was from the naval reactors program. Most aqueous solutions from fuel processing and isotope extraction were concentrated by evaporation and separat low-level and high-level waste streams in the Process Equipment Waste Evaporator. T liquid HLW is stored in subsurface tanks and then transformed into solid metallic o in a granular form by calcination. The majority of the waste in storage tanks conta sodium and cannot be calcined directly. New equipment is being installed to permit resumption of calcination in 1996. The calcine is stored in stainless steel bins in near-surface concrete vaults where it awaits further processing into a form suitabl emplacement in a Federal repository. Technologies are being tested that would conve calcine into an immobilized form suitable for storage under RCRA Land Disposal Restrictions, and meeting waste acceptance criteria for a Federal repository. The I Operations Office has prepared a No-Migration Variance Petition to be submitted to the continued storage of calcine. Calcination will continue and new storage facilit will be added as necessary until all the liquid HLW is stabilized.

Transuranic Waste. TRU wastes are stored at the Radioactive Waste Management Comple inventory represents more than one-half of the total DOE inventory. There is very l TRU waste generation at INEL. Most of the TRU waste in storage was received from th Rocky Flats Environmental Technology Site (formerly known as the Rocky Flats Plant) 1989, there has been a moratorium on the receipt of TRU wastes from out-of-state facilities; however, shipments may be accepted on a case-by-case basis. TRU wastes currently being stored pending the outcome of the Waste Isolation Pilot Plant (WIPP Program to determine the suitability of WIPP to serve as a repository for these was Assuming WIPP is determined to be a suitable repository for these wastes, pursuant the requirements of 40 CFR 191 and 40 CFR 268, these wastes will be treated to meet WIPP Waste Acceptance Criteria and packaged in accordance with DOE and NRC requirem for transport to WIPP for disposal.

Prior to 1970, when the Atomic Energy Commission required segregation of TRU waste other wastes, TRU wastes were buried in earthen trenches at the Radioactive Waste Management Complex. This waste must be retrieved and repackaged to meet the current Waste Acceptance Criteria. Wastes generated or received from offsite since 1970 are in a form designed for eventual retrieval. Since 1972, TRU wastes have been stored A in the Radioactive Waste Management Complex. Most of this waste will require certification and repackaging. A new facility, the Idaho Waste Processing Facility, being designed to accomplish this task. Some waste has radioactivity levels high en that there are no certified or licensed transportation capabilities for it. Further study will be required for its eventual disposal. While the EPA has issued a Notice Noncompliance for TRU waste stored at the Radioactive Waste Management Complex, a p plan for the treatment and storage of TRU wastes has been documented in the Federal Facility Agreement and Consent Order, which addresses EPA and State of Idaho concer while also meeting DOE's concerns for worker protection.

Most of the mixed TRU waste at INEL requires retrieval, treatment, and repackaging order to meet the WIPP Waste Acceptance Criteria. Additional facilities at other ar INEL are planned for the treatment of mixed waste, rendering it acceptable for disp The specifics of their Site Treatment Plan will be detailed pursuant to the require of the Federal Facility Compliance Act and as negotiated with the State of Idaho an Some of the waste now handled as TRU or mixed TRU is alpha-contaminated LLW and mix LLW. A strategy for treatment and disposal of this waste has yet to be established. and offsite treatment is being investigated.

Low-Level Waste. The bulk of LLW generated at INEL is the result of work in contami areas, and consists of materials such as rags, bags, scrap metal, and used protecti clothing. A large volume of LLW is generated in the decontamination and decommissio activities associated with environmental restoration. These materials must be treat the operating facility to meet the waste acceptance criteria of the receiving facil

and their conformity to these criteria must be inspected by the receiving facility. LLW at INEL is sent to the Waste Experimental Reduction Facility for compaction, si incineration, and stabilization prior to shipment for disposal at the Radioactive W Management Complex. The Waste Experimental Reduction Facility, shut down while undergoing a revision of processes and procedures, is currently in startup and is e to be in operation in 1996.

Mixed Low-Level Waste. The volume of mixed LLW waste generated at INEL is small. Th mixed waste is stored in several areas onsite awaiting treatment capacities to be developed to treat the specific nature of a wide variety of different mixed waste s Organic mixed LLW is planned to be processed through the Waste Experimental Reducti Facility incinerator to the established Land Disposal Restrictions treatment standa The resulting ash will be immobilized and disposed of as LLW. The use of commercial treatment facilities is also being considered. Large volumes of wastewater are proc in the Process Equipment Waste Evaporator, resulting in a concentrated mixed waste is sent to the HLW tank farm and eventually stabilized in a fluidized bed calciner. Condensate from the Process Equipment Waste Evaporator is converted into a concentr acidic solution in the Liquid Effluent Treatment Facility. This concentrate is eith recycled as a scrubber solution for the calciner or sent to the HLW tank farm for s The Liquid Effluent Treatment Facility eliminates residual discharge of hazardous/radioactive contaminants into wastewater percolation ponds, which was the practice, in accordance with a Consent Order signed on October7, 1992. Stored and n generated mixed LLW will be treated at the Waste Experimental Reduction Facility incinerator, the Nonincinerable Mixed Waste Treatment Project, and the Sodium Proce Facility through generator treatment plans developed under 40 CFR 262.34.

Hazardous Waste. Hazardous wastes are generated at the widely separated facilities and sent to the Hazardous Waste Storage Facility in the Central Facilities Area. Th is staged for shipment offsite to commercial RCRA-permitted treatment and disposal facilities. DOE has temporarily prohibited offsite shipments pending development of system for the certification that the wastes have no radioactive content (are not m waste). Facilities to convert sodium hydroxide to a disposable waste form are plann Argonne National Laboratory-West.

Nonhazardous Waste. Nonhazardous waste generated at INEL facilities is disposed of in a landfill complex in the Central Facilities Area and at the Bonneville County landfill. The current landfill complex contains separate areas for sanitary, indust and asbestos waste. In accordance with terms of the Consent Order dated October 7, sewage is directed to sur

CHAPTER 5: ENVIRONMENTAL, OCCUPATIONAL SAFETY & HEALTH PERMITS AND COMPLIANCE REQUI

Chapter 5 identifies the environmental, occupational safety and health, permits, an compliance requirements associated with the proposed action as specified by the maj Federal and state statutes, regulations, orders, and agreements.

5.1 Introduction and Purpose

Chapter 5 provides information concerning the environmental standards and statutory requirements that impact on the various tritium supply technologies and recycling facilities to the extent necessary to assist in making programmatic-level decisions presents some of the more important regulatory requirements associated with the pro action by identifying the applicable environmental statutes, regulations, and appro requirements. These requirements are found in Federal and state statutes, regulatio permits, approvals, and consultations, as well as in Executive and Department of En (DOE) orders, Consent Orders, Federal Facility Agreements, Federal Facility Complia Agreements, and Agreements In Principle. These documents provide the standard for evaluating the ability of candidate sites to meet the environment, safety, and heal (ES&H) requirements and obtaining required Federal and state permits and licenses necessary to implement programmatic decisions. The remainder of the chapter provide historical background on environmental protection at nuclear weapons production facilities, explains the concept of shared Federal and state enforcement, and summa compliance with occupational safety and health and environmental justice requiremen

Compliance with the applicable requirements of each of the major environmental stat regulations, or orders identified in the tables would allow DOE to construct and op the tritium supply and recycling facilities to meet existing ES&H requirements. To environmentally sound, programmatic decisions must also address the ES&H planning c siderations described in section 3.3 of the Nuclear Weapons Complex Reconfiguration (DOE/DP-0083) in order for the tritium supply and recycling facilities to meet ES&H requirements which would exist in the future and to accomplish the mission in a tim cost-effective manner.

5.2 Background

Since the majority of the Nuclear Weapons Complex (Complex) facilities were constru the 1940s and 1950s before the advent of today's environmental and worker health requirements, safety and the ability to satisfy national security requirements play dominant roles in the design and operation of these major industrial plants. With t emergence of an awareness of environmental and health-related issues and the enactm environmental and worker health programs, however, DOE shifted a great deal of its resources into programs designed to achieve compliance with all applicable Federal, and local ES&H requirements. Today, many government agencies at the Federal, state, local levels have regulatory authority over DOE facility operations. DOE has entere into enforceable compliance agreements with the regulators at most of its facilitie These agreements detail specific programs, funding levels, and schedules for achiev compliance with applicable ES&H statutory and regulatory requirements.

All newly constructed and modified facilities must comply with the increasing numbe complexity of environmental regulations. The application of constantly changing requirements to facilities that are more than 40 years old makes it difficult to ac compliance quickly. These older facilities generally do not meet all current standa seismic design, fire protection, and environmental protection (air emissions, liqui effluents, and the management of solid and hazardous wastes). However, modernizatio facilities to meet all applicable ES&H requirements now and into the 21st century a

the development of a system to adequately manage the wastes generated by these faci would take place regardless of the proposed action addressed in this PEIS.

5.3 Environmental Statutes, Orders, and Agreements

The Atomic Energy Act of 1954 authorizes DOE to establish standards to protect heal minimize dangers to life or property with respect to activities under its jurisdict The Nuclear Regulatory Commission (NRC) is charged under the Atomic Energy Act and Energy Reorganization Act of 1974 with jurisdiction over commercial reactor constru and operation. NRC also licenses and regulates the possession, use, transportation, disposal of radioactive materials, including wastes. The Environmental Protection Agency (EPA), under authority of the Atomic Energy Act, has set radiation protectio standards such as "Environmental Radiation Protection Standards for Nuclear Power Operations" (40 CFR 190). EPA has also promulgated Federal environmental statutes a regulations to protect the environment and to control the generation, handling, treatment, storage, and disposal of hazardous materials and waste substances.

Because of their length, and for ease of reading, all tables in this chapter are pr consecutively at the end of the text. Table 5.3-1 lists the applicable Federal environmental statutes, regulations, and Executive orders, and also identifies the associated permit, approval, and consultation requirements generally required to si construct, or operate a tritium supply technology and recycling facility. Except fo limited Presidential exemptions, Federal agencies must comply with all applicable provisions of Federal environmental statutes and regulations, in addition to all applicable state and local requirements. DOE is committed to fully complying with a applicable environmental statutes, regulatory requirements, and Executive and inter orders. Table 5.3-2 lists selected DOE ES&H orders which apply to all sites, but wh affect each site differently.

DOE has entered into agreements with regulatory agencies on behalf of all of the DO facilities being considered in this Programmatic Environmental Impact Statement (PE These agreements normally establish a schedule for achieving full compliance at the DOE facilities. Table 5.3-3 lists those DOE environmental agreements with Federal a state regulatory agencies that have substantive provisions in effect. Appendix sect summarizes the applicability and provides more detail on the environmental regulato compliance agreements and consent orders still in effect at each of the nuclear facilities. These agreements and consent orders are generally available from the regulatory agency that is a party to the agreement, normally the state environmenta department or EPA region, and also at the local DOE information resource center or room. Table 5.3-4 lists the potential requirements imposed by the major state environmental statutes and regulations applicable to this PEIS. These requirements to Federal activities within the jurisdiction of the enforcing authority. Just as t 5.3-1 identifies requirements based on Federal laws, table 5.3-4 identifies the per approvals, and consultations generally required to site, construct, or operate trit supply and recycling facilities in accordance with state statutes and regulations.

Table 5.3-1.-Federal Environmental Statutes, Regulations, and Orders [Page 1 of 5]

Resource Category	Statute/Regulation/Order	Citation	Responsible Agency
Air Resources	Clean Air Act (CAA), as amended	42 USC 7401 etseq.	EPA
-	National Ambient Air Quality Standards/State Implementation Plans	42 USC 7409 etseq.	EPA

	- Standards of Performance for New Stationary Sources	42 USC 7411	EPA
	- National Emission Standards for Hazardous Air Pollutants	42 USC 7412	EPA
	- Prevention of Significant Deterioration	42 USC 7470 etseq.	EPA
	- Noise Control Act of 1972	42 USC 4901 etseq.	EPA
Water Resources	Clean Water Act (CWA)	33 USC 1251 etseq.	EPA
	- National Pollutant Discharge Elimination System (NPDES) (section 402 of CWA)	33 USC 1342	EPA
	- Dredged or Fill Material - (section 404 of CWA)/Rivers and Harbors Appropriations Act of 1899	33 USC 1344/ 33 USC 401 etseq.	U.S. Army Corps of Engineers
Water Resources (continued)	Wild and Scenic Rivers Act	16 USC 1271 etseq.	Fish and Wildlife Service (USFWS), Bureau of Land Management, Forest Service, National Park Service
	- Safe Drinking Water Act (SDWA)	42 USC 300f etseq.	EPA
	- Executive Order 11988: Floodplain Management	3 CFR, 1977 Comp., p.117	Water Resources Council, Federal Emergency Management Agency, Council on Environmental Quality (CEQ)
	- Executive Order 11990: Protection of Wetlands	3 CFR, 1977 Comp., p.121	U.S. Army Corps of Engineers/USFWS
	- Compliance with Floodplain/Wetlands Environmental Review Requirements	10 CFR 1022	DOE
Hazardous Wastes and	Resource Conservation and Recovery Act	42 USC 6901 etseq./PL 98-616	EPA

Soil Resources	(RCRA)/Hazardous and Solid Waste Amendments of 1984		
-	Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)/Superfund Amendments and Reauthorization Act of 1986 (SARA)	42 USC 9601 etseq./PL 99-499	EPA
-	Executive Order 12580: Superfund Implementation	3 CFR, 1987 Comp., p. 193	EPA
Hazardous Wastes and Soil Resources (continued)	Community Environmental Response Facilitation Act	PL 102-426	EPA
-	Farmland Protection Policy Act of 1981	7 USC 4201 etseq.	Soil Conservation Service
-	Federal Facility Compliance Act of 1992	42 USC 6961	States
Biotic Resources	Fish and Wildlife Coordination Act	16 USC 661 etseq.	USFWS
-	Bald and Golden Eagle Protection Act	16 USC 668 etseq.	USFWS
-	Migratory Bird Treaty Act	16 USC 703 etseq.	USFWS
-	Wilderness Act of 1964	16 USC 1131 etseq.	Department of Commerce and DOI
-	Wild Free-Roaming Horses and Burros Act of 1971	16 USC 1331 etseq.	DOI
-	Endangered Species Act of 1973	16 USC 1531 etseq.	USFWS/National Marine Fisheries Service
Cultural Resources	National Historic Preservation Act of 1966, as amended	16 USC 470 etseq.	President's Advisor Council on Historic Preservation
-	Archaeological and Historical Preservation Act of 1974	16 USC 469 etseq.	DOI
-	Archaeological Resources Protection Act of 1979	16 USC 470aa etseq.	DOI

-	Antiquities Act	16 USC 431-33	DOI
Cultural Resources (continued)	American Indian Religious Freedom Act of 1978	42 USC 1996	DOI
-	Native American Graves Protection and Repatriation Act of 1990	25 USC 3001	DOI
-	Executive Order 11593: Protection and Enhancement of the Cultural Environment	3 CFR 154, 1971-1975 Comp., p. 559	DOI
Worker Safety and Health	Occupational Safety and Health Act (OSHA)	5 USC 5108	OSHA
-	Hazard Communication Standard	29 CFR 1910.1200	OSHA
Other	Atomic Energy Act of 1954	42 USC 2011	DOE
-	National Environmental Policy Act (NEPA)	42 USC 4321 etseq.	CEQ
-	Uranium Mill Tailings Radiation Control Act of 1978	42 USC 7901 etseq.	EPA
-	Toxic Substances Control Act (TSCA)	15 USC 2601 etseq.	EPA
-	Hazardous Materials Transport Action Act	49 USC 1801 etseq.	DOT
-	Hazardous Materials Transportation Uniform Safety Act of 1990	49 USC 1801	DOT
-	Emergency Planning and Community Right-To-Know Act of 1986	42 USC 11001 etseq.	EPA
Other (continued)	Pollution Prevention Act of 1990	42 USC 11001-11050	EPA
-	Executive Order 12843: Procurement Requirements and Policies for Federal Agencies for Ozone-Depleting Substances	April 21, 1993	EPA
-	Executive Order 12856: Federal Compliance with Right-To-Know Laws and Pollution Prevention	August 3, 1993	EPA

	Requirements		
-	Executive Order 12873: Federal Acquisition, Recycling, and Waste Prevention	October 20, 1993	EPA
-	Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations	February 11, 1994	EPA
-	Executive Order 12088: Federal Compliance with Pollution Control Standards	3 CFR, 1978 Comp., p. 243	Office of Managemen and Budget
-	Executive Order 11514: Protection and Enhancement of Environmental Quality	3 CFR, 1966-1970 Comp., p. 902	CEQ
-	Nuclear Waste Policy Act of 1982	42 USC 10101 etseq.	EPA
-	Low-Level Radioactive Waste Policy Act	42 USC 2021b-2021d	NRC

Table 5.3-2.-Selected Department of Energy Environment, Safety, and Health Orders

DOE Order	Order Title
1540.2	Hazardous Material Packaging for Transport-Administrative Procedures
1540.3A	Base Technology for Radioactive Material Transportation Packaging Syst
3790.1B	Federal Employee Occupational Safety and Health Program
5000.3B	Occurrence Reporting and Processing of Operations Information
5400.1	General Environmental Protection Program
5400.2A	Environmental Compliance Issue Coordination
5400.4	Comprehensive Environmental Response, Compensation, and Liability Act
5400.5	Radiation Protection of the Public and the Environment
5440.1E	National Environmental Policy Act Compliance Program
5480.1B	Environment, Safety, and Health Program for Department of Energy Opera
5480.3	Safety Requirements for the Packaging and Transportation of Hazardous Substances, and Hazardous Waste
5480.4	Environmental Protection, Safety, and Health Protection Standards
5480.6	Safety of Department of Energy-Owned Nuclear Reactors

5480.7A	Fire Protection
5480.9A	Construction Project Safety and Health Management
5480.10	Contractor Industrial Hygiene Program
5480.11	Radiation Protection for Occupational Workers
5480.19	Conduct of Operations Requirements for DOE Facilities
5480.21	Unreviewed Safety Questions
5480.22	Technical Safety Requirements
5480.23	Nuclear Safety Analysis Reports
5480.24	Nuclear Criticality Safety
5481.1B	Safety Analysis and Review System
5482.1B	Environment, Safety, and Health Appraisal Program
5483.1A	Occupational Safety and Health Program for DOE Contractor Employees at Contractor-Operated Facilities
5484.1	Environmental Protection, Safety, and Health Protection Information Re
5500.1B	Emergency Management System
5500.3A	Planning and Preparedness for Operational Emergencies
5530.1A	Accident Response Group
5530.4	Aerial Measuring System
5630.11B	Safeguards and Security Program
5630.12A	Safeguards and Security Inspection and Assessment Program
5632.1C	Protection and Control of Safeguards and Security Interests
5700.6C	Quality Assurance
5820.2A	Radioactive Waste Management
6430.1A	General Design Criteria

Table 5.3-3.-Department of Energy Agreements with Federal and State Environmental Regulatory Agencies

Facility	Resource Category	Parties (Agency/State)	Scope of Agreement
Idaho National Engineering Laboratory	Air	DOE/ID	CAA-Consent Order (Permit to cons
-	Water	DOE/ID	RCRA-Consent Order on percolation
-	Soil	DOE/EPA/ID	CERCLA/RCRA-Federal Facility Agre
-	Soil	DOE/ID/EPA	RCRA-Consent Order

Nevada Test Site	Soil	DOE/NV	RCRA-Settlement Agreement-TRU mix
-	Cultural	DOE/NV	Programmatic Agreement-Archaeolog activities
Oak Ridge Reservation	Air	DOE/EPA	CAA-Federal Facility Compliance A NESHAP
-	Soil	DOE/EPA/TN	CERCLA-Federal Facility Agreement
-	Soil	DOE/EPA	RCRA-Federal Facility Compliance mixed waste subject to Land Dispo
Pantex Plant	Soil	DOE/EPA	RCRA-Section 3008 (h) Administrat
Savannah River Site	Air	DOE/EPA	CAA-Federal Facility Compliance A NESHAP
-	Water	DOE/SC	CWA-Consent Order 84-4-W, Thermal with amendment
-	Water	DOE/SC	CWA-Settlement Agreement 90-13-W, treatment facility
-	Water	DOE/SC	CWA-Settlement Agreement 90-25-W, discharges
-	Water	DOE/SC	CWA-Settlement Agreement 90-26-W,
-	Water	DOE/SC	CWA-Settlement Agreement 91-44-W,
-	Soil	DOE/SC	RCRA-Settlement Agreement 87-52-S Part B application deficiencies;
-	Soil	DOE/SC	RCRA/SC Hazardous Waste Managemen Civil Action
-	Soil	DOE/EPA	RCRA-Federal Facility Compliance Restrictions, with amendment 1, D
-	Soil	DOE/SC	RCRA-Settlement Agreement 91-51-S
-	Soil	DOE/EPA/SC	CERCLA/RCRA-Federal Facility Agre
-	Cultural	DOE/SHPO ACHP	Programmatic Memorandum of Agreem archaeological sites

Table 5.3-4.-State Environmental Statutes, Regulations, and Orders [Page 1 of 5]

Resource Category	Legislation	Citation	R
		Idaho National Engineering	
Air Resources	Idaho Environmental Protection and Health Act	ID Code, Title 39, Chapter 101	I a
-	Idaho Department of Health and Welfare Rules	ID Code, Title 39, Chapter 1	I a
Water Resources	Idaho Wastewater-Land Application Permit Regulations	ID Rules/Regs., Title 1,	I a

		Chapter 17	
-	Idaho Water Pollution Control Act	ID Code, Title 39, Chapter 36	I a
-	Idaho Water Quality Standards	ID Rules/Regs., Title 1, Chapter 2	I R A
-	Idaho Stream Channel Protection Act	ID Code, Title 42, Chapter 38	I R
-	Idaho Lake Protection Act	ID Code, Section 58-142 et seq.	I
Hazardous Wastes and Soil Resources	Idaho Hazardous Waste Management Act	ID Code, Title 39, Chapter 44	I a
-	Idaho Hazardous Waste Management Regulations	ID Rules/Regs., Title 1, Chapter 5	I a
Biotic Resources	No state-level legislation identified	-	
Cultural Resources	Idaho Historic Preservation Act	ID Code, Title 67, Chapter 46	I C
Worker Safety and Health	No state-level legislation identified	-	
		Nevada Test Site	
Air Resources	Nevada Air Pollution Control Law	NV Statutes, Title 40	N C
-	Nevada Air Quality Regulations	NV Admin. Code, Chapter 445	N C
Water Resources	Nevada Water Pollution Control Law	NV Statutes, Title 40, Chapter 445	N E
-	Nevada Water Pollution Control Regulations	NV Admin. Code, Chapter 445	N E
Hazardous Wastes and Soil Resources	Nevada Underground Storage Tank Rules	NV Admin. Code, Chapter 459	N E
-	Nevada Solid Waste Disposal Law	NV Statutes, Title 40, Chapter 444	N E
-	Nevada Solid Waste Disposal Regulations	NV Admin. Code, Chapter 44	N E
-	Nevada Hazardous Waste Disposal Law	NV Statutes, Title 40, Chapter 459	N E
-	Nevada Hazardous Waste Facility	NV Admin. Code,	N

	Regulations	Chapter 444	E
Biotic Resources	Nevada Non-Game Species Act	NV Admin. Code, Title 45, Chapter 503	N W
Cultural Resources	Historic Preservation and Archaeology Regulations	NV Statutes, Title 26, Chapter 381-383	N H A
Worker Safety and Health	No state-level legislation identified	-	
		Oak Ridge Reservatio	
Air Resources	Tennessee Air Pollution Control Regulations	TN Rules, Division of Air Pollution	T B
Water Resources	Tennessee Water Quality Control Act	TN Code, Title 69, Chapter 3	T B
Hazardous Wastes and Soil Resources	Tennessee Underground Storage Tank Program Regulations	TN Rules, Chapter 1200-1-15	T P
-	Tennessee Hazardous Waste Management Act	TN Code, Title 68, Chapter 46	T M
-	Tennessee Solid Waste Processing and Disposal Regulations	TN Rules, Chapter 1200-1-7	T M
Biotic Resources	Tennessee State Executive Order on Wetlands	TN State Executive Order	T Q
-	Tennessee Threatened Wildlife Species Conservation Act of 1974	TN Code, Title 70, Chapter 8	T A
-	Tennessee Rare Plant Protection and Conservation Act of 1985	TN Code, Title 70, Chapter 8-301 et seq.	T A
-	Tennessee Water Quality Control Act	TN Code, Title 69, Chapter 3	T Q
Cultural Resources	Tennessee Desecration of Venerated Objects	TN Code, Title 39, Chapter 17-311	T
-	Tennessee Abuse of Corpse	TN Code, Title 39, Chapter 17-312	T
-	Native American Indian Cemetery Removal and Reburial	TN Comp. Rules and Regulations, Chapter 400-9-1	T
-	Tennessee Protective Easements	TN Code, Title 11, Chapter 15-101	T
Worker Safety and	No state-level legislation identified	-	

Health			
			Pantex Plant,
Air Resources	Texas Air Pollution Control Regulations	TX Admin. Code, Title 30, Chapter 101-125, 305	T C C (
Water Resources	Texas Water Quality Standards	TX Admin. Code, Title 30, Chapter 305, 308-325	T C C (
-	Texas Consolidated Permit Rules	TX Admin. Code, Title 30	T C C (
-	Texas Water Quality Acts	TX Code, Title 30, Chapter 290	T C C (
Hazardous Wastes and Soil Resources	Texas Underground Storage Tanks Rules	TX Admin. Code, Title 30, Chapter 334	T C C (
-	Texas Solid Waste Management Regulations	TX Admin. Code, Title 30, Chapter 305, 335	T C C (
-	Texas Solid Waste Disposal Act	TX Statutes, Article 4477-7	T C C 9
Biotic Resources	Texas Parks and Wildlife Regulations	TX Parks and Wildlife Code, Chapters 67, 68, & 88	T D
Cultural Resources	Antiquities Code of Texas	TX Statutes, Volume 17, Article 6145	T C
Worker Safety and Health	No state-level legislation identified	-	
		Savannah River Site,	S
Air Resources	South Carolina Pollution Control Act/South Carolina Air Pollution Control Regulations and Standards	SC Code, Title 48, Chapter 1	S E
-	Augusta-Aiken Air Quality Control Region	40 CFR 81.114	S
-	South Carolina Atomic Energy &	SC Code, Title 13,	S

	Radiation Control Act	Chapter 7	
Water Resources	South Carolina Pollution Control Act	SC Code, Title 48, Chapter 1	S
-	South Carolina Water Quality Standards	SC Code, Title 61, Chapter 68	S
-	South Carolina Safe Drinking Water Act	SC Code, Title 44, Chapter 55	S
Hazardous Wastes and Soil Resources	South Carolina Underground Storage Tanks Act	SC Code, Title 44, Chapter 2	S
-	South Carolina Solid Waste Regulations	SC Code, Title 61, Chapter 60	S
-	South Carolina Industrial Solid Waste Disposal Site Regulations	SC Code, Title 61, Chapter 66	S A
-	South Carolina Hazardous Waste Management Act	SC Code, Title 44, Chapter 56	S
-	South Carolina Solid Waste ManagementAct	SC Code, Title 44, Chapter 96	S
Biotic Resources	South Carolina Nongame and Endangered Species Conservation Act	SC Code, Title 50, Chapter 15	S R
Cultural Resources	South Carolina Institute of Archaeology and Anthropology	SC Code, Title 60, Chapter 13-210	S P
Worker Safety and Health	No state-level legislation identified	-	

5.4 Federal and State Environmental Enforcement

Under various Federal environmental statutes (table 5.3-1), the EPA may delegate th implementation and execution of the laws' various provisions to states with approve programs that are at least as stringent as the minimum Federal requirements contain the laws and EPA regulations. Table 5.3-4 lists many of the states' laws and regula including provisions that are more stringent than the minimum requirements. In addi the Federal Facility Compliance Act of 1992 waives sovereign immunity from the enfo of Resource Conservation and Recovery Act (RCRA) at Federal facilities and thereby gives states the authority to assess fines and penalties under certain conditions. further requires DOE to develop plans and enter into agreements with states as to s management actions for particular mixed waste streams. Such agreements could have a effect on the wastes generated as a result of the implementation of the proposed ac yet such an effect cannot be determined until such time as these agreements are app according to the terms of the Federal Facility Compliance Act.

Some environmental regulatory programs are enforced through review, approval, and

permitting requirements that attempt to minimize the negative impacts from releases environment from potential pollution sources by limiting activities to established standards. Federal and state agencies share environmental regulatory authority over facility operations when Federal legislation delegates permitting or review authori qualifying states. Some examples are: the National Emission Standards for Hazardous Pollutants (NESHAP) and the Prevention of Significant Deterioration under the Clean Act (CAA); the Water Quality Standards and the National Pollutant Discharge Elimina System (NPDES) under the Clean Water Act (CWA); the Hazardous Waste Programs under and the Drinking Water and Underground Injection Control Programs under the Safe Dr Water Act (SDWA). When Federal legislation allows delegation of enforcement authori states must set standards equal to or more stringent than those required by Federal obtain such authority. Where the Federal regulatory agency has delegated its author the state or local regulations set the governing standards. However, when Federal l lation does not provide for delegation of enforcement authority to the states, e.g. Toxic Substances Control Act (TSCA), the standards are administered and enforced so the Federal government.

5.5 Compliance with Occupational Safety and Health Requirements

The health and safety of all workers associated with the tritium supply and recycli facilities is a primary consideration in the programmatic decision resulting from t PEIS. A comprehensive nuclear and occupational safety and health initiative was announced by the Secretary on May 5, 1993 entailing closer consultation with the Occupational Safety and Health Administration (OSHA) regarding regulation of worker and health at DOE contractor-operated facilities. Regulation of worker health and s at DOE contractor-operated facilities will gradually shift from DOE to OSHA. The Occupational Safety and Health Act of 1970, (Public Law 91-596) establishes Federal requirements for assuring occupational safety and health protection for employees. facilities also comply with the Emergency Planning and Community Right-To-Know Act, USC 11001) which requires facilities to report the release of extremely hazardous substances and other specified chemicals; provide material safety data sheets or li thereof; and provide estimates of the amounts of hazardous chemicals on-site. The reporting and emergency preparedness requirements are designed to protect both indi and communities.

Workplace Safety and Accidents. Operations at all DOE sites expose workers to occup hazards during the normal conduct of their work activities. Occupational safety and training is provided for all employees at DOE facilities and includes specialized j safety and health training appropriate to the work performed. Such training also in informing employees of their rights and responsibilities under the Occupational Saf and Health Act of 1970, Executive Order 12196, which established OSHA Federal Agenc Standards, 29 CFR 1960- The OSHA Federal Agency Standards-which describes the safet health programs that Federal agencies must establish and implement under Executive 12196, and DOE Order 3790.1B (Federal Employee Occupational Safety and Health Progr DOE provides implementation guidance in DOE Order 3790.1B, including the requiremen guidelines for the DOE Federal Employee Industrial Hygiene Program. DOE policy is t

Provide places and conditions of employment that are as free as possible from recognized hazards that cause or are likely to cause illness or physical harm.

Assure that employees and employee representatives shall have the opportunity to participate in the Federal Employee Occupational Safety and Health Program.

Establish programs in safety and health training for all levels of Federal employee

Consider the 29 CFR 1960 (OSHA Standards For Federal Agencies) requirements to be t minimum standards for DOE employees.

DOE contractor operations at each site expose workers to hazardous constituents. DO orders require that site operations have programs for protection of workers. DOE Or 5480.11, Radiation Protection for Occupational Workers, and 5483.1A, Occupational S and Health Program for DOE Contractor Employees at Government-Owned Contractor-Oper

Facilities, establish procedures for protection of workers against radiological and hazardous materials, respectively. DOE Order 5000.3B, Occurrence Reporting and Processing of Operations Information, provides for reporting and guides appropriate corrective action(s) and follow-up should an exposure occur.

DOE Order 5440.1E, National Environmental Policy Act Compliance Program; DOE Order 5480.1B, Environment Safety and Health Program for Department of Energy Operations; Order 5480.23, Nuclear Safety Analysis Reports; DOE Order 5481.1B, Safety Analysis Review System; and DOE Order 6430.1A, General Design Criteria, provide the basis fo review of all planned and existing construction and operation for the potential for accidents and the assessment of the associated human health and environmental consequences, should an accident occur. The results of these reviews are used as th for determining the need for controls or other mitigative actions to eliminate or g reduce the potential for, and consequences of, an accident. These reviews are requi before authorization of construction or start of operation. These reviews also invo identification of hazards and an analysis of normal, abnormal, and accident conditi This analysis includes consideration of natural and man-made external events includ fires, floods, tornadoes, earthquakes, other severe weather events, human errors, a explosions. The sites associated with the tritium supply and recycling proposal hav complied with applicable DOE orders.

In accordance with DOE Order 5500.1B, Emergency Management System, emergency respon planning and training are provided to mitigate the consequences of potential accide Additionally, should an accident occur, the incident would be reported in accordanc DOE Orders 5000.3B, Occurrence Reporting and Processing of Operations Information, 5400.4, Comprehensive Environmental Response, Compensation, and Liability Act Requi ments. The reports would also include appropriate corrective action(s) and followup

Consequences of the Tritium Supply and Recycling Proposal on Candidate Site Workpla Safety and Accidents. Construction and operation of tritium supply and recycling facilities at potential candidate sites would result in increased exposure of site to industrial-type work hazards and accidents. In addition, levels of risk to worke new construction increases in relation to the amount of new construction required f tritium supply and recycling facilities. Based on the length of construction period the candidate tritium supply technologies, the Modular High Temperature Gas-Cooled Reactor (MHTGR) (9 years) and the Heavy Water Reactor (HWR) (8 years) would have th largest risk and the Accelerator Production of Tritium (APT) (5 years) the least construction accident risk. Based on technology designs, the MHTGR and APT would be expected to have increased worker safety and accident risks during construction bec the deep below ground excavation required for reactor vessel and accelerator tunnel construction. Table 5.5-1 shows the relative risk of fatalities due to construction technology. Before implementation of the tritium supply and recycling proposal at a site, however, notification would be made to the site's environmental, safety, and staff that a new process or facility is being planned, or that an existing process being considered for change or modification to allow the impact of the anticipated on the work environment to be evaluated.

Appropriate measures would be implemented to minimize work hazards and accidents ba this early evaluation. Once operational, as part of the Occupational Safety and Hea Program at each site, ongoing surveillance of the new or modified processes or acti would be performed to identify potential health hazards. If potential health hazard identified, a hazard evaluation would be conducted to determine the extent of the h and if required, the recommended control measures. Where feasible, engineering cont would be used to protect worker health and safety. Administrative controls and pers protective equipment would supplement engineering controls as appropriate.

Table 5.5-1.-Estimated Number of Construction Worker Fatalities by Technology

-	HWR	MHTGR	ALWR/Large	ALWR/Small	APT	Tritiu
Potential accidental worker deaths	2.1	1.9	2.8	1.6	.8	.2

CHAPTER 6: REFERENCES

REGULATION, ORDER, LAW

10 CFR 20 Nuclear Regulatory Commission (NRC), "Energy: Standards for Protection Ag Radiation," Code of Federal Regulations, Office of the Federal Register, National A and Records Administration, U.S. Government Printing Office, Washington, DC, Januar 1992.

10 CFR 71 NRC, "Energy: Packaging and Transportation of Radioactive Material," Code Federal Regulations, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, January 1, 1992.

10 CFR 1022 Department of Energy (DOE), "Energy: Compliance with Floodplains/Wetlan Environmental Review Requirements," Code of Federal Regulations, Office of the Fede Register, National Archives and Records Administration, U.S. Government Printing Of Washington, DC, January 1, 1992.

40 CFR 50 Environmental Protection Agency (EPA), "Protection of the Environment: Na Primary and Secondary Ambient Air Quality Standards," Code of Federal Regulations, of the Federal Register, National Archives and Records Administration, U.S. Governm Printing Office, Washington, DC, Revised July 1, 1992.

40 CFR 52.21 EPA, "Protection of the Environment: Approval and Promulgation of Implementation Plans-Prevention of Significant Deterioration of Air Quality," Code Federal Regulations, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, Revised July 1, 19

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B.S., Chemistry, 1963, Duquesne University, Pittsburgh, PA
Years of Experience: 29

Rench, Jerry D., Chemical Health Risk Assessment Task Leader, SRA Technologies, In
Ph.D., Environmental Health, 1979, Colorado State University, Fort Collins, CO
M.S., Environmental Health, 1976, Colorado State University, Fort Collins, CO
A.B., Zoology, 1972, Indiana University, Bloomington, IN
Years of Experience: 18

Rikhoff, Jeffrey J., Technical Coordinator for Air Quality and Acoustics, Biotic R
Normal Operations and Accidents, Halliburton NUS Corp.
M.R.P., Regional Planning, 1988, University of Pennsylvania, Philadelphia, PA
M.S., Development Economics, 1987, University of Pennsylvania, Philadelphia, PA
B.A., English, 1980, Depauw University, Greencastle, IN
Years of Experience: 11

Roed, Carl J., Project Definition Site Task Leader, Lamb Associates, Inc.
M.B.A., Management, 1986, Salve Regina College, Newport, RI
B.A., Public Administration, 1969, San Diego State College, San Diego, CA
Years of Experience: 26

Rose, James J., PEIS Document Manager, DP-25, DOE

J.D., 1994, Columbus School of Law, Catholic University, Washington, DC
B.S., Ocean Engineering, 1983, U.S. Naval Academy, Annapolis, MD
Years of Experience: 12

Schinner, James R., Biotic Resources Discipline Leader, Halliburton NUS Corp.
Ph.D., Wildlife Management, 1974, Michigan State University, East Lansing, MI
B.S., Zoology, 1967, University of Cincinnati, Cincinnati, OH
Years of Experience: 22

Schlegel, Robert L., Radiological Health Risk Assessment Task Leader, Halliburton
M.S., Nuclear Engineering, 1961, Columbia University, New York, NY
B.S., Chemical Engineering, 1959, Massachusetts Institute of Technology, Cambridge
Years of Experience: 30

Schweitzer, Eric A., Deputy Director, Office of Reconfiguration, DP-25, DOE
M.U.R.P., Urban and Regional Planning, 1971, University of Pittsburgh, Pittsburgh,
B.A., Geography, 1969, Indiana University, Bloomington, IN
Years of Experience: 24

Silhanek, Jay S., Waste Management Task Leader, Lamb Associates, Inc.
M.P.H., Health Physics, 1961, University of Michigan, Ann Arbor, MI
M.S., Sanitary Engineering, 1957, University of Wisconsin, Madison, WI
B.S., Civil Engineering, 1956, Case Western Reserve, Cleveland, OH
Years of Experience: 37

Smith, Mark E., Deputy Project Task Manager, Tetra Tech, Inc.
B.S., Civil Engineering, 1987, Carnegie Mellon University, Pittsburgh, PA
Years of Experience: 8

Sohinki, Stephen M., Director, Office of Reconfiguration, DP-25, DOE
J.D., 1974, Georgetown University Law Center, Washington, DC
B.A., Political Science, 1971, University of Pittsburgh, Pittsburgh, PA
Years of Experience: 17

Steibel, John, Waste Management Technical Lead, SRA Technologies, Inc.
B.S., Industrial Engineering, Management Systems, 1958, General Motors Institute,
Years of Experience: 36

Sullivan, Barry D., Facility Accidents, Halliburton NUS Corp.
M.B.A., Management, 1964, Hofstra University, Hempstead, NY
B.S., Electrical Engineering, 1960, Rutgers University, New Brunswick, NJ
Years of Experience: 34

Swedock, Robert D., Project Definition Team Leader, Lamb Associates, Inc.
M.S., Civil Engineering, 1975, Stanford University, Stanford, CA
B.S., Military Science, 1968, U.S. Military Academy, West Point, NY
Years of Experience: 26

Toblin, Alan L., Health Physics Member, Halliburton NUS Corp.
M.S., Chemical Engineering, 1970, University of Maryland, College Park, MD
B.E., Engineering, 1968, The Cooper Union, New York, NY
Years of Experience: 24

Tray, Michaela, Reference Coordinator, Tetra Tech, Inc.
Currently enrolled, University of Virginia, Falls Church, VA
Years of Experience: 25

Varner, Steven M., Local Transportation Task Leader, Halliburton NUS Corp.
M. Arch., Architecture, 1991, Virginia Polytechnic Institute and State University,
Blacksburg, VA
B.S., Civil Engineering, 1987, Virginia Polytechnic Institute and State University
Blacksburg, VA
Years of Experience: 2

West, Terri S., Groundwater Task Leader, Tetra Tech, Inc.
B.S., Geology, 1985, Texas A&M University, College Station, TX
Years of Experience: 9

Westbrook, Chris R., Project Definition Site Task Leader, Lamb Associates, Inc.
M.S., Nuclear Engineering, 1980, Air Force Institute of Technology, Dayton, OH
M.A., Business Administration, 1976, Webster University, St. Louis, MO
B.S., Nuclear Engineering, 1973, University of Tennessee, Knoxville, TN
Years of Experience: 24

PAGE TOC FIGURES TABLES PAGE

CHAPTER 8: LIST OF AGENCIES, ORGANIZATIONS, AND PERSONSTO WHOM COPIES OF THIS STATE WERE SENT

This chapter lists agencies, organizations, and persons who requested Volumes I and and the Executive Summary of the Draft Programmatic Environmental Impact Statement for Tritium Supply and Recycling. Not listed are the many agencies, organizations, persons who requested the Executive Summary or Volume II appendices.

Federal-Elected Officials Representing Affected Areas

States: Georgia

Idaho

Nevada

South Carolina

Tennessee

Texas

Governors Representing Affected Areas

States: Georgia

Idaho

Nevada

South Carolina

Tennessee

Texas

State Elected Officials Representing

States: Georgia

Idaho

Nevada

South Carolina

Tennessee

Texas

NEPA State Single Points of Contact

States: Georgia
Idaho
Nevada
South Carolina
Tennessee
Texas

Federal-Recognized Indian Tribes

Battle Mountain Band Council, NV

Bureau of Indain Affairs

Carson Community Council, NV

Cawtawba Indian Nation, SC

Coeur d'Alene Tribal Council, ID

Council of the Te-Moak, NV

Dresslerville Community Council, NV

Duckwater Shoshone Indian Tribe, NV

Elko Band Council, NV

Ely Colony Tribal Council, NV

Fallon Business Council, NV

Fort Hall Business Council Sho Ban Tribes, ID

Fort McDermitt Paiute-Shoshone Tribes, NV

Kootenai Tribal Council, ID

Las Vegas Indian Colony, NV

Moapa Paiute Indian Tribe, NV

National Congress of American Indians, DC

Nez Perce Tribal Executive Committee, ID

Northwestern Band of Shoshoni Nation

Pahrump Paiute Indian Tribe, NV

Pascua Yagui Tribal Council, NV

Reno/Sparks Tribal Council, NV

Shoshone Bannock Tribe, NV

Shoshone Paiute Business Council, NV

South Fork Band Council, NV

Stewart Community Council, NV

Summit Lake Paiute Council, NV

Walker River Paiute Tribal Council, NV

Wells Indian Colony Band Council, NV

Western Shoshone Elders Council, NV

Western Shoshone National Council, NV

Winnemucca Indian Colony, NV

Yerington Paiute Tribal Council, NV

Yomba Shoshone Indian Tribe, NV

Mayors Representing Affected Areas

Georgia	Idaho (Continued)	Nevada (Continued)	South Carolina (Continued)	Tennessee (Continued)	Ten (Co
City	City	City	Salley	Fairfield Glade	New
Atlanta	Dubious	Warm Spring	Saluda	Fairview	Nio
Augusta	Firth	South Carolina	Springfield	Friendsville	Nor
Bath	Fort Hall	City	Sycamore	Gatlinburg	Oak
Blyth	Hailey	Allendale	Trenton	Grandview	Oak
Evans	Idaho Falls	Augusta	Vanville	Greenback	Old
Girard	Iona	Bamberg	Wagener	Harriman	Oli
Harlem	Ketchum	Barnwell	Windsor	Halls Crossroads	One
Hephzibah	Lewisville	Batesburg	Williston	Huntsville	Pet
Keysville	Menan	Blackville	Tennessee	Jacksonboro	Phi
Martinez	Mud Lake	Beech Island	City	Jamestown	Pig
Millen	Pocatello	Columbia	Andersonville	Jefferson City	Pom
Sardis	Richfield	Denmark	Alcoa	Jellico	Pow
Savannah	Rigby	Edgefield	Allardt	Karns	Roc
Statesboro	Rupert	Estill	Athens	Kingston	Roc
Thomson	Shelley	Gaston	Bethel	Knoxville	Rut
Waynesboro	SunValley	Gloverville	Blaine	Kodak	Sev
Wrens	Ucon	Graniteville	Briceville	La Follette	Sha
Idaho	Nevada	Hampton	Caryville	Lake City	Sol

City	City	Jackson	Clarkrange	Lancing	Spe
Aberdeen	Alamo	Johston	Clinton	Lenoir City	Spr
American Falls	Amargosa Valley	Leesville	Coalfield	Loudon	Str Pla
Ammon	Ash Springs	Monmorenci	Corrytown	Louisville	Sun
Arco	Beatty	New Ellenton	Crossville	Luttrell	Swe
Atomic	Blue Diamond	North	Dandridge	Madisonville	Tal
Basalt	Henderson	Norway	Decatur	Maryville	Tel
Bellevue	Hiko	Orangeburg	Deer Lodge	Mascot	Ten
Blackfoot	Indian Springs	Owdoms	Elgin	Maynardville	Tow
Butte	Las Vegas	Pelion	Etowah	Midtown	Was
Carey	Pahrump	Perry	Town of Farragut	New Market	Von

FEDERAL AGENCIES

Commission on Economic Development, NV

Council on Environmental Quality

Defense Contract Administration

Defense Nuclear Facilities Safety Board

Department of Archives & History, SC

Department of Conservation and Natural Resources, NV

Department of Conservation, TN

Department of Natural Resources

Defense Nuclear Facilities Safety Board

Defense Contract Administration

Environmental Protection Agency

Environmental Protection Agency, Region IV

Environmental Protection Agency, Region VI

Environmental Protection Agency, Region IX

Environmental Protection Agency, Region X

Federal Energy Regulatory Commission

Food and Drug Administration

General Accounting Office

General Services Administration

Georgia State Clearinghouse

Housing and Urban Development

Interstate Commerce Commission

Legislative and Intergoverment Affairs

Management Support Systems

Marine Mammal Commission

National Academy of Sciences

National Marine Fisheries Service

National Oceanic and Atmospheric Administration

National Parks and Conservation

National Science Foundation

Office of Environmental Policy

Office of Management and Budget

Office of Regulatory Analysis

Office of Solid Waste and Emergency Response

Office of Technology Assessment

Small Business Administration

State and Local Federal Emergency Management Agency

U.S. Arms Control and Disarmament Agency

U.S. Army Corps of Engineers, GA

U.S. Army Corps of Engineers, ID

U.S. Army Corps of Engineers, NV

U.S. Army Corps of Engineers, SC

U.S. Army Corps of Engineers, TN

U.S. Army Corps of Engineers, TX

U.S. Bureau of Land Management

U.S. Department of Justice

U.S. Department of Labor

U.S. Department of the Interior, Region III

U.S. Department of the Interior, Region V

U.S. Department of the Interior, Region VII

U.S. Department of the Interior, Region VIII

U.S. Department of Housing and Urban Development Region II, V, VIII, and XI

U.S. Dept. of Transportation Environmental Division

U.S. General Accounting Office

U.S. Geological Survey

U.S. National Park Service

U.S. Nuclear Regulatory Commission

State Historical Preservation Officers

Idaho State Historic Society, ID

Department of Conservation and Natural Resources, NV

Department of Archives & History, SC

Department of Conservation, TN

Texas Historical Commission, TX

Organizations and Individuals Requesting Copies to Date

Alaska
Moore, Sonya
_
Alabama
Pagan, Kathleen Walson
_
Arkansas
Martin, Gerald
-
Arizona
Haenichen, Jack
-
California
Adduci, Anthony
Alberstein, David
Anderson, Carl N.
Brechin, Vernon
Callbeck, Helen
Corrado, Paul G.
Crisa, Richard
Dahdouh, Sam
Deihl, Patrick
Fischer, Bernice
Forssell, R.M.
Gibson, Jane
Hendley, Peter

California (Continued)
McKay, Tim
Meyer, Loretta
Milam, JoAnn
Niblock, Glenn
Nystrom, Gustav
Owen, John
Perry, James
Port, Patricia S.
Roth, Julie
Schaeffer, Donald W.
Shepodd, Tim
Subbaraman, G.
Summers, Allen
Thomas, Randy
Viereck, Jennifer
Winterfeldt, Detloff Von
Wade, Claudia Ann
Weiss, Peter
Wilder, Richard
Wilderman, Joan
Williams, Arthur C.
Williams, ChristopherD.
Woodard, Victoria
Woodard, Victoria A.

Colorado (Continued)
Hatch, Les
Haynes, Betty
Hulse, Scott
Hobbs, Farrel
Juricek, Kay
Kangas, Mark
Knutson, Paul
Koleski, L.A., Jr.
Kunter, Richard
Mattson, Roger
Mehta, Pushpa
Miller, Dan
Navarro, D.M.
Palmer, David
Paukert, Jill G.
Quillin, Robert
Quinn, Larry
Rademacher, Keith R.
Rauch, Thomas M.
Ross, Fred
Ross, Ron
Schwartz, Jeffery
Sprenkle, Dave
Stone, James
Summers, Harold

District of
Abney, Geor
Airozo, Dav
Aurillio, A
Bean, Miche
Bernero, Ro
Blackwelder
Boyd, Susan
Burnfield,
Caputo, Dre
Civiak, Bob
Clements, T
Collina, To
Conway, Joh
Darcy, Cind
Dolley, Ste
Dunn, Loret
Duorak, Ant
Eggenberger
Einarsen, F
Eldridge, M
Fairweather
Fosburgh, W
Fowler, Sam
Fuller, Kat
Glass, Burt

Horn, Alan
Jahnkow, Carol
Jones, Charles
Jordan, Maria
Kaiser, Bob
Kelley, Marylia
Kravitz, Jay
Kring, Bernice
Kuletz, Valerie L.
LaBar, Malcolm
Langer, Sidney
Larkin, Donald K.
Liapis, Steven G.
Lichterman, Andrew M.
Majerowicz, Eugene I.
McCleary, Patty
Wright, Judith G.
Yonge, Sandra

-

Colorado
Amaria, Navroze D.
Bruch, Judy
Claussen, Ronald
Coqhill, Catherine E.
Daub, Jerry
Deem, Penelope Pegis
Dixion, Sam
Fox, Dick
Goldfield, Joe
Tarleton, Steve
Thompson, Gary
Weiland, David
Ziegler, Ted

-

Connecticut
Davis, George
Helm, John L.
Klein, Ralph L.
Kobasa, Stephen V.
Lowe, Judy
Reisen-weaver, Dennis
Solnit, Martha
Sheard, Wendy
Gowda, Mama
Hair, Jay D
Harris, Pat
Hawkins, Ch
Hurt, Davis
Johnston, T
Kilma, Don
Kimball, Da
Kojm
Lanouette,
Magavern, B
Merritt, Mi
Meyer, Alde
Modeen, Dav
Moorehead,

Idaho (Continued)
Chipman, Nathan
Coleman, Jay
Coles, Brent
Cooke, Kerry
Cotant, Don
Cramer, Luise
Crow, Dolores J.
Crow, Gordon F.
Danielson, Judith
Darrington, Denton
Dickerson, LM
Dobbe, Charles
Downs, Jerry L.
Elle, Jean
Eulmahan, Kenneth D.
Frauenholz, Lowell H.
Geddes, Robert L.
Gibson, Liceltel
Glaccum, Ellen R.
Glore, Denise M.
Graf, Richard
Guenzler, Robert
Haddon, Cindy
Hagen, Gary
Hampton, Teresa A.
Hartung, Mary
Hawkins, Stan
Hill, Calre E.
Holman, Richard
Hornbeck, Twila
Ingram, Cecil D.
Irving, John S.
Ispen, Grant R.
Jergins, Colvin E.
Jobe, Lowell A.
Jones, Charles
Jones, Errol
Jones, Susan
Kerrick, David E.
Kirby, Michelle
Idaho (Continued)
Knudson, Robert
Larson, TK
MacDonald, Philip E.
Maheras, Steven J.
Mann, Cindy
Mason, Evelyn C.
McLaughlin,
Marguerite
McRoberts, Joyce B.
Merritt, Alan
Meyer, Wayne
Mikesell, Debbie
Noh, Laird
Nokkentved, Niels
Paroni, Genevieve M.
Paul, Liz
Peavey, John
Peralta, Robert A.
Perez, Terry
Potts, Theresa H.
Poulsen, Bill
Proksa, Margo
Reents, Sue
Reyes, Gustavo
Richardson, Melvin M.
Richardson, Peter J.
Rigg, Jim
Rinehart, Kenneth E.
Risch, Jim
Rohde, Kenneth
Rowland, Jennifer
Sahr, James B.
Schaffer, Robert
Schroder, Gary J.
Seever, Victoria A.
Serr, Steve
Snider, Lynn
Stanley, Clifford J.
Stanley, Norm
Stopol, Richard
Idaho (Continued)
Stormo, Keith
Tanner, John, Jr.
Tremblay, Rick
Tucker, Tim
Von Alten, Tom
Walker, Doug W.
Wesselman, Wayne
Wetherell, Claire R.
White, Charles E., Jr.
Wilcox, Debra
Worley, Tal

-

Illinois
Belsey, Richard
Biwer, Bruce
Devolpi, A.
Dvorak, Anthony
Jadro, William ,Jr.
Kerrick, Sharon
McCord, Catherine
Zeyher, Allen

-

Iowa
Prater Merle P.
Kansas
Osborne, Mike

-

Kentucky
Blankenship, Greg
Crosby, Lucille
Loghry, Rick
Nathan, Richard

-

Louisiana
Andrews, John

-

Maine
Hughes, Henry
Johnson, Chadwick
Lidsky, L.M.
Thompson, Gordon R.

-

Maryland
Barrett, Lynn
Maryland (C
Elisburg, D
Franklin, T
Gannon, L.B
Goodwin, Da
Jupiter, Cl
Martinson,
Michelson,
Morgan-Hubb
Margaret
Perge, Alex
Savage, Car
Schoene, Ka
Strarosteck
Tape, Geral
Sweeney, Ro
Tucker, Kat
Weiler, Jef
Zeitoun, Ab

-

Massachuset
Gladstone,
Hiller, Mer

-

Mississippi
Fuente, Edd
Maher, Jame
Rayborn, T.

-

North Carol
Boniske, Ka
Brown, Dayn
Capps, Jack
Chang, Jame
Clark, Terr
Cockrell, R
Entmacher,
Everett, Mi
Fellers, Ri
Gunn, Chris
Hedrick, Ga
Hunt, Jim,
Karpen, Lea
Lee, Willia

Best, Duya
Borsum PE, Robert B

Nevada (Continued)
Graham, Boyd
Griffith, Thomas
Hafer, Mark
Hamilton, David
Harkess, Nancy
Harry, Norman
Haslo, John
Hecht, Charles
Hoferer, Raymond
Lawless, Kevin L.
Lefferts, Myrna
Malotte, Dale
Manning, Lindsey
McGowan, Thomas
McNeil, Nancy
Meder, John
Melendez, Arian
Mike, Roselyn
Neilson, Rick
Nieto-Markussen, Bernadette
Overpeck, Clarence
Owens, Mark T.
Sam, Robert
Saunders, Cliff
Schupp, Liz
Serdoz, Dick
Sherman, Shell S.
Stahl, Stacy L.
Steele, Jacqueline
Summerfield, Harry
Toomey, Fred
Vasconi, William
Walker, John B.
Wallace, A.
Woods, Andrea R.
Wright, Edward

New York
Beyea, Jan
Foster, Gerald
Gallagher, Denise
Gould, Kenneth
Gupta, Ashok
Krupp, Frederick
Linendoll, Healther
Lonner, Jolie
Roberts, Carlyle J.
Valente, John U.
VanTuyle, Gregory J.
Ware, Alyn
Wolfe, Terry
Yuan, Lynn C.
-
Ohio
Hertweck, Floyd R.
Hutchinson, Jerry
Kirk, Eric T.
Knauff, John D.
Lamberger, Paul
Rueb, William G.
Wolff, Louis
-
Oklahoma
Jacobson, Brian
-
Oregon
Bean, Jim
Besey, Richard
Bogdanski, John A.
Caldwell, Larry
Ferguson, Kenneth S.
Gordon, Susan
Grainey, Michael
Kasler, Greg
Martisus, E.D.
McCormic, Marvis
Polityka, Charles S.
Ringle, John C
Strahl, Rena

Pennsylvannia
Jarabak, Andy
Kraft, Kenneth
Tonnessen, Amy
Travis, Mike
-
Porta Rico
Molina, Vilma E.
-
South Carolina
Boothe, Edmund
Bridges, Donald N.
Brooks, Joseph R.
Bunch, Andy
Burd, RM.
Burgess, Omegia
Chostner, David F.
Clapp, Richard E.
Collins, Willis F., Jr.
Davis, Bob D.
Duggleby, Robert
Edmunds, Jerry
Fiorillobsri, Jim
Folsom, Robert W.
Futrell, Walter L., Jr.
Gilbert, Wilene
Gilbert, Claude L., Jr.
Goergen, Charles
Gouge, Eliza
beth P.
Green, Donald J.
Griffin, Hap
Harmon, Michele
Hass, Todd
Henderson, Glenda
Holcomb, C.C.
Holley, Charles S.
Humes, Fred E.
Hursey, JohnE.
Jernigan, Gail
Kearse, James H.
Kelly, Mary T.

South Carol
Kepler, Don
Kneece, Mon
Lane, Jenni
Lee, James
Martin, Cha
Matthews, R
Mazzola, Ca
McDonald, E
Merz, Geral
Wolf II, Na
Minot, Geor
Moore, Phil
Moss, Dean
Murray, Guy
Overman, Ro
Patton, Mar
Payette, Pe
Pendarvis, Edward O.,
Permer, Phi
Pittman, Da
Reilly, Vic
Reinig, Wil
Rogers, Den
Sacco, Paul
Salisbury,
Satcher, Wi
Shealy, Har
Thompson, E
Shipman, Jo
Simpson, Wi
Skinner, Do
Smith, Wesl
Smith, Robe
Stewart, Jo
Stine, Step
Wall, JW, J
Watson, Aus
Williams, R
Wood, Danie

Tennessee (Continued)
Marine, Mayford W.
Martin, J.W.
McCurdy, Wade
McMillian, Glen
Miles, Clifford E.
Miller, David R.
Mitchell, R.W.
Mobley, Micheal H.
Moore, Mary
Moore, Michael
Morris, James
Moses, David L.
Myhre, Trygve C.
Newcomb, Ralph
Nisley, Steve S.
Oliver, Ann M.
Paddock, Brian

Tennessee (Continued)
Stevens, John
Thomas, Mary
Thomas, Steven
Thomas, WT
Trabalka, John
Truex, William A.
Turnpin, John N.
VanHall, Alan K.
Veach, Kenneth R.
Walker, D.
West, CM
Wilholm, Dale V.
Yager, Ken
Young, Jack P.
-
Texas
Abernathy, (???) L.

Texas (Continued)
Bremer, Carol
Brown, Kenneth L.
Buell, Sharon M.
Burdett, Brad
Burrow, Chad
Bull, Cristi
Campbell, Kerry
Campbell, Richard B.
Campbell, Sam
Carathers, Richard
Carpenter, Charles G.
Carr, John
Ceasar, Glendon H.
Charless, Addis, Jr.
Charter, Helen
Chisum, Warren
Christensen, Cheri

Texas (Cont
Dixon, R.H.
Dockins, Gw
Dull, Allen
Dull, Kandi
Duncan, Kat
Dunn, James
Dutton, Wil
Fairchild,
Fiel, Karl
Fisherk, Ma
Floyd, Shir
Forbes, Don
Foss, Kelly
Fowler, Shi
Fruscella,
Fulton, Dan
Fulton, Joh

Palad, Gerald L.
Pardue, William M.
Pate, James, Jr.
Petelka, Frank M.
Phelps, James E.
Pruett, Roy
Rader, John
Rice, Harvey
Roberts, Stan
Robinson, Paul S.
Roettger, Fred
Rogers, Paul E.
Smith, Ellan
Russell, Carolyn
Salts, Ruth
Short, Jim
Short, Warren L.
Smarsh, John
Snow, Larry D.
Smith, Ben
Stanley, Phil

Adams, Tom
Allen , Bill
Alley, Clyde D.
Alley, Peggy
Andern, John P.
Arnold, Charles
Arredondo, George
Ashley, Floyd
Austin, Wes
Bagwell, Henry
Bain, James
Baldwin, Dudley
Barfield, Elle
Belisle, Mavis
Bell, Kenja
Brian, Bidwell
Bilderback, Toby
Bingham, Millie
Birkbeck, Thomas E.
Borchardt, Paul
Bovey, John A.
Bowman, Alan Y., PhD
Braden, Daniel J.
Breeding, Les

Clayton, Dolye
Clayton, Todd
Clinton, Beryl
Coldiron, Davad E.
Collins, Lewis R.
Conkling, James
Cooper, Jay
Courtney, Jerry D.
Cox, Edward
Crammer, James L.
Cranfill, Lowell
Crawford, Richard E.
Crenshaw, William J.
Criste, Tamara
Crocker, Steven
Crow, Mary E.
Crowley, Johnny
Cude, Bruce
David, CF
Davis, A.E.
Hoyos Detten, Tonya
Denison, Neal R.
Denning, Galen

Gattis, Bev
Gaut, Rufus
Gibson, Jil
Glazener, G
Goebel, Jer
Gramstorff,
Graves, Dor
Grantham, H
Green, Char
Guleke II,
Haggard, Ra
Halliday, T
Hardin, Way
Harris, Mar
Harris, Ter
Hawkins, Ja
Hays, John
Hemphil, Sh
Hill, Ronni
Hinar, Debb
Hodges, Car
Hood, Joan
Hood, Wanda

Texas (cont'd)
Stewart, Rachelle
Stone, Elsie
Supina, Lawrence R.
Taylor, S.
Tezak, Lloyd J.
Thomason, Seth
Thompson, J O
Tollett, Art
Triebel, Dean
Tyler, David
Utsinger, Kelly
Urban, Lloyd
Walker, James E.
Walter, George
Ward, John Q.
Ware, Arthur
Watson, Alton H.
Wendel, Duane
Wermund, Edmund G.
Wheeler, Sidney
Whicker, Lawrence V.
White, Jere
Wilcox, James T.
Wilhite, Jim C.
Williams, Donna
Williams, Terry D.
Wingrone, Jane L.
Wise, Micheal
Wood, Ted
Woodman, Jim

-

Utah
Feucht, Donald
Jarvis, Boyer
Sutherland, Arthur A.
Wong, Cherry

-

Virginia

Virginia (cont'd)
Hardwick, Nancy E.
Holland, Mary
Jones, David C.
Jones, Jennifer
Kemp, Bruce
Mausshardt, Donald B.
Megargle, Lisa
Rose, James B.
Rowe, Teddy
Sullivan, Daniel
Thomas, Ross T.
Thurston, Donna
Tray, Brian
Vinton, Raymond L.

-

Washington
Acord, James L.
Anderson, Bill
Asplund, Ronald
Bean, William
Blair, Walter D.
Bragg, Mary
Breckel, Jeffery P.
Conrad, Delores
Cook, F R
Crowell, Allison K.
Davis, Steven C.
Doran, Daniel
Duncan, Daniel L.
Ellis, Diana Z.
Enelmann, R.H.
Ennew, John
Gadbois, Larry
Glenn, Gerald T.
Gouge, Ron
Guay, Steve
Harty, William M.
Haymaker, Alton

Washington (cont'd)
Kamerrer, John
Kilbuny, Charles D.
Klute, Terry
Knawa, Robert
Kripps, Lawrence J.
Loon, Jai
Marschman, Steve
Midgett, J C
Miller, Robert
Milner, Glen
Mitchell, Bill
Mooney, Bob
Morris, Allen R.
Morris, James H.
Nelson, Frederick W.
Parks, Mary
Powell, Waldridge
Rogers, Gordon J.
Ross, Wayne
Ruel, William
Sarther, Cynthia
Smith, David M.
Smith, Don
Smith, Keith
Stoffels, Jim
Sutley, Paul
Thacker, Adeline
Volpentest, Sam
Widdows, A D
Walen, Tommy
Widdows, A.D.

-

Wyoming
Fiske, Kent
Hamilton, Julie

-

Couver, Roberta
Deegan, Robert
Donnelly, Tom
Embrey, Nelson S.
Herbert, Patricia
Jones, Derek
Jordan, Evonne V.

PAGE TOC FIGURES TABLES PAGE