APPENDIX A

ORNL Stakeholder Responses

No stakeholder responses
received by date of publication.

APPENDIX B

Self-Sufficiency Parcels for the City of Oak Ridge

Self-Sufficiency Parcels for the City of Oak Ridge

In 1979, the Secretary of Energy approved a program to permit DOE to make financial assistance payments to the City of Oak Ridge for a five-year period under the authority of the Atomic Energy Community Act of 1955. The city submitted a self-sufficiency plan which proposed that DOE sell land to the city for industrial and commercial development. ORO determined that the land could be transferred directly at fair market value to the city in support of the self-sufficiency program rather than being reported as excess to the General Services Administration for screening and subsequent disposal. When the self-sufficiency program ended, certain remaining designated parcels that had been in review at the time were "grandfathered," thus permitting DOE to consider those transfers should the land become excess to the needs of DOE. These parcels are shown in Fig. B.1.

APPENDIX C

Oak Ridge Reservation Research Focus

Oak Ridge Reservation Research Focus

The location of the ORR in a suburban/industrial setting in the Southeastern United States makes it a particularly valuable site for addressing several important issues dealing with future ecosystem management. The Southeastern United States is experiencing higher rates of population and industrial growth than most areas of the nation. Such growth will place increased stresses on the diverse ecosystems of the region, particularly the abundant forests and freshwaters. Forest productivity and vitality are important to the large forest products industry in the region, and water quality is critical for domestic, industrial, and recreational interests. The Southeastern United States is also thought to be among the most vulnerable regions to global climate change (Neilson and Marks 1994). Future management of terrestrial and aquatic ecosystems in the region will require a much better understanding of the interactions between these expected anthropogenic stresses and climate changes. Many species and communities in the Southeast are at the southern limits of their distributions, and warming may result in elimination. The humid climate and high rates of evapotranspiration (ET) in the Southeast increase the vulnerability to drought resulting from warming effects on ET or possible reductions in rainfall. Plant distributions and productivity, aquatic productivity and biodiversity, and water quality in the Southeast are likely to be strongly impacted by climate change.

One of the most important issues concerning the well-being and security of the nation is how to accommodate future economic development and maintain the ecosystem integrity and sustainability on which human systems ultimately depend. Management approaches to development and land use are frequently driven by emphasis on short-term productivity or economic gain, rather than the long-term sustainability of ecosystems. The ability to make rational decisions about land management and to be adaptable to changing needs and priorities while, at the same time, preserving long-term options requires a combination of long-term monitoring and research based on a fundamental understanding of the ecological processes and relationships necessary for long-term sustainability of ecosystem structure and function. The Ecological Society of America recently identified several barriers to long-term sustainability: (1) inadequate information on the biological diversity of environments, (2) widespread ignorance of the function and dynamics of ecosystems, (3) the openness and interconnectedness of ecosystems on scales that transcend management boundaries, and (4) a prevailing public perception that the immediate economic and social value of exploiting supposedly renewable resources outweighs the risk of future ecosystem damage or the benefits of alternative management approaches.

The ORR will be used for experimental research and monitoring activities addressing the following areas for the eastern deciduous forest type:

- Vegetation response to atmospheric stresses (ozone, high nitrogen deposition) under variations in climate (productivity, water use, natural pathogens);
- Changes in plant community dynamics in response to land use, atmospheric stresses, and climate variation (rare species, shifts in dominant vegetation types);
- Biogeochemical cycling and output of nitrogen with changes in nitrogen deposition and forest succession and growth;
- Interactions among different vegetation and animal communities at the landscape scale;
- Terrestrial-aquatic interactions under climate variations and terrestrial community succession or change; and
- Recovery of stream communities from past disturbances.

Expected outcomes:

- A viable, working framework and model for sustainable development of the Oak Ridge subregion.

- Establishment of the ORR as a national showcase for the environmental and social sciences missions of DOE.

- Creation of the long-term context within which the infrastructure assets of the ORR are preserved and enhanced for new initiative development.
    - -Bioremediation Demonstration Center
    - -Global Change Ecosystem Research
    - -Biofuels Feedstock Demonstrations
    - -Plant Genome Introductions
    - -Environmental Technology Demonstrations

Research on the ORR will continue to address major national issues and contribute to national and international collaborative research initiatives and issues such as:

Global Climate Change

- Manipulative experiments to evaluate impacts of future climate change
  - -U.S. Global Change Research Program
    - -Water balance manipulation
    - -Elevated CO_2
    - -Temperature manipulations
  - -NOAA/ATDD
    - -Air-surface exchange studies of interchange of heat, water vapor, carbon dioxide, ozone, sulfure dioxide, and other air pollutants
    - -Climate-related estimates of carbon balance of atmosphere

- Biodiversity
  - -Southern Appalachian Man and the Biosphere Program
    - -Biosphere Reserve Unit
    - -DOE National Environmental Research Park
    - -Threatened and endangered species
    - -Neotropical migratory birds
    - -Wildlife management

- Tropospheric Air Quality
  - -National Acid Precipitation Assessment Program
  - -North American Research Strategy for Tropospheric Ozone Program
  - -Ozone secondary air quality standard research

- Sustainable Development
  - -Council on Environmental Quality/PCSD Initiative
    - -Indices of sustainability
  - -DOE Science of Sustainability

- Multiple Stress Interactions
  -Climate Change X Ozone X Nitrogen

- Solar Radiation Monitoring
  -NOAA long-term observations for Integrated Surface Irradiance Study

There are a number of important issues where future research will draw upon the land resources of the ORR to meet future mission needs:

- Monitoring and Scaling Issues
  -National Environmental Monitoring and Research Program
  -National Index Site
  -National Environmental Report Card
  -National Aeronautics and Space Administration Ground-Truthing of Ecological Processes, Scaling
  -EPA Environmental Monitoring Technologies Test Bed

- Ecological Recovery
  -Natural and Accelerated Bioremediation Research Demonstration Site
  -Test Bed for Environmental Restoration Technologies
  -Demonstration of Ecological Recovery

- Basic Forest Biology Research
  -Genotypic and phenotypic mapping of significant forest species, either for global change research or for forest industry research
  -Forest biotechnology demonstrations
    -Short rotation woody crops
    -Herbaceous crops

- Other interagency research missions for which the ORR serves as a resource:
  -Wetlands research, wetlands banking
  -Wildlife research
    -Game species (e.g., deer and turkey)
    -Beaver
  -NOAA
    -Improving global climate-related estimates of carbon balance of atmosphere

- Landscape Dynamics/Land Use/Urban Ecosystems
  -Patch dynamics
  -Ecologically significant corridors
  -Minimum size of patch

APPENDIX D

ORNL Stakeholder Plan

ORNL Stakeholder Plan

Many individuals, communities, industries, agencies, and institutions are interested in the successful planning and growth of ORNL. While some of the stakeholders for ORNL are the same as those for ETTP and the Y-12 National Security Complex, many groups are specific to ORNL because of differing mission objectives. Recognizing these unique site needs, DOE has requested that each site establish and implement a "tailored" stakeholder plan. Through the tailored stakeholder plan, input specific to a particular site and its mission is targeted. This stakeholder plan identifies the process used for ORNL. Local stakeholder input obtained in 1995 through the DOE Future Use Initiative for the entire Oak Ridge Reservation (ORR) has been incorporated into the ORNL plan as appropriate. General land use plans for the entire ORR are identified in a comprehensive integrated planning document published in September 1999. Continuing updates to this *ORR Comprehensive Integrated Plan* will have public review for comments and will incorporate stakeholder input obtained through the site planning documents.

Requesting Input

Electronic communication is the preferred method of stakeholder review and input. Stakeholder review will be requested by E-mail, when possible, or by letter with reference to the document location on the World Wide Web. Reviewers unable to access the electronic version can request a hard copy of the document sections of interest. A comment box at the end of the Web document will facilitate reviewer input on individual document sections. Comments will be returned to Pat Parr, ORNL Area Manager, and Tony Medley, Director, ORNL Facilities and Operations Infrastructure Planning. The number of hits and the location of the hits on the document will be recorded.

Incorporation of Stakeholder Comments

All comments will be evaluated for compatibility with the ORNL Vision for Land Use. Where appropriate and possible, these responses have been or will be incorporated into the Plan of Current Land Uses and Planning for Future Land Uses. Planning land uses is an opportunistic and dynamic process. Through the ORNL Land and Facility Use Committee, additional comments, ideas, and suggestions will be evaluated in a timely manner for implementation and reviewed through the Reservation Management Organization, as needed.

Responding to Stakeholder's Input

Receipt of stakeholder comments will be acknowledged. For the most part, however, a response to each stakeholder comment will not be provided to the stakeholder. Updated versions of the document will be brought to the attention of the participating stakeholders. Opportunities to comment on additional drafts of the document, as well as document updates, will be provided.

Identification of ORNL Stakeholders

A diverse group of agencies, institutions, and organizations will be contacted for stakeholder input and includes

A. DOE Oak Ridge Operations and Headquarters Sponsors/Programs - such as *ORNL Institutional Plan* reviewers, DOE Office of Science, DOE ORNL Site Office, National Environmental Research Parks.

B. Other agencies that support research - including UT-Battelle, National Oceanic and Atmospheric Administration, U.S. Environmental Protection Agency, Electric Power Research Institute, National Aeronautics and Space Administration, Department of Defense, Southern Appalachian Man and the Biosphere, National Park Service, Tennessee Valley Authority.

C. Educational users - The University of Tennessee, Oak Ridge Associated Universities, Tennessee Technological University, University of Tennessee Forestry Experiment Station.

D. Natural Resource Trustees or Agencies - DOE's List of Natural Resource Trustees, Tennessee Wildlife Resources Agency, Tennessee Department of Environment and Conservation Natural Heritage Program, Tennessee Department of Environment and Conservation Oversight Office, U.S. Fish and Wildlife Service, Tennessee Valley Authority.

E. Professional organizations with large-scale perspective on ecosystem management - Ecological Society of America, Association of Southeastern Biologists, Tennessee Nature Conservancy, Partners in Flight.

F. Other - Friends of Oak Ridge National Laboratory, Tennessee Citizens for Wilderness Planning, World Engineering Partnership for Sustainable Development, Advocates for the Oak Ridge Reservation, Southern Appalachian Man and the Biosphere, Local Oversight Committee, Citizens' Advisory Panel, DOE Land Use Planning Process Focus Group, local elected officials, general public.

APPENDIX E

DOE/UT-Battelle Contract
(Section on Land-Use Planning and Management)

Excerpts from Contract No. DE-AC05-00OR22725

C-2. Statement of Work (SOW)

(a) Research and Development

(6) The Contractor shall manage and maintain government-owned buildings and facilities at the Laboratory site and the NERP, together with the utilities and appurtenances thereto. The Contractor is also responsible for certain buildings at the Y-12 Plant which house major facilities and equipment in support of ORNL programs. Some of the facilities at the Laboratory related to the cleanup of the site are managed by the DOE-Oak Ridge Operations (ORO) Environmental Management, Management and Integration prime contractor.

(e) Other Activities

(2) The Contractor shall support DOE/ORO in its responsibilities for land use planning and land management activities for the DOE Oak Ridge Reservation, which consists of 34,545* acres of federally-owned land. The Contractor's responsibilities, as directed by DOE and as identified in the DOE/ORO Reservation Management Plan and the Facility Information Management System (FIMS) database, include land and facility planning for the Laboratory site, conducting research and operational and maintenance activities within the NERP, and integrating reservation activities among contractors and other parties to support DOE's management responsibility.

Section I

I-131. 970.5204-60 Facilities Management (Nov 1997)

(a) *Site Development Planning.* The Government shall provide to the contractor site development guidance for the facilities and lands for which the contractor is responsible under the terms and conditions of this contract. Based upon this guidance, the contractor shall prepare, and maintain through annual updates, a Long-Range Site Development Plan (Plan) to reflect those actions necessary to keep the development of these facilities current with the needs of the Government and allow the contractor to successfully accomplish the work required under this contract. In developing this Plan, the contractor shall follow the procedural guidance set forth in the applicable DOE Directives in the Life Cycle Facility Operations Series listed elsewhere in this contract. The contractor shall use the Plan to manage and control the development of facilities and lands. All plans and revisions shall be approved by the Government.

*As of April 2002, the Oak Ridge Reservation consists of 34,235 acres.

APPENDIX F

Supporting Information

SUPPORTING INFORMATION

This plan has been developed with the philosophy of referencing existing, relevant planning documents whenever possible and duplicating information from those documents only to the extent necessary to assure a cogent, comprehensive presentation of appropriate information within the context of this plan. Users, therefore, should access the referenced documents for detailed information. The *ORNL Land and Facilities Plan* will be updated periodically on the World Wide Web as significant changes to the information in the plan occur. *Paper copies of this plan should be utilized with the understanding that they may not contain the most current information available.*

Listed below are the key planning documents that support this plan. A short description of the referenced document is provided along with a World Wide Web Uniform Resource Locator (URL) address, if one is available. An organizational contact responsible for the specific document is also provided (Table 3.1).

F.1 COMPREHENSIVE INTEGRATED PLANNING PROCESS FOR THE OAK RIDGE OPERATIONS SITES

The *Oak Ridge Reservation (ORR) Comprehensive Integrated Plan* is intended to assist DOE and contractor personnel in implementing a comprehensive/integrated planning process consistent with DOE Order 430.1A, "Life Cycle Asset Management." DOE contractors are charged with developing and producing the *ORR Comprehensive Integrated Plan*, which serves as a summary document, providing information from other planning efforts regarding vision statements, missions, contextual conditions, resources and facilities, decision processes, and stakeholder involvement.

The *ORR Comprehensive Integrated Plan* is a planning reference that identifies primary issues regarding major changes in land and facility use and serves all programs and functions on-site, as well as the DOE-ORO and DOE Headquarters. The plan illustrates (1) how the ORR, as a valuable national resource, is and shall be managed based on the principles of ecosystem management and sustainable development and (2) how mission, economic, ecological, social, and cultural factors are used to guide land and facility use decisions. The long-term goals of the comprehensive integrated planning process, in priority order, are to support DOE critical missions and stimulate the economy while maintaining a quality environment. (Available at URL http://www.ornl.gov/~dmsi/cip/.)

F.2 ESHQ&I MANAGEMENT PLAN INFORMATION SYSTEM

The ESHQ&I Management Plan Information System was developed to serve as a management decision-making support tool. It accepts and stores data associated with ESHQ&I activity data sheets (ADSs) either from the ORNL Program Management Tracking System (PMTS) or as direct input information into an ADS. The system accepts the risk matrix scores assigned to each ADS by the ORNL Risk Ranking Board and screens for entry of all pertinent data associated with an ADS and support data validation where possible and appropriate. This system provides flexibility in viewing and editing data with powerful features for querying, indexing, and reporting data. (Available on the Web at URL http://svr1.cmo.ornl.gov/eshwc/wc.dll?eshweb~TopPage.)

F.3 ENVIRONMENTAL MANAGEMENT PROGRAM LIFE CYCLE BASELINE

The Environmental Management Program Life Cycle Baseline (LCB) is the primary tool used by Bechtel Jacobs Company, LLC, in planning the cleanup of contaminated sites and facilities within the scope of the program. The LCB is used to perform long-range and strategic planning, develop financial budget requests, identify resource requirements, measure performance, and facilitate the development of subcontracting plans. (Current and prior year baselines are available on the World Wide Web at URL http//www.bechteljacobs.org/busmgt/baseline/Baselines.html.)

F.4 ESHQ&I BUDGET FORMULATION SUBMISSION FOR ORNL

ORNL's annual *ESHQ&I Budget Formulation Submission* is developed in accordance with the annual *DOE Guidance Manual for the ES&H Planning Process.* ESHQ&I activities are identified to ensure the health and safety of employees and the public; protection of the environment; and compliance with applicable laws, regulations, DOE policies and orders, and other ESHQ&I requirements, while carrying out the site's missions and the planning for ORNL infrastructure needs that support R&D as well as the environment, safety, health, and quality. This plan is developed using risk-based planning and priority-setting methodologies to (1) establish and communicate ESHQ&I expectations to all stakeholders, (2) support the development of Departmental budgets and secure funding for ESHQ&I programs and activities, (3) support the integration of ESHQ&I principles in site-wide work planning and execution, and (4) assess ESHQ&I performance and provide feedback to promote continuous improvement. (Available at URL http://www.ornl.gov/camext/CAMIndex.htm.)

F.5 ESHQ&I MANAGEMENT PLAN AND EXECUTION PLAN FOR ORNL

The annual *ORNL ESHQ&I Management Plan and Execution Plan* was developed to describe the approach used at ORNL to ensure the health and safety of employees and the public, protect the environment, comply with contractual requirements set forth in the Work Smart Standards (WSSs) agreed upon by the contractor and DOE, and manage physical assets and infrastructure from acquisition through operation and disposition. This plan documents the systems and processes used by ORNL to (1) establish and communicate ESHQ&I expectations and requirements to the ORNL community, (2) identify and secure funding for ESHQ&I activities using risk-based planning and priority setting, (3) conduct R&D activities and operations through integration of ESHQ&I principles in work planning and execution, and (4) assess ESHQ&I performance and provide feedback to promote continuous improvement. The plan is prepared annually in accordance with guidelines in the annual *DOE Guidance Manual for the ES&H Planning Process*, and its issuance satisfies the requirement in the DOE/UT-Battelle Management Contract, I.101 970.5204-2(c). ORNL has an integrated ESHQ&I database system that enables the Laboratory to (1) meet major ESHQ&I commitments, (2) address key issues, (3) manage unfunded ESHQ&I risks, (4) systematically provide information for the reduction of ESHQ&I risks, and (5) establish and maintain stakeholder confidence. (Available on the World Wide Web at URL http://www.ornl.gov/camext/CAMIndex.htm.)

F.6 ORNL FACILITY INDEX

The ORNL Facility Index is an internally available Web-based database of ORNL facilities with

related links that include ORNL site maps, the ORNL Facilities Management Database, the ORNL Area Responsibility Listing, the ORNL Condition Assessment Survey (CAS), the ORNL Space Allocation Management System (SAMS), the Property Management System (PRISM), GLI Web-General Locator Information, and Whos. Photographs of the facilities are also found in this index. (Available at http://www-sap.ornl.gov/scripts/wgate/ZKWWW_FACINDEX/!?_FUNCTION= Z_K_WWW_FACINDEX_MENU.)

F.7 ORNL INSTITUTIONAL PLAN

ORNL produces an institutional plan each year to convey information about the Laboratory to DOE. The institutional planning process provides a means for DOE to consider the Laboratory as an institution (rather than as a collection of programs) and to review its mission, its health as an institution, and its plans for the future. DOE approval of ORNL's institutional plan indicates that the Laboratory's mission, vision, and strategic plan are aligned with Departmental needs and plans. (Available on the World Wide Web at URL http://www.ornl.gov/inst_plan/IP_Outline.html.)

F.8 ORNL LABORATORY AGENDA

UT-Battelle's plan for ORNL is guided by a commitment to achieving simultaneous excellence in the areas of science and technology, Laboratory operations and ES&H, and community service. The UT-Battelle Leadership Team has developed a Laboratory Agenda to provide a structured framework for the long-term initiatives, critical outcomes, and near-term actions through which it will deliver on this commitment. The Laboratory Agenda is focused on the most significant activities that UT-Battelle must accomplish to achieve its vision of simultaneous excellence. It includes clear statements of the primary results that will be delivered to DOE over the next few years.(The URL is http://home.ornl.gov/offices/strategic_planning/stratplan/labagenda/lab_agenda.htm.)

F.9 ORNL LAND AND FACILITIES PLAN

The *ORNL Land and Facilities Plan* provides current information concerning DOE-ORO reservation land use development, integrated strategic facilities planning, cost and schedules for planned projects, and conclusions and recommendations. The plan contains maps and tables describing major facility systems and structures. (Available at URL http://www.ornl.gov/~dmsi/landUse/.)

F.10 OAK RIDGE RESERVATION ANNUAL SITE ENVIRONMENTAL REPORT

This document contains a summary of environmental monitoring activities on the ORR and its surroundings. The monitoring and documentation criteria are described within the requirements of DOE Order 5400.1, “General Environmental Protection Program.” The results summarized in this annual report are based on the data collected prior to and through the reported year. (Available on the World Wide Web at URL http://www.ornl.gov/Env_Rpt/aser2000/aser2000.htm.)

F.11 OAK RIDGE RESERVATION MANAGEMENT PLAN

The primary purpose of this management plan is to define responsibilities and authority for ORR management. The management plan treats the ORR as a single site wherever possible and addresses

roles and responsibilities for managing the physical and human resources of the reservation on both a day-to-day and long-term basis. The focus of the document is to address general overall reservation policy and management, particularly as it relates to the portion of the ORR outside the immediate site boundaries. (Available on the Web at URL http://home.ornl.gov/general/orrmp/.)

F.12 ORNL STRATEGIC FACILITIES PLAN

The *ORNL Strategic Facilities Plan* provides: a brief overview of the Facilities Revitalization Project (FRP) team established to accomplish the revitalization mission; a review of the current inventory and condition of existing ORNL facilities, as well as the programmatic mission drivers that are the basis for future facilities needs; and an outline of the specific facilities consolidation, upgrade, and new construction needs that leads to the overall Master Plan for ORNL development. The preliminary cost and schedule estimates for completing that Master Plan are then provided, followed by a short discussion of the conclusions and recommendations of the strategic planning exercise. (Available on the World Wide Web at URL http://www.ornl.gov/~dmsi/strategic_plan/index.html.)

F.13 ORNL PARKING LOT AND TRAFFIC FLOW PLAN

The *ORNL Parking Lot and Traffic Flow Plan* addresses the impact of the FRP on Laboratory parking areas and traffic flow. Included in the plan are activities that will be implemented to properly mitigate the impact to employees and visitors, including parking lot construction and operations, a summary of parking supply and demand, new transportation initiatives, communication, and site access and control. (Available on the World Wide Web at URL http://www.ornl.gov/~dmsi/parking.)

APPENDIX G

Environment, Safety, Health, and Quality
Facility Environmental Vulnerability Assessment

Environment Protection and Waste Services/
Facility Environmental Vulnerability Assessment

Environmental Protection and Waste Services (EP&WS) is ORNL's liaison with regulators, interpreting and translating requirements, managing all aspects of the permitting processes and operations for newly generated waste, and monitoring and reporting on the environmental impact of ORNL operations. EP&WS is also responsible for the Facility Environmental Vulnerability Assessment Recommendations Implementation (FEVARI).

Environmental and waste services provided include programs focusing on ensuring UT-Battelle's compliance with federal and associated state environmental regulations, such as the Clean Air Act, Clean Water Act, Resource Conservation and Recovery Act (RCRA), Toxic Substances Control Act (TSCA), and Comprehensive Environmental Response, Liability, and Compensation Act (CERCLA); monitoring (including sampling and sample management for laboratory analyses) for the ORNL site and the ORR to support compliance with permitted programs, compliance agreements, and regulatory requirements; environmental surveillance on the ORR to monitor the effect of DOE activities on-site and off-site on environmental and natural resources; environmental management to provide resources for the National Environmental Policy Act (NEPA), the National Historic Preservation Act (NHPA), state oversight agreements between DOE and the State of Tennessee; coordination of ORNL environmental management, including managing Work Authorization Documents, developing strategic connections between ORNL remediation and facility modernization efforts, and coordinating ORNL interfaces between ORNL and Bechtel Jacobs Company, LLC; and ensuring that UT-Battelle's waste is properly characterized and certified to meet all requirements and assisting in getting its waste ready for receipt by Bechtel Jacobs Company, LLC.

Current Activities and Future Needs: Facility upgrades are planned for environmental sampling laboratories and administrative space within the scope of work for the Building 4500 Line Item Project.

Facility Environmental Vulnerability Assessment (FEVA)

In the spring of 2001, a Facility Environmental Vulnerability Assessment (FEVA) was conducted at ORNL (ORNL/TM-2001/123, June 2000). The primary goal of the FEVA is to establish an environmental vulnerability baseline that can be used to support the Laboratory planning process and to place environmental liabilities in perspective. The information developed by FEVA provided the basis for management to identify and initiate immediate, near-term and long-term actions to respond to the identified vulnerabilities.

The FEVA did not identify any need for immediate "stop work" actions. It is recognized, however, that the potential exists for low-level releases of contaminants from the aging ORNL infrastructure. A number of near-term and long-term actions and initiatives has been identified to address the FEVA recommendations. These recommendations can be grouped into the following major types of actions: (1) systems implementation (e.g., environmental policy, Systems Based Management, and Environmental Management and Facility Operation and Management Systems) to address fundamental Laboratory management process vulnerabilities; (2) investigations and studies to confirm existing conditions, determine if additional vulnerabilities exist, and identify actions to address them (e.g., once-through cooling evaluation, facility process evaluations, waste inventories, Land and Facilities Plan, ESHQ&I Budget Submission); and (3) actions to directly address identified vulnerabilities (e.g., contaminated vegetation removal, reduction in discharges to the Process Waste System drains, reduction/consolidation

of ORNL waste inventories, infrastructure upgrades, etc.). The FEVARI project, funded through the Operations Improvement Program (OIP), will initiate selected actions to address FEVA recommendations. A number of currently planned activities are also being used to respond to the FEVA recommendations. Results from FEVARI will be incorporated into existing Laboratory initiatives (*ORNL Land and Facilities Plan* and *ORNL ESHQ&I Budget Formulation Submission*) to help ensure that environmental vulnerabilities and infrastructure upgrades are identified and addressed.

Operational Safety Services

Operational Safety Services programs provide managers and employees with technical support, consultation, and oversight in the areas of industrial hygiene, radiation protection, occupational safety, and nuclear safety to minimize the risk of exposures to chemical, physical, radiological, and biological hazards.

Services provided in radiation protection include surveillance of ongoing activities involving radiation hazards; characterization of radiation and contamination hazards in work environments; identification and control of areas where hazards exist; clearance of materials; maintenance of an effective and efficient dose assessment program, including whole-body counting, bioassay, external dosimetry, and dosimetry data management; guidance and control for ALARA; and collection and dissemination of data for performance measures.

Services provided by fire protection include both establishing a fire-safe posture at ORNL and ensuring that fire-related threats to life, property, and the public are minimized.

Services provided in industrial hygiene and industrial safety include analyzing regulations; analyzing injury/illness and vehicle accident reports; conducting accident/illness trend analysis (Laboratory level); maintaining current material safety data sheets; monitoring employees and analyzing employee monitoring results; assisting in the implementation of health and safety programs; assisting with work planning; assisting in the selection, use, and training for personal protective equipment; participating in operational readiness reviews; conducting hazard analysis/control; investigating accidents/injuries, motor vehicle accidents, and employee concerns; and supporting self-assessment, the respiratory protection program, and training development and delivery.

Services provided in nuclear/facility safety include guidance for configuration management, conduct of operations, and unreviewed safety question determinations; facility surveillance and support visits; occurrence investigations, readiness reviews and assessments, and special task reviews; support for the Accelerator Safety, Criticality, and Reactor Review Committees; and guidance and reviews for facility authorization basis documents.

Current Activities and Future Needs: Building 5500 has been upgraded to house industrial hygiene and industrial safety services. The respiratory protection program's cleaning, testing, and issue activities have been co-located in Building 5500 to improve services. Future needs include upgrades to Building 2007 for the Whole-Body Counting Laboratory change rooms and administrative areas, relocation of the External Dosimetry Laboratory from a trailer to a permanent upgraded facility, and relocation of the Internal Dosimetry Laboratory to upgraded laboratories. Internal dosimetry laboratories are currently located in Building 4500S and will be relocated as part of the Building 4500 Renovation Line Item.

Quality Services

Quality Services programs provide services in the areas of quality planning; quality engineering; inspection, surveillance and verification assessment; and occurrence and issues management.

Services provided in Quality include interpretation of quality requirements for customers and ensuring the development of implementing systems; supplier evaluation services (SES) and procurement document quality reviews; metrology (NIST-traceable calibration of M&TE); ORNL Occurrence Reporting; technical evaluations of quality-related activities; issues management; alerts and Lessons Learned Program; radiographic, ultrasonic, liquid penetrant, magnetic particle, mass spectrometer examinations of materials and weldments; visual inspections of mechanical, electrical, structural, and civil activities; quality engineering functions for planning, design, construction, and acceptance; welding engineering functions for weld procedures, reviews, and consultation; and intercomparison studies.

Current Activities and Future Needs: Quality Services programs are currently located in substandard facilities. Quality management and inspection programs, currently located in Building 3017, are scheduled for relocation to Building 5500 by FY 2006. Respirator cleaning and testing services, which were located in Building 2013, have been relocated to Building 5500. Building 2013 is scheduled to be demolished by September 30, 2002. Metrology Services, located in Building 2033, is scheduled to be moved to Building 5510A by December 31, 2002. General plant projects are planned to provide upgraded facility space for other Quality Services programs in Buildings 5500 and 5510A.

Records, Training, and Standards-based Management System (SBMS)

Records, Training, and SBMS Services Division (RTSSD) is responsible for services and support for ORNL records management functions; corporate management and integration of all ORNL training activities and provision of core training services; and development and implementation of the ORNL Standards-Based Management System (SBMS).

Records Management provides services and support to ORNL for achieving life cycle management of its information resources, and promotes compliance with records management and document control requirements. Included in these services are the development of records retention and disposition schedules; management of the ORNL Inactive Records Center; management of the transfer of inactive records to the National Archives or Federal Records Center; coordination of Laboratory activities relating to the use of ORNL information by federal, state, and citizen groups; compliance coordination in areas of records management and document control; and development and implementation of electronic solutions to information management.

Training Program Administration and Training Services provides for corporate management of all ORNL training and qualification activities, as well as core training services in the areas of environmental protection, staff safety and health protection, and quality management (ESH&Q). Included in these services are management and administration of the Training and Qualification (TQ) Management System; development and maintenance of procedures established to support the TQ Management System; guidance for implementation/conduct of training activities; administration of the corporate training data management system and provision of user support services; training information management and communication; training assessments and program evaluations, assistance in determining staff training and qualification needs, provision of over 150 ESH&Q training courses through classroom, web-based, and other delivery methods; and training design, development, and implementation.

RTSSD is responsible for development, deployment, and management of the ORNL Standards-Based Management System (SBMS), an operations improvement initiative with phased implementation during the FY 2001-2003 period. The SBMS translates laws, orders, and regulatory requirements into Laboratory-wide subject area documents (procedures and guidelines) that are current, accurate and relevant to the work being performed by staff. This area of service includes *Information Development and Integration* for basic support for developing management system descriptions and subject area documents (Laboratory-wide procedures and guidelines) and integration review of all new and revised policies, management system descriptions, R2A2s (Roles, Responsibilities, Accountabilities and Authorities), subject areas documents, and Program Descriptions; and *Operations and Administration* to provide on-line delivery of management system descriptions, policies, subject area documents, program descriptions, the Support Services Directory, R2A2s, and document review/comment process tools.

The SBMS Help Desk is provided for Requirements Management for initiation/maintenance of the requirements decision record (RDR); preparation of response letters to DOE; maintenance of the listing of contract requirements (Work Smart Standards); distribution of other external drivers that are identified by management system owners to other management system owners, as appropriate; maintenance of the listing of other internal or external drivers; maintenance of FMC, Draft DOE orders and Impact Assessment reviews/comments; maintenance of review and comment information on potential contract changes; and maintenance of variances to requirements.

Current Activities and Future Needs: No specific needs are identified for these activities.

Fire Protection

ORNL maintains a professionally staffed and equipped fire department to respond to fire, medical, rescue, and other general emergencies. A comprehensive, looped proprietary fire alarm system serves facilities at the ORNL site. ORNL facilities at the K-25 Site and the Y-12 National Security Complex are provided fire and emergency response by on-site fire departments. The ORNL Fire Station, located in Building 2500 near the western end of the Bethel Valley site, provides a central alarm signal receiving station and houses emergency equipment, including fire engines, rescue vehicles, and ambulances. A second fire alarm receiving station location is provided at Building 4512, the Laboratory Emergency Response Center. Most ORNL buildings are equipped with fire protection systems having automatic capabilities which include fire detection, occupant notification of evacuation, alarm signal transmission to the ORNL Fire Department, and fire suppression system initiation. National and State of Tennessee codes and consensus standards require a rigorous Inspection, Testing, and Maintenance (IT&M) program of fire alarm and protective systems. The Fire Department performs and/or coordinates systems IT&M or repairs of all site fixed fire protection systems.

Fire Protection Engineering reviews all engineering plans to ensure that fire codes and applicable DOE orders are met. Codes also require that roads to buildings be constructed with the required width and capability to support the emergency response and fire equipment.

The system that supplies water for fire protection is generally adequate. However, a small percentage of the system has vulnerabilities due mostly to age. System vulnerabilities include (1) old, deteriorated water lines that are likely to cause an impairment; (2) an inadequate number of sectional valves to isolate an impairment; (3) dead-end lines without loops; and (4) insufficient lines to adequately service developing sites.

Wildland fire control is primarily provided by the ORNL Forestry Management Group. This group maintains access to trained personnel, equipment, and other resources to initiate emergency and preventive wildland fire control operations on the Oak Ridge Reservation.

Current Activities and Future Needs: Significant fire protection upgrades are being addressed through a Line Item project for the installation of improved, reliable fire alarm and suppression capabilities by replacing deteriorated, obsolete systems; replacing the single 16-inch water main in the east central section of ORNL with a looped system; and extending coverage of automatic alarm systems and sprinkler systems to areas not previously served. A General Plant Project is providing improved fire protection equipment and systems in selected facilities at the ORNL main site. Fire protection reviews are ongoing as a method to identify and list concerns and improvement opportunities for future funding and project activity.

Construction Support Services

Construction Safety provides an interface to ensure that site-specific ES&H requirements are identified and incorporated into project planning and documentation. Through interaction and individual alignment with project managers (PMs) and subcontract requesters (SRs), Construction Safety provides the liaison between the PM/SR and the Procurement Division to ensure that ES&H is included during the project planning process, as well as during work execution in the field.

Current Activities and Future Needs: Construction Support Services personnel are currently located in a substandard facility and will be relocated to upgraded facilities in the FY 2005–FY 2006 time frame.

Health Services

The Health Services programs provide assessment of worker health and fitness for work assignments, on-site primary care for minor illnesses and injuries as well as first response for medical emergencies, and monitor both short- and long-term effects of occupational activities on worker health.

Health Services provides programs (1) to assist in the maintenance and protection of optimal health through occupational medicine, psychology, and nursing and (2) to maintain a close interface with allied health disciplines and programs offering employees counseling, treatment, rehabilitation, and/or referral services for a wide range of problems ranging from drug and alcohol abuse to marital, financial, job and/or career development issues.

Current Activities and Future Needs: The upgrades to Building 4500N and the construction and modernization of other facilities will allow for additional space in Building 4500N for expansion and modernization of the medical facilities.

Hazardous Material Transportation, Storage, and Handling

Many buildings at ORNL receive, store, or use hazardous materials or chemicals. Storage of chemicals is typically limited to amounts that can be used in short periods and involve small amounts or consumer volume (defined as laboratory quantities, which, if suddenly released, would have no measurable off-site impact). Larger volumes of hazardous materials may be stored in bulk at various locations. Only two facilities have been identified as bulk storage areas, and neither poses any off-site release impact. The refueling station is the primary location where large volumes of hazardous fuels and oils are stored. It is separated from other facilities by sufficient distance to minimize any on-site or off-site impact from an inadvertent spill, release, or fire. The Materials Receiving Area provides large-capacity storage for compressed gases used throughout ORNL. Gas cylinders are properly secured to prevent inadvertent tipover accidents, and hazardous gases are segregated to prevent the formation of toxic chemical combinations. Transportation of hazardous materials and chemicals is typically performed by the ORNL shipping and receiving function in accordance with all applicable U.S. Department of Transportation (DOT) regulations. A Transportation Safety Document (TSD) has been completed for on-site transportation that provides a process to transport hazardous materials with negligible risk due to equivalent DOT safety practices when all DOT requirements cannot be achieved.

Chemicals and radioactive materials in transit within the ORR are packaged in accordance with DOT regulations or equivalent packaging requirements and are not considered capable of creating an off-site release of hazardous materials. Moreover, receipt, handling, and storage of bulk chemicals is not expected to affect facility operations. Efforts have been made to minimize the probability of these types of accidents so that the potential for off-site releases from the affected facilities is minimal.

Current Activities and Future Needs: Future plans identify a need to construct a Transportation and Packaging Facility. The current operations are in a substandard building that was not designed for this operation.

APPENDIX H

Waste Management and Environmental Restoration

WASTE MANAGEMENT AND ENVIRONMENTAL RESTORATION

H.1 WASTE MANAGEMENT

On February 1, 1999, Bechtel Jacobs Company, LLC, assumed responsibilities for waste storage, transport, and disposal at ORNL. Most of the functions previously performed by the ORNL Waste Management Operations Division transitioned to Bechtel Jacobs Company, LLC.

To ensure that ORNL waste is properly characterized and certified to meet all requirements and to assist ORNL in getting its waste ready for receipt by Bechtel Jacobs Company, LLC, ORNL established an organization called Laboratory Waste Services (LWS), which has three major groups: (1) Planning and Administration, (2) Waste Characterization and Handling, and (3) Waste Certification.

The Planning and Administration Group focuses on day-to-day operations; strategic planning, including up-front waste management planning with new generators, such as the Spallation Neutron Source Division; the interface with Bechtel Jacobs Company, LLC, and its subcontractors; and waste management performance measurement. This group also integrates and coordinates the pollution prevention and recycle functions for ORNL.

The Waste Characterization and Handling Group focuses on assuring that waste is adequately characterized, packaged, and certified for transfer to Bechtel Jacobs Company, LLC, or its subcontractors for treatment, storage, or disposal. In addition, the group operates a consolidated 90-day area and schedules all waste transferred to Bechtel Jacobs Company, LLC.

Another organizational element, the Waste Certification Office, reviews characterization and certification information and provides the final Laboratory waste certification.

ORNL's wastes are managed in seven categories: conventional, low-level radioactive, transuranic, hazardous, mixed, toxic, and classified. This section discusses the sources of these wastes and the facilities for treatment, storage, and disposal.

H.1.1 Conventional Waste

Conventional wastes include sanitary/industrial wastes, sanitary sewage, process wastewater, and stormwater. Solid conventional wastes are regulated by the Tennessee Solid Waste Management Act.

Sanitary/Industrial Wastes. See Appendix I.

Sanitary Sewage Collection and Treatment. See Appendix I.

Process Wastewater. The collection system consists of a series of underground pipes where process wastewater flows from the source facility to a pumping station for transfer to the Process Waste Treatment Complex (Buildings 3544 and 3608). At strategic points throughout the collection system, manholes are equipped with alpha and beta-gamma radiation monitors, pH monitors, and/or flow monitors that are continuously monitored at the Waste Operations Control Center (WOCC) to allow personnel to detect any unusual activity within the system. Wastewater goes to either the radiological or nonradiological treatment process based on radiation limits monitored at these manholes. Wastewater going to radiological treatment is transferred to the storage tanks (two 350,000-gallon

and one 1,000,000-gallon capacity each) at Building 2600. An underground pipe is used to transfer the wastewater to Building 3608 for water softening prior to its transfer to Building 3544 for radiological treatment.

Process Waste Treatment Complex - Building 3544. The process equipment installed for the Building 3544 operations was originally sized on a process water design flow rate of 200 gallons per minute (gpm). In early 1997, modifications were made to Building 3608 to relocate the water softening operation from Building 3544 to the spare clarifier at Building 3608. This modification allowed personnel to achieve treatment rates of 300 gpm at Building 3544 and was placed in service in the spring of 1997 after an extensive test and evaluation. The existing clarifier and filter press at Building 3544 were placed in standby for use if needed under unusual circumstances.

The Building 3544 treatment process consists of three basic operations: precipitation (which actually takes place at Building 3608), filtration, and ion exchange. The first two of these, together called head-end treatment, utilize conventional water-treatment equipment: a sludge recycle tank, a sludge-blanket-type precipitator-clarifier, and pressure filters. The ion-exchange equipment, utilizing a process with strong acid cation exchange resins, is tailored to the process based on criteria developed during the pilot plant operations. There is also the capability, when needed, to treat up to 180 gpm of wastewater through a chabazite zeolite resin for the removal of radioactive cesium.

Process Waste Treatment Complex - Building 3608. This facility was designed to treat process wastewater from the Process Waste Treatment Complex - Building 3544, the 4500, 2000, and 1505 Areas, and the HFIR/REDC site to remove particulates, heavy metals, and organics, as well as to adjust the pH of the wastewater before discharge to White Oak Creek. Building 3608 was designed to segregate its incoming waste streams into two streams: one containing heavy metals and one not containing heavy metals. At the facility are two 325,000-gallon surge tanks: one receives heavy metals wastewater, and the other receives the nonmetals wastewater. The facility consists of the following unit operations: precipitation, filtration, air stripping, treatment through granular-activated carbon columns, and pH adjustment.

Building 3608 has the capacity to treat up to 760 gpm (1.1 Mgd) of wastewater. This facility is operated 24 h/day, 7 days/week. The plant is controlled using a computerized system that allows the operator to monitor and control the plant operations either from the Building 3608 control room or from backup control consoles at other waste management facilities that are manned 24 h/day, 7 days/week.

In late 1996, modifications were made to route process waste from the surge tanks at Building 2600 to Building 3608 for water softening prior to treatment at Building 3544. This was done to eliminate mechanical restrictions that limited the throughput of the existing water-softening process at Building 3544 to no more than 200 gpm. With the modifications to Building 3608, the water-softening throughput was increased to over 300 gpm. The modifications included installation of piping to allow the water from Building 2600 to bypass the metals tank at Building 3608 and go directly to the clarification process. One of the clarifiers was modified for water-softening operations. A new surge tank and feed pumps to transfer the softened water to Building 3544 for further treatment were also installed. The modifications were declared fully operational in the spring of 1997.

H.1.2 Liquid Low-Level Waste System

The Liquid Low-Level Waste (LLLW) system/facilities are located throughout ORNL—the LLLW storage tanks are located near the LLLW source buildings, the LLLW Evaporator Facility is located

near Third Street, and the Melton Valley Storage Tanks (MVSTs) and LLLW Solidification Facility are located in Melton Valley.

LLLW Collection Tanks

Bethel Valley. The collection tank (F-1401, located at Building 2099) currently in service in Bethel Valley is fabricated of stainless steel and was placed into service in Bethel Valley in April 1996. This tank is double-contained in a stainless-steel-lined concrete vault with leak detection and meets all requirements of the Federal Facilities Agreement (FFA) for the LLLW system. This tank services Building 2026. Waste from F-1401 is transferred to the LLLW Evaporator System. Other buildings on the LLLW system in Bethel Valley transfer directly to the system without first being collected in a collection tank outside of the generating building.

Melton Valley. There is only one tank currently in service in Melton Valley. Tank F-1800 (located at Building 7966) is a 10,000-gallon horizontal collection tank located in Melton Valley to serve Buildings 7920 and 7930 (the REDC). This tank is fabricated of 304L stainless steel and is installed in a reinforced underground concrete vault, which is lined with stainless steel to provide secondary containment. This facility also contains transfer pumps and associated valving so that the tank's contents can be transferred to the LLLW Evaporator Facility in Bethel Valley through a double-contained pipeline (also placed in service in September 1997). This facility meets all requirements of the FFA for the LLLW system.

Engineered Safeguards

The LLLW collection tanks are provided with liquid level measuring devices. Alarms indicating over-filling are telemetered to the WOCC, which is manned continuously. Also, Tanks F-1401 and F-1800 are provided with combustible gas analyzers.

Tanks F-1401 and F-1800 are doubly contained, and both the tank and secondary containment vault are provided with liquid level alarms. In all cases, the tanks are vented, either via off-gas systems or directly to the atmosphere, through HEPA filters.

LLLW Bottling and On-Site Transportation

As an alternative to the LLLW collection system utilizing a network of underground piping and tanks, LLLW is also transported by surface vehicles to the LLLW collection system for treatment. Bulk liquid wastes that are not transferred by pipeline are transported from the generating facility by tank motor vehicle to the collection header in the South Tank Farm for further transport by pipeline to the storage tanks and Building 2531 for treatment. Smaller quantities of liquid waste, such as those produced in some of the research laboratories, are bottled and transferred from the generating facility by motor vehicle directly to Building 2531 for treatment.

Vehicular Tanks. Two tanks are presently in use. The first is a 1000-gallon flatbed-mounted tank operated by Duratek Federal Services personnel to transport up to 800 gallons of LLLW to the LLLW collection system, where it is gravity drained to the hard-piped system. The second tank is the Building 3074 dumpster tank, which is owned by the Facilities Management Division (FMD). Duratek Federal Services empties this tank as requested by FMD personnel.

Bottled Waste. Small quantities of LLLW are routinely transferred from the generators' facilities to the LLLW evaporator facility in a DOT Specification 7A Type A Bottle Package System, which consists of a 2.5-gallon thick-walled reusable polyethylene bottle with a 20-gallon drum overpack.

Bethel Valley Evaporator Service Tanks

The Bethel Valley Evaporator Service Tanks (BVESTs), consisting of Tanks C-1, C-2, W-22, and W-23, store evaporator concentrate and dilute radioactive LLLW. Accumulated sludge was removed from these tanks in 1998 and 1999 using AEA Technology's fluidic pulsed jet mixing process. The sludges were transferred to the MVSTs for storage.

LLLW Evaporator System

Two 600-gal/h evaporator systems, housed in Building 2531, are used to concentrate the LLLW. The first of these was put into operation in 1965 and the second in 1979 (the vessel was replaced in 1994 due to deterioration of the internal steam coils). The original evaporator is served by a 4400-gallon feed tank (A-1). The newer evaporator is fed directly from one of the evaporator service tanks (normally W-21 or W-22). Both evaporator installations consist of an evaporator vessel, a vapor filter, a water-cooled condenser, and a condensate catch tank. With the exception of the feed and the condensers, the equipment in both systems is identical. The overheads from the evaporator vessels are condensed and receive treatment at the Process Waste Treatment Complex - Building 3544 for the removal of radiochemicals from the evaporation process. The 50,000-gallon evaporator storage tanks are used to store the LLLW concentrate until it can be transferred to the MVSTs.

Melton Valley Storage Tanks

Storage capacity for the concentrated LLLW has been provided by eight 50,000-gallon storage tanks installed in two underground vaults located adjacent to the LLLW Solidification Facility in Melton Valley (Building 7830, also called the Melton Valley Storage Tanks). The tanks are contained in two concrete vaults with stainless steel liners and leak detection instrumentation.

Construction of additional storage capacity for the concentrated LLLW has recently been completed with the turnover on November 13, 1998, of Building 7856 (Melton Valley Storage Tanks Annex) to Liquid and Gaseous Waste Operations Project (LGWOP) personnel. This facility, which was placed in service on December 3, 1998, after undergoing a DOE-ORO Readiness Assessment, provided an additional six 100,000-gallon storage tanks installed in individual vaults located southeast of the existing MVSTs (Building 7830). The tanks are contained in individual concrete vaults with stainless steel liners and leak detection instrumentation, which were constructed by the Melton Valley Storage Tanks - Capacity Increase Project.

Principal Process

The LLLW system at ORNL collects, neutralizes, concentrates, and stores aqueous radioactive waste solutions from various sources at the Laboratory. The Waste Acceptance Criteria (WAC) administratively limits the wastes added to the LLLW system to a total radionuclide concentration of the ingestion dose equivalent of 2 Ci/gal ^{90}Sr. The sources of these waste solutions are "hot" sinks and drains in R&D laboratories, radiochemical pilot plants, and nuclear reactors located in both Bethel and Melton valleys. With the exception of some facilities that do not contain radioactive operations, virtually all of the buildings at ORNL are serviced by this system.

Waste is generated from buildings and sent to collection tanks near the facility or directly to the LLLW Evaporator Service Tanks W-21 or W-22. Tanks W-21 and W-22 are connected directly to the LLLW Evaporator systems, and their contents are transferred on a batch basis to the evaporator facility for volume reduction.

At the evaporators, the aqueous waste is routinely concentrated by a factor of 20 to 35. The radioactive concentration of the condensate is less than the feed solution concentration by a factor of 10E4 to 10E5. Evaporation is achieved by the use of steam coils located in the bottom of the evaporator vessel. The evaporators are operated in a semicontinuous manner. Raw waste is transferred by steam jet to an evaporator, and blowdown proceeds at a rate of 50 $lb/h/ft^2$ of surface area. During this period, more raw waste is automatically sent to the evaporator at a rate controlled by the level in the evaporator vessel. Condensate from the evaporator is directed to the Process Waste System for further treatment prior to discharge. When the specific gravity of the concentrated waste reaches a value between 1.20 and 1.25, the evaporator is shut down. Its contents are cooled and then transferred to one of the 50,000-gallon storage tanks for interim storage.

The concentrate stored at the evaporator facility is periodically pumped to the MVSTs or MVST Annex for long-term storage. Transfer from the LLLW Evaporator Facility to the MVSTs is through approximately 6000 ft of double-contained stainless steel pipe. This pipe is buried in a specially prepared bed of select clay and is cathodically protected.

H.1.3 Stack Ventilation 3039 System Description

The 3039 Stack Ventilation System, which was originally built in 1950, was extensively modified and upgraded in 1984 to increase its efficiency and reliability. In 1997 several of the cell ventilation blowers and the off-gas primary blower and backup fan were replaced to increase the system's reliability. Also in early 1997, a new scrubber solution tank and associated transfer equipment was installed that met requirements of the FFA for the Liquid Low-Level Waste system.

The 3039 Stack Ventilation System consists of seven collection systems, each with its own underground and/or aboveground ducting, fans, and controls. Five of these are designed to handle the cell-ventilation waste streams from limited-access areas and hot cells. The other two systems are designed to handle the off-gas from process equipment and laboratory experiments. The Oak Ridge Research Reactor pressurized off-gas system is not active and has been disconnected from the 3039 Stack Ventilation System.

The 3039 stack is a 76.2-m-(250-ft)-high unreinforced radial brick masonry chimney. It has an acid-proof lining utilizing a special acid-proof brick. The stack is supported on a 50-ft-diameter octagonal reinforced concrete footing, cast on bedrock with a varying thickness ranging from 11 ft to 17 ft. The fans and connecting duct to the stack are located near the stack to minimize the length of duct between the stack and the fans.

The interface between the 3039 Stack Ventilation System and the buildings served is either the building isolation valve or, if no isolation valve exists, the point at which the duct penetrates the wall of the building served. However, there are several buildings whose filter systems are located in a separate housing outside the building. In these cases, the external filter system and the building it serves are considered as an integrated unit and the interface with the 3039 Stack Ventilation system is where the duct penetrates the wall of the filter housing. Safe operation of the facilities upstream of the interface with the 3039 Stack Ventilation System is the responsibility of the facility operator. Because of the diversity of the activities carried out in the buildings that the system serves, any gaseous waste stream may contain transuranic radionuclides, fission products, and hazardous chemicals whose usage is controlled by ORNL.

Radioactivity and gaseous emissions can, therefore, enter the 3039 Stack Ventilation System only if it is contained in the process off-gas or the cell-ventilation gaseous waste streams. However, the

building operators, as the waste generators, are responsible for keeping the amounts of radionuclides in the gaseous waste streams that discharge into the 3039 Stack Ventilation System to levels that will limit risks to the health and safety of the public and employees. This is accomplished through a combination of administrative controls, input controls, application of health physics procedures, and treatment (usually by HEPA filters) of the gaseous waste stream prior to discharge into the 3039 Stack Ventilation System.

Principal Process

The primary functions of the 3039 Stack Ventilation System are to safely and efficiently collect process off-gas and cell ventilation gaseous waste streams from various ORNL facilities, to monitor the streams for radionuclide and hazardous material contents, and to discharge the combined streams to the atmosphere at a central location. The system is designed to provide continuous, uninterrupted operation by utilizing installed back-up auxiliary fans. Operators of the interfacing buildings are notified when abnormal operation of the 3039 Stack Ventilation System occurs. Supporting services are furnished by various ORNL organizations and safety committees that provide health physics coverage, equipment maintenance, and safety oversight.

The 3039 Stack Ventilation System off-gas and cell-ventilation facilities include various cell-ventilation, off-gas scrubber, air, water, electrical, and waste systems. These are discussed in detail in the subsections that follow. Unless otherwise stated, system components, e.g., ducts and fans, exposed to the weather and/or corrosive gases are fabricated from stainless steel, typically 304-L.

Each collection system is provided with two fans for the air or off-gas transport through the system. The cell/off-gas fan is a direct-drive motor unit and is used as the normal operating unit for the system. The other fan, a steam turbine unit, is employed as a standby. However, each week for a 15-minute period, each electrically driven cell ventilation unit is shut down and the turbine unit put into service. In addition, the electrically driven off-gas unit is shut down and the turbine unit put into service each day for a 1-hr period.

Each system (with the exception of the 3042 system) is instrumented such that a loss of on-site electrical power will activate both the standby fan and a 750 kw diesel engine emergency generator. When the diesel generator reaches normal operating speed, the sequencing relays will automatically restart the electrically driven fans. The steam turbine-driven fans will then automatically reset to their standby condition when the negative pressure at the suction side of the fan returns to normal.

H.1.4 Solid Low-Level Radioactive Waste

Solid low-level waste (SLLW) is waste that contains radioactivity but is not classified as high-level waste, transuranic (TRU) waste, spent nuclear fuel, or by-product material as defined by DOE Order 435.1, “Radioactive Waste Management.” SLLW does not contain hazardous waste as regulated by the Resource Conservation and Recovery Act (RCRA) and as defined in 40 *CFR* 260-268 (or State of Tennessee equivalent standards) or polychlorinated biphenyl (PCB)-contaminated or PCB-detectable waste as regulated by the Toxic Substances Control Act (TSCA) and as defined in 40 *CFR* 761. DOE Order 435.1 and the Atomic Energy Act of 1954, as amended, provide the primary regulatory guidance and requirements for the management of SLLW. Waste Acceptance Criteria have been developed to address the storage, treatment, and disposal of SLLW, and an implementing procedure to effect the WAC is in place for SLLW.

SLLW is generated throughout ORNL and is characterized by the generator, with waste certification being accomplished through the combined efforts of the generator, LWS, and the Laboratory Waste Certification Official. SLLW is staged at the generating location until the waste is certified by ORNL and accepted by Bechtel Jacobs Company, LLC. Bechtel Jacobs Company, LLC, determines the most suitable management option for all SLLW generated by ORNL. Based on the characteristics and certification of the waste, Bechtel Jacobs Company, LLC, may (1) store the waste in one of several storage facilities dedicated to SLLW; (2) utilize treatment options such as compaction and incineration offered by commercial treatment, storage, and disposal facilities (TSDFs) or in-house treatment options; or (3) ship the waste to an approved off-site disposal facility such as NTS or Envirocare. The primary goal is to expeditiously disposition newly generated waste from generators to the disposal site.

Use of the Interim Waste Management Facility (IWMF) for on-site disposal of ORNL newly generated SLLW was suspended in 1998 pending completion of the Performance Assessment (PA) and Composite Analysis (CA) for the facility. The IWMF uses tumulus disposal technology to dispose of SLLW. The waste is packaged inside a concrete or steel cask, which is placed inside a tumulus vault, and any void space within the vault is filled with concrete grouting. The vault lid is sealed with a steel-reinforced concrete cover and stacked on a concrete tumulus pad. A drainage system and several monitoring stations test any water running off or beneath the pads. The first pad was constructed to accommodate 324 vaults, and each subsequent pad can accommodate 330 vaults. DOE has decided that operation of the IWMF is no longer tenable. The cleanup of MV, the high cost of the IWMF, and access to NTS are reasons to close the IWMF permanently.

LLW is currently stored in multiple facilities within Solid Waste Storage Area (SWSA) 5 and SWSA 6. By mid-2004, this activity will be consolidated in SWSA 5 North because of the final capping and closure of SWSAs 5 and 6.

H.1.5 Transuranic Waste

TRU waste is waste contaminated with alpha-emitting transuranium radionuclides (atomic number greater than 92) with half-lives greater than 20 years and concentrations greater than 100 nCi/g at the time of assay. The following radioisotopes meet these criteria and are managed as TRU: Am-241, Am-242m, Am-243, Bk-247, Cf-249, Cf-251, Cm-243, Cm-245, Cm-246, Cm-247, Cm-248, Cm-250, Np-237, Pu-238, Pu-239, Pu-240, Pu-242, and Pu-244. Waste Acceptance Criteria and an implementing procedure are in place for TRU wastes.

TRU waste is generated by a limited number of generators and facilities at ORNL. TRU waste is characterized by the generator, with certification being accomplished through the combined efforts of the generator, LWS, and the Laboratory Waste Certification Official. All TRU waste is currently stored in on-site storage facilities operated by Bechtel Jacobs Company, LLC. Most of these facilities are RCRA-permitted and store some RCRA-contaminated TRU waste, as well as some RCRA-contaminated SLLW that exceeds the dose limits for Bechtel Jacobs Company's other RCRA-permitted storage facilities. A very small quantity of TRU waste is also PCB-contaminated. During FY 2001, ORNL generated approximately 6 m^3 of TRU waste, which was placed in on-site storage.
TRU storage facilities in SWSAs 5 and 6 will be emptied and closed between 2001 and 2008, when the waste stream achieves steady-state. All of the existing inventory will be shipped to the Foster Wheeler processing facilities in Melton Valley.

H.1.6 Hazardous Waste

Hazardous waste is any discarded material that is not excluded by 40 *CFR* 261.4(a) and that is either listed in 40 *CFR* 261, Subpart D, or that exhibits one or more characteristics identified in 40 *CFR*

261, Subpart C. RCRA, as amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA), regulates the generation, storage, treatment, disposal, and transportation of hazardous wastes. RCRA also regulates the facilities that conduct these operations. The State Tennessee Department of Environment and Conservation (TDEC) is authorized to administer its own RCRA program in lieu of the federal program, except to the extent of newly issued HSWA provisions. The State program has authorization to regulate mixed waste and RCRA corrective actions as well and is authorized under the Tennessee Hazardous Waste Reduction Act of 1990.

Hazardous waste is a waste or surplus material with negligible value that may cause or significantly contribute to an increase in mortality or to an increase in serious irreversible illness or pose a substantial present or potential hazard to human health or the environment when improperly stored, treated, disposed of, or transported. Hazardous wastes are defined in RCRA by specific source lists, nonspecific source lists, characteristic hazards, and discarded commercial chemical product lists. Characteristic wastes are those which exhibit the characteristics of ignitability, corrosivity, reactivity, or toxicity, as defined in 40 *CFR* 261.

Hazardous wastes are generated throughout ORNL and are stored in generator satellite accumulation areas or in (90-day) accumulation areas operated by the generator or LWS pending pickup by Bechtel Jacobs Company, LLC. Bechtel Jacobs Company, LLC, determines the most suitable management option for all hazardous waste generated by ORNL. Based on the characteristics and certification of the waste, Bechtel Jacobs Company, LLC, may (1) immediately transport the waste to an off-site commercial TSDF for treatment and/or disposal, (2) store the waste in one of several storage facilities dedicated to hazardous and mixed waste pending off-site treatment or disposal, (3) detonate the waste in the on-site Chemical Detonation Facility, or (4) utilize other on-site treatment. Waste Acceptance Criteria and an implementing procedure are in place for hazardous wastes.

Hazardous waste storage is consolidated at the Bechtel Jacobs Company, LLC, accumulation area in the 7650 series buildings on Melton Valley Access Road. This waste type is considered to be at steady-state, which means that all generated waste is disposed of within one year.

H.1.7 Mixed Waste

Mixed waste is waste that contains both hazardous and radioactive components and must be managed to meet the requirements applicable to both. “Hazardous,” in this instance, refers to both those wastes regulated by RCRA and those PCB wastes with concentrations or sources greater than or equal to 50 ppm. Like hazardous wastes, mixed wastes are generated throughout ORNL and are stored in accumulation areas operated by the generator or LWS pending pickup by Bechtel Jacobs Company, LLC. Bechtel Jacobs Company, LLC, determines the most suitable management option for all mixed wastes generated by ORNL. Based on the characteristics of the waste, Bechtel Jacobs Company, LLC, may store the waste in one of several storage facilities dedicated to hazardous and mixed waste, pending determination of suitable treatment, storage, and disposal options. Many of ORNL’s mixed wastes are treated in the TSCA Incinerator at ETTP. This incinerator burns mixed wastes from ORNL, the Y-12 National Security Complex, ETTP, the Paducah Gaseous Diffusion Plant, the Portsmouth Gaseous Diffusion Plant, and other sites and facilities as directed by DOE. The resulting ash is treated, as required, and disposed of at Envirocare of Utah.

By 2003, mixed waste storage will be performed in the same facility area as hazardous waste. If additional storage area is required, the waste will be stored at ETTP.

H.1.8 TSCA Waste

PCB Waste. TSCA waste is waste regulated by the U.S. Environmental Protection Agency (EPA) Environmental Protection Division under TSCA. In accordance with 40 *CFR* 761, Subpart D, TSCA regulates PCB materials (wastes/contaminated equipment) based on PCB concentration. PCB materials with <50 ppm are minimally regulated; those with ≥ 50 ppm and < 500 ppm are moderately regulated; and those with ≥ 500 ppm are stringently regulated. TSCA also regulates PCB/radioactive wastes. The majority of ORNL's PCB/radioactive wastes are treated at the TSCA incinerator at ETTP; whereas, other PCB wastes are sent to commercial facilities within a year of generation. ORNL is also governed by the Oak Ridge Reservation/PCB/Federal Facility Compliance agreement. In addition, TDEC regulates the disposal of PCBs >2 ppm in State sanitary landfills.

Asbestos Waste. TSCA also addresses the manufacturing, importing, and processing of asbestos and establishes requirements for asbestos abatement projects performed by government and State employees not covered by (1) the Asbestos Standard of OSHA, 29 *CFR* 1926.58, (2) an asbestos standard adopted by a state as a part of a plan approved by OSHA under Section 18 of the Occupational Safety and Health Act, or (3) a state asbestos regulation which the EPA has determined to be comparable to, or more stringent than, that established in 40 *CFR* 763.120. Since ORNL does not manufacture, import, or process asbestos, and since asbestos activities are covered by an approved Asbestos Standard, any waste with asbestos-containing material (ACM) is not regulated under TSCA. ACM is either managed as sanitary waste, SLLW, transuranic waste, TSCA/RCRA waste, or TSCA/RCRA mixed waste if the ACM has come into contact with such constituents. Accordingly, asbestos will be managed as a TSCA (PCB) waste only if it has come into contact with PCBs.

Waste Acceptance Criteria and implementing procedures are in place for TSCA (PCB) and asbestos wastes. These wastes are initially stored by generators until transfer to Bechtel Jacobs Company, LLC, for either on-site storage or off-site storage or disposal. PCB wastes received, treated, and disposed are routinely included in the totals for hazardous and mixed wastes.

H.1.9 Classified Waste

Classified wastes are discarded materials whose analysis or review could reveal information withheld for reasons of national security. The management of such waste is governed by DOE Order 470. ORNL generates a minute amount of classified waste. Disassociation from source or use is sometimes used to declassify certain materials.

H.2 EFFLUENT MONITORING

Liquid effluents are regulated by ORNL's National Pollutant Discharge Elimination System (NPDES) Permit issued by TDEC. Receiving streams are monitored at designated locations for both radioactive and nonradioactive contaminants. Surface water samples are collected as part of the Clean Water Act (CWA) requirements and DOE orders. In addition, monthly surface water samples are collected to determine background contaminant levels before the influence of ORNL. These samples are collected at White Oak Creek headwaters above the locations of ORNL discharges to White Oak Creek. Figure H.1 shows the locations of the various sampling points. The White Oak Creek Headwaters monitoring was temporarily suspended in 2001 while repairs were made to the Headwaters monitoring site, and monitoring will be resumed in the first part of 2002.

All process wastewater streams were routed to the Nonradiological Wastewater Treatment Plant (NRWTP) when it began operations in 1990. This made it possible to combine five permitted and monitored NPDES wastewater-discharge points into one monitored point. The NRWTP operated in total compliance with the ORNL NPDES Permit from 1990 to 1998. In 1997–1998, the NRWTP and the Process Waste Treatment Plant (PWTP) were reconfigured and combined to provide the Process Waste Treatment Complex (PWTC), which resulted in more effective, efficient treatment of ORNL process wastewaters. The PWTC has operated in essentially complete compliance with the ORNL NPDES Permit, with only a single permit limit exceedance recorded since 1998, giving an NPDES compliance rate of greater than 99%.

H.3 ENVIRONMENTAL RESTORATION ACTIVITIES AND ISSUES

The Oak Ridge Environmental Restoration Program is being performed by Bechtel Jacobs Company, LLC, as DOE's M&I contractor for environmental management activities in Oak Ridge. ORNL and Bechtel Jacobs Company, LLC, are closely coordinating site activities and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) decision-making process related to long-term land use plans for major portions of the ORNL site as records of decision are being finalized and remedial actions implemented.

ORNL has been one of the primary contributors in EM technology development and deployment. Any significant reduction in technology funding will seriously affect the supporting research divisions. Successful execution of DOE's plans for cleanup will be dependent on the use of new and more cost-effective technologies. ORNL is working to maintain DOE support for the continuation of all phases of the EM technology development and demonstration being conducted through the Focus and Crosscut Areas, the EM Science Program, and the Accelerated Site Technology Deployment initiative for getting proven technologies into the field.

For the technology deployment work, Bechtel Jacobs Company, LLC, has been given the leadership role for technologies being deployed on its sites. ORNL principal investigators will need to coordinate with Bechtel Jacobs, LLC, in proposing and implementing field activities.

H.3.1 Record of Decision for Interim Actions in Bethel Valley

The cleanup of Bethel Valley, which includes the main ORNL site, is being conducted under CERCLA. Four regions have been established in the Bethel Valley Watershed based on area hydrology, the level and type of environmental management activities, and the knowledge that the end use of these regions may vary. These regions are

Raccoon Creek Region (West of State Highway 95),
West Region (from Highway 95 to the developed area of ORNL),
Central Region (the originally developed area of ORNL), and
East Region (the 7000 Area of ORNL).

In FY 2001, DOE submitted the Record of Decision for Interim Actions in Bethel Valley (BV ROD) to the regulatory agencies for review and approval as part of the CERCLA decision-making process for environmental remediation of the site. The BV ROD identifies the remediation goals for Bethel Valley and all actions needed to meet these goals. The key issue to be addressed is the environmental restoration strategy for the Central Region, encompassing the initial area of the site, which was developed beginning in 1943. This strategy will address decontamination and decommissioning of inactive laboratory facilities and reactors and disposition of contaminated soils and sediments. A

final groundwater remediation decision has been deferred; in the interim, the selected remedy proposes selected plume containment and source actions. Resolution of issues raised during regulatory agency review of the ROD is in progress, with the goal of having a signed ROD in FY 2002.

H.3.2 Gunite and Associated Tanks

The Gunite and Associated Tanks (GAAT) consist of six large tanks of 170,000-gallon capacity each and two smaller tanks of 42,500-gallon capacity. Prior to remediation, each tank contained residual quantities of mixed waste (radioactive and RCRA-characteristic sludges; some tanks contain transuranic mixed waste). Most of the liquid and solid waste was removed in the 1980s, but a heel of sludge and other debris remained in the tanks. Additional contamination is also present in the tank walls and floors. This waste, as well as the equipment, structures, soil, and groundwater in the tank farms, represents a potential threat to human health and the environment. A CERCLA interim remedial action was implemented to remove the waste from the tanks and a CERCLA non-time critical removal action was implemented to stabilize (grout) the tank shells in place. The associated piping, valve pits, contaminated soil, etc., will be addressed in other remedial actions implementing the selected remedy in the BV ROD.

Tank waste removal was completed in FY 2000, and tank shell stabilization was completed in FY 2001. Over 400,000 gallons of waste slurry containing about 87,000 gallons of transuranic mixed waste sludge were transferred to the Melton Valley Storage Tanks where it will be treated in the Transuranic Waste Processing Facility for shipment to the Waste Isolation Pilot Plant (WIPP) in New Mexico for disposal. Dismantlement of waste removal equipment and platforms has been completed and the site is now available for beneficial reuse.

H.3.3 Corehole 8

The Corehole 8 contaminated groundwater plume (CH8 Plume) is the result of LLLW pipeline leaks at the LLLW Collection/Storage Tank W-1A located in the North Tank Farm at ORNL. The historic pipeline leaks, discovered in the mid-1980s, have contaminated soil and groundwater adjacent to and beneath the tank and created the source for the CH8 Plume, which has spread east and west of the tank site.

Three actions have been taken over the past several years after discovery of radiological contaminant releases into First Creek at the western end of the ORNL plant site. The primary contaminants detected in the creek were Sr-90 and uranium isotopes. In 1995, a CERCLA removal action was initiated to collect and treat contaminated groundwater. A shallow interceptor and sump collection system was installed, with the water being pumped back to a manhole for treatment at the ORNL Process Waste Treatment Plant (PWTP). In early 1998, a shallow french drain collector was installed and two manholes were waterproofed to prevent contaminated groundwater infiltration into the storm drain system and ultimate release into First Creek. In 2000, extraction of contaminated groundwater was initiated from a well (Well 4411) that intercepts a portion of the plume. The extracted groundwater is being treated at the PWTP.

An additional CERCLA removal action was implemented to stop further leaching of contaminants from the plume source into groundwater. The project focused on remediating the contaminated soil, Tank W-1A, and pipelines at the plume source leak site. Tank contents were removed in FY 2001 and 90% of the contaminated soil was excavated. Unexpectedly high concentrations of transuranic contaminants were encountered while excavating soils immediately surrounding the tank. Excavation of this highly contaminated soil was not within the approved scope of the removal action. The tank

and approximately 100 cubic yards of highly contaminated soil were left in place to be addressed in a future CERCLA action, and the excavated area was backfilled.

Additional plume management, such as hydraulic control of the plume using extraction wells to control groundwater flow in the plume and slowly remove contaminants from the bedrock zone, will be addressed in the BV ROD.

H.3.4 Metal Recovery Facility Demolition

The Metal Recovery Facility (MRF) was a one-story, metal-sided building used as a pilot and small-scale nuclear fuel reprocessing plant between 1952 and 1960. Associated with the MRF were an exterior concrete canal; a small storage facility; and, interior to the facility, a dissolver pit and seven concrete hot cells. The MRF was used primarily to recover fuel and other nuclear materials. The fuel reprocessing occurred in the building's seven hot cells; fission products were also separated out. A CERCLA removal action was initiated in FY 2001 to remove the surface structure of the facility to the finish floor elevation. The walls of the dissolver pit, small storage building, and canal were demolished to the finish floor elevation of the facility. The dissolver pit and other small pits and sumps were drained, decontaminated, and stabilized with grout. The remaining slab will be stabilized in place in FY 2002.

H.3.5 Surface Impoundments Operable Unit Project

The Surface Impoundments Operable Unit (SIOU) is part of the Bethel Valley Watershed Central Region and consists of four impoundments designated A (3524), B (3513), C (3539), and D (3540). The impoundments received radioactive low-level liquid wastes generated during experiments and materials processing at ORNL. They contain radioactively contaminated sediments with the primary contaminants of concern being cesium, plutonium, cobalt, strontium, and americium. The selected remedy consists of the removal, treatment, and off-site disposal of the sediments and backfilling of the impoundments for beneficial reuse. Impoundments C and D were successfully remediated in 1998. A facility to treat the sediments has been constructed on the backfilled impoundments. Sediment was transferred from Impoundment A to Impoundment B in 2000. Impoundment A was then backfilled with rock and grout and is being used as a staging area for treated waste awaiting shipment for disposal. Treatment system startup with hot and cold testing was completed and treatment of consolidated sediment from Impoundment B was initiated in FY 2001and is scheduled for completion in FY 2003.

H.3.6 Federal Facilities Agreement Tanks Remediation

ORNL has a comprehensive program under way to upgrade the LLLW system to meet the FFA requirements. Those tank systems that do not meet the FFA requirements are required to be removed from service, characterized, and remediated. The FFA Tanks Remediation Project is responsible for sampling and analyzing the inactive tanks' contents, submitting these results in the Waste and Risk Characterization Data Manuals, maintaining the tanks in a safe inactive condition, and remediating the tanks. As of the end of FY 1998, all LLLW tanks not meeting the FFA requirements for active service have been removed from service. The inactive tanks are remediated within the CERCLA framework: tanks with little associated risk are remediated as maintenance actions with regulatory agency concurrence; tanks with more associated risk are remediated as removal actions.

A CERCLA removal action was implemented to remove the contents from 27 inactive LLLW storage tanks located in Bethel Valley and Melton Valley and stabilize (grout) the shells and residual internal contamination in place. Seven tanks were remediated in FY 2000 and 17 tanks were

remediated in FY 2001. The remediation of three tanks (i.e., T-1, T-2, and HFIR) was deferred to a future CERCLA action due to the nature of their contents (i.e., resins), which will require a more sophisticated approach to retrieval and treatment.

H.3.7 Cooling Towers Demolition

Six ORNL cooling tower structures [HRE Cooling Tower (7554), Oak Ridge Research Reactor Heat Exchanger (3087), ORRR A/C Cooling Tower (3089), ORRR Cooling Tower #3 (Building 3103), Pool-Water Cooling Tower (3086), and BSR Cooling Tower (3117)] were demolished in FY 2000. Waste generated from demolition of the towers will be dispositioned in FY 2002. The remaining basins and any contaminated soil associated with the towers will be addressed in the BV ROD selected remedy.

H.3.8 Spent Nuclear Fuel Project

The objective of the ORNL Spent Nuclear Fuel (SNF) Project is to safely, reliably, and efficiently manage SNF that is stored on the Oak Ridge Reservation until it can be shipped off-site for disposal. SNF is being retrieved, repackaged, and certified for shipment to the Idaho National Engineering and Environmental Laboratory (INEEL). The final SNF package has been retrieved (KEMA fuel from SWSA 6) and is being repackaged for placement back into safe storage pending shipment to INEEL. A cask loading facility was constructed in FY 2001 to allow packaging of SNF in licensed containers that will be used to ship SNF to INEEL beginning in FY 2003.

H.3.9 Record of Decision for Interim Actions for the Melton Valley Watershed

The cleanup of the Melton Valley portion of the White Oak Creek Watershed, which includes most of ORNL's primary waste disposal units, is being conducted under CERCLA. The Record of Decision for Interim Actions for the Melton Valley Watershed (MV ROD), documenting the selected remedy, was signed by DOE, EPA, and TDEC on September 21, 2000. The Melton Valley (MV) ROD addresses current contaminant releases and potential risk or hazard through a combination of remedial activities such as containment, stabilization, removal, treatment, monitoring, and land use controls.

A Remedial Design Work Plan which summarizes the remedy design and implementation approach for the cleanup of the waste units and other contaminated areas in the watershed was approved by the regulatory agencies in FY 2001. A Land Use Control Implementation Plan that identifies various land use controls (LUCs) that will be utilized for the interim remedial actions was also submitted to the regulatory agencies for review and approval in FY 2001. Since the remedy includes leaving hazardous substances in place within the watershed above unrestricted use levels, the LUCs play an important role in preventing unacceptable exposures and ensuring the selected remedy remains protective of human health and the environment.

H.3.10 Molten Salt Reactor Experiment

The Molten Salt Reactor Experiment (MSRE) facility operated from 1965 to 1969 to test the molten salt concept for commercial nuclear power reactors. During routine surveillance activities in 1994, it was noted that measured radiation levels in various areas throughout the facility were increasing. The source of radiation originated in the two fuel drain tanks and was being distributed throughout the off-gas system. A uranium deposit was also discovered in a charcoal bed that filtered the off-gas from the drain tanks. This condition could have resulted in a criticality accident and possible radiation exposure to the on-site (MSRE) personnel.

Actions have been implemented under CERCLA to reduce and eliminate potential risks of a nuclear criticality accident or a release of reactive gases from the facility. The three activities to remediate these concerns are (1) removal of the migrating gases throughout the facility off-gas system, (2) removal of the uranium deposit from the Auxiliary Charcoal Bed, and (3) removal of the fuel salt itself. Removal of reactive gases was initiated in 1996 as part of a CERCLA time-critical removal action and will continue as appropriate until all remedial actions have been completed. Removal of the uranium deposit for conversion to a stable oxide form and later disposition was completed in FY 2001 as a CERCLA removal action. An Interim Record of Decision for the MSRE Fuel Salt Removal has been approved by the regulatory agencies. Design, procurement, fabrication, and installation of fuel salt removal equipment was completed in FY 2001. The fuel salts, which contain uranium and fission products, will be removed, converted to a stable oxide form, and permanently disposed off-site at DOE's WIPP site in Carlsbad, New Mexico. Fabrication of conversion vessels and installation/checkout of conversion process equipment was also completed in FY 2001. Fuel salt removal will be initiated in FY 2003.

H.3.11 Old Hydrofracture Facility Site

The Old Hydrofracture Facility (OHF) site was used from 1964 to 1979 for permanent disposal of liquid radioactive waste in shale formations at depths > 780 ft. Various facilities were required to support the waste disposal operations, including five underground tanks used for storage of the liquid waste before mixing it with grout; surface structures for storing, mixing, and handling the grout/liquid waste mixture; and an impoundment (OHF Pond) and waste pit (T-4 Waste Pit) for emergency storage of liquid waste due to system failures. Operations were terminated in 1980, leaving approximately 50,000 gallons of transuranic waste in the five underground storage tanks. This waste has been removed and transferred to the Melton Valley Storage Tanks (MVSTs) for processing and disposal. An additional CERCLA removal action was conducted in 2000 that stabilized the OHF Pond, the five storage tanks, and the T-4 Waste Pit. In addition to these actions, the sludge was removed from the Process Waste Sludge Basin (PWSB), placed in the OHF Pond, and stabilized along with the OHF Pond sediment. The PWSB was a PVC-lined basin constructed in 1975 and used between 1976 and 1981 for the storage and settlement of sludge produced by the water-softening processes at the ORNL PWTP. Remedial design for the demolition of the OHF structures and tank stabilization equipment was completed and demolition initiated in FY 2001. Demolition of the structures will be completed in FY 2002.

H.3.12 Hydrofracture Wells Plugging and Abandonment

Between the 1960s and mid-1980s, the process of deep injection of waste was used at ORNL to dispose of radioactive liquids and sludges in mixtures of waste with portland cement-based grout and various additives. Two test, or experimental, injection wells were constructed along with boreholes and wells to observe the behavior of the injected grout in the injection zone bedrock. At these two sites, small quantities (tens of curies) of radionuclides were added to injected grout to make the grout sheets detectable using gamma detectors to log the bedrock to locate the thin grout sheets. The third and fourth injection wells were constructed for large-scale waste disposal. More than 5 million gallons of liquid waste-grout mix containing approximately 1.4 million curies of activity were injected into artificially induced fractures in a shale formation at depths of 300 ft. to 1000 ft. All large-scale disposals were at depths greater than 780 ft. Contamination levels in hydrofracture monitoring wells have been reported as high as 97 million pCi/L gross beta, which could potentially migrate up an unplugged well bore. To prevent this migration, a CERCLA remedial action was initiated in FY 2001 to plug and abandon (P&A) the four injection wells and 107 associated monitoring wells. Thirty-three of the 107 monitoring wells were plugged and abandoned in FY 2001. This remedial action implements the selected remedy for these wells as specified in the MV ROD.

H.3.13 Solid Waste Storage Area 4 Remediation

Solid Waste Storage Area (SWSA) 4 was used for the disposal of SLLW in trenches and auger holes from 1951 to 1959. There are also pipelines on the north side of SWSA 4 that were used for transporting LLLW to waste pits and hydrofracture facilities. The selected remedy for SWSA 4, agreed to by DOE, EPA, and TDEC in the MV ROD, includes the installation of a multilayer cap to facilitate hydrologic isolation of the buried waste in SWSA 4 and Liquid Waste Pit 1. The cap will also cover the Experimental Pilot Pit Area. Excavation of the Intermediate Holding Pond (IHP), also part of the MV ROD selected remedy, is included in this project. Prior to cap installation, existing facilities and equipment located within the cap footprint were demolished to slab. The facilities and equipment included in this task consisted of the Alpha Greenhouse Facility (7833), Decontamination Facility (7819), Pilot Pits Building (7811), and the off-gas hood and structure used during the Waste Pit 1 in-situ vitrification technology demonstration. Demolition of the facilities and equipment was completed in FY 2001. Borrow area development and haul road upgrades were initiated in FY 2001 and will be completed in FY 2002. Excavation of the IHP will be initiated in FY 2002 and completed in FY 2003. Relocation of Lagoon Road will be completed in FY 2003. Capping of SWSA 4 will be completed in FY 2004.

H.3.14 Building 7602 IPDF Highbay Maintenance Action

In the first major cost-sharing collaboration between Bechtel Jacobs Company, LLC, and UT-Battelle, the highbay portion of Building 7602, the Integrated Process Demonstration Facility (IPDF), was “recovered” on a fast-track schedule to make this facility available to support the Spallation Neutron Source program. Building recovery was completed in early FY 2001 and included the removal of radioactively contaminated process equipment and decontamination of the entire facility.

H.4 TRANSURANIC WASTE PROCESSING FACILITY

This project includes designing, constructing, operating, and decontaminating and decommissioning a facility in the Melton Valley area of ORNL for the processing, packaging, and shipment of transuranic wastes collected in the Melton Valley Storage Tanks and solid TRU storage facilities for off-site disposal.

H.5 HAZARDOUS MATERIALS WITHIN THE 500-YEAR FLOODPLAIN

Flooding on the ORNL site has not been a major problem. Brief summer storms have caused short-duration flooding of some parking areas and roads, but have had little impact on plant operations. The level of White Oak Creek governs flooding at ORNL. The creek's level is determined by the level of Watts Bar Lake, and the lake level can be controlled by dams operated by TVA. Thus, TVA can mitigate the consequences of heavy rainfall.

The 500-year flood, that flood expected to occur only once in 500 years or, equivalently, that flood which has a 1-in-500 chance (0.2%) per year of occurring, will have little impact on ORNL facilities. Table H.1 lists those facilities located within the 500-year floodplain. It is important to note that none of the SWSAs lie within the 500-year floodplain. Moreover, none of the facilities designated by the Safety Analysis Report Update Program (SARUP) as posing a moderate or high hazard, nor any of the facilities designated for decontamination and decommissioning (D&D), lie within the 500-

year floodplain. The most serious impact would probably result from the flooding of the Sewage Treatment Plant.

Table H.1. ORNL facilities located within the 500-year floodplain

Building no.	Facility name
2521	Sewage Treatment Plant
3518	Process Wastewater Treatment Plant
4500S	Central Research and Administration Building
5500	High Voltage Accelerator Lab
6008	Office/Lab Facility
6011	Computer and Telecommunications Building

Source: Derived from information provided by the TVA Floodplain Protection section, 1992.

Table H.2. Management and Integration (M&I) contractor facilities
As of July 19, 2002

Facility no.	Program	Bechtel Jacobs Company, LLC, contract facility
807	MV	Cesium-137 Erosion/Runoff Study Area (0807)
814	MV	Trailer (814)
816	MV	Cesium Plots Study Area (816)
830	MV	White Oak Creek Embayment Sediment Control Facility (830)
853	MV	White Oak Creek & Tributaries
857	MV	Goat Building (857)
870	BV	Raccoon Creek Monitoring Station (0870)
1001	BV	SWSA 3 (1001)
1554	BV	Contractors' Landfill (1554)
1562	BV	Closed Scrap Metal Area (1562)
2026A	WO	Inactive LLLW Collection Tank 2026A
2032	WO	Manhole 240 Monitoring Station (2032)
2034	WO	Manhole 95 Monitoring Station (2034)
2099	WO	Monitoring Control Station for Bldg. 2026 (2099)
2101	WO	LGWOD Health & Hygiene Change House (2101)
2508	WO	Instrument Trailer for Sludge Mobilization (2508)
2531	WO	Low-Level Waste Evaporator (2531)
2532	WO	HLW Storage Cooling Pumphouse (2532)
2533	WO	Cell Vent Filter Pit for Bldg 2531 & 2537 (2533)
2534	WO	Off-Gas Filter Pit for Bldg 2531 & 2537 (2534)
2535	WO	Cooling Tower #1 for bldg 2531 (2535)
2537	WO	Evap. Service Tanks & Cont. room (Bldg. 2531) (2537)
2539	WO	Cooling Tower #2 for bldg. 2531 (2539)
2568	WO	Cell Vent & Off-gas Filter Fac. for 2531 (2568)
2600	WO	Bethel Valley Storage Tank (2600)
2624	BV	Solid Waste Storage Area (SWSA) 1 - (2624)
2649	WO	Transported Waste Receiving Facility (2649)
2650	WO	Evaporator Chemical Addition Shed (2650)
2651	WO	Emergency Generator for 2600 area (2651)
2657	WO	Manhole 243 Monitoring Station (2657)
2658	WO	F-4005 Monitoring Station (2658)
2660	WD	Waste Operation Support Facility
3001	BV	Graphite Reactor (OGR), Building 3001
3001		3001 Storage Canal
3001/3019		Graphite Reactor Storage Canal Overflow (3001/3019)
3001-3003		Underground Exhaust Ducts 3001-3003
3001B		Inactive LLLW Collection Tank 3001-B
3002	BV	OGR Filter House 3002
3002A	WO	Inactive Filter House Seal Tank 3002-A
3003	BV	OGR Fan House 3003 (Fan Room Only)
3003A	BV	Inactive LLLW Collection Tank 3003-A
3004B		Inactive LLLW Collection Tank 3004-B
3005	BV	Low Intensity Test Reactor (LITR) - (3005)
3009	BV	Pump House for bldg. 3010 (3009)
3010	BV	Bulk Shielding Reactor Facility
3013		Inactive LLLW Collection Tank 3013
3018	BV	OGR Stack (3018)
3019B	BV	High Radiation Level Analytical Facility (3019B)
3023	BV	North Tank Farm (3023)
3026C	BV	Krypton-87 Enrichment Facility (3026C)
3026D	BV	Metal Segmenting Hot Cell Facility
3028	BV	Alpha Powder Facility (3028)
3029	BV	Source Development Laboratory (3029)

Table H.2. Management and Integration (M&I) contractor facilities
As of July 19, 2002

Facility no.	Program	Bechtel Jacobs Company, LLC, contract facility
3030	BV	Radioisotope Production Laboratory -- C (3030)
3031	BV	Radioisotope Production Laboratory -- D (3031)
3032	BV	Radioisotope Production Laboratory -- E (3032)
3033	BV	Radioactive Gas Processing Facility (3033)
3033A	BV	Radioactive Production Laboratory Annex (3033A)
3037	BV	LLLW Collection/Storage Tank WC-1
3038	BV	Radioisotopes Laboratory (3038)
3038AHF	BV	Alpha Handling Facility
3038E	BV	Isotopes Materials Laboratory
3038M	BV	Radioisotopes Packaging and Handling Facility
3039	WO	Central Radioactive Gas Disposal Facility (3039)
3042	BV	Oak Ridge Research Reactor (3042)
3075	BV	Decommissioned LITR Ponds
3077		LITR Heat Exchangers (3077)
3082	WO	Data Concentrator #2 for WOCC DAS (3082)
3083	BV	ORRR Neutron Spectrometer Station (Neutron Flight Tube Bldg 3083)
3085	BV	ORRR Pumphouse (3085)
3085A	BV	20,000 Gallon Water Tank (3085A)
3085B	BV	20,000 Gallon Water Tank (3085B)
3086	BV	Pool-water Cooling Tower (3086)
3087	BV	Heat Exchangers for ORRR (3042)
3089	BV	ORRR A/C Cooling Tower (3089)
3092	WO	Off-Gas Scrubber (3092)
3093	BV	Krypton Storage Cubicle (3093)
3098	BV	Filter Facility - BSR (3098)
3099	BV	Storage Pad (3099)
3102	BV	ORRR Heat Exchanger Pit (3102)
3103	BV	ORRR Cooling Tower #3 (Building 3103)
3105	WO	LGWOD Health Physics Office (3105)
3106	WO	Cell Vent Filters for 4501, 4506, 4507 (3106)
3107	BV	ORRR 25-meter Target House (Flight Tube Building) (3107)
3109	BV	ORRR POG Filter Pit Off-Gas Filter (3109)
3110	BV	Isotopes Ductwork/3110 Filter House
3116	BV	Nitrogen Cylinder Storage Building (3116)
3117	BV	Cooling Tower - Bulk Shielding (3117)
3117A	BV	Sulfuric Acid Tank (3117A)
3118	BV	Radioisotope Production Laboratory -- H (3118)
3119	BV	BSR Heat Exchanger & Pumphouse (3119)
3125	WO	3039 Stack Area Emergency Generator (3125)
3126	BV	ORRR NOG Filter Pit Charcoal Filter (3126)
3127	WO	PDS Record Storage (3127)
3130	WO	Waste Operation Control Center (3130)
3133	WO	BV Valve Box 1A (3133)
3139	BV	ORRR Cell Vent Filters (3139)
3140	BV	Cell Vent Filters for 3026
3145	WO	LGWOD Storage Building (3145)
3151	WO	Manhole 25 Monitoring Station (3151)
3154	WO	Manhole 112 Monitoring Station (3154)
3155	WO	Manholes 114 & 234 Monitoring Station (3155)
3158	WO	North CV Duct Monitoring Bldg. (3158)
3159	WO	South CV Duct Monitoring Bldg. (3159)
3502B	WO	Data Concentrator #4 for WOCC DAS @ 3502 (3502B)
3503		Mercury Contaminated Soil (Bldg. 3503)

Table H.2. Management and Integration (M&I) contractor facilities
As of July 19, 2002

Facility no.	Program	Bechtel Jacobs Company, LLC, contract facility
3507	BV	South Tank Farm (Gunite Tanks) (3507)
3507 Area		FPDL LLLW Transfer Line
3512	BV	Decommissioned Waste Holding Basin (3512)
3513	BV	Waste Holding Basin (3513)
3515	BV	Fission Product Pilot Plant (FPPP) - (3515)
3517	BV	Fission Product Development Laboratory (FPDL) - (3517)
3517 Area		FPDL Inactive Cells {Cells 4,5,6,7,22} and Service Tunnel - (3517)
3518	WO	Neutralization Facility (3518)
3518A	WO	LGWOD Spare Parts Trailer (3518A)
3524	BV	Equalization Basin (3524)
3535		Filter Enclosure in South Tank Farm (3535)
3539	BV	Process Waste Pond (3539)
3540	BV	Process Waste Pond (3540)
3544	WO	Process Waste Treatment Plant (3544)
3544B	WO	Filter Press Building (3544B)
3547	BV	Cell Vent Roughing Filter for 3517
3548	BV	Cell Vent Filter for 3517
3592		Mercury Contaminated Soil (Bldg. 3592)
3594	WO	Waste Management Storage Bldg. (3594)
3608	WO	Process Waste Treatment Complex (3608)
3613	WO	Diversion Box Monitoring Station (3613)
3614	WO	Manhole 190 Monitoring Station (3614)
3615	WO	Manhole 235 Monitoring Station (3615)
3616	WO	Manhole 149 Monitoring Station (3616)
3617	WO	Manhole 229 Monitoring Station (3617)
3618	WO	Pumping Station, Tanks WC-10, 11, 12, 13, 14 (3618)
3620	WO	Hot Off Gas Collection Tank F2175
4003	BV	Solid Waste Storage Area (SWSA) 2 - (4003)
4501		Mercury Contaminated Soil (Bldg. 4501)
4507	BV	High-Level Chemical Development Lab (4507)
4507 South		Inactive LLLW Collection Tank T-30
4507 South		Inactive LLLW Collection Tank T-30
4508		Mercury Contaminated Soil (Bldg. 4508)
4556	BV	High-Level Chemical Development Lab Filter Pit (4556)
6556A	BV	Contractor Trailer (6556A)
6556B	BV	Contractor Trailer (6556B)
6556C	BV	Contractor Trailer (6556C)
6556D	BV	Contractor Trailer (6556D)
6556G	BV	Contractor Trailer (6556G)
6556J	BV	Contractor Trailer (6556J)
6556K	BV	Contractor Trailer (6556K)
6556L	BV	Contractor Trailer (6556L)
6556M	BV	Contractor Trailer (6556M)
6556R	BV	Contractor Trailer (6556R)
6556ST1	BV	Contractor Trailer (6556ST1)
6556ST3	BV	Contractor Trailer (6556ST3)
6556ST4	BV	Contractor Trailer (6556ST4)
6556ST5	BV	Contractor Trailer (6556ST5)
6556ST6	BV	Contractor Trailer (6556ST6)
6556ST7	BV	Contractor Trailer (6556ST7)
6556ST8	BV	Contractor Trailer (6556ST8)
6556ST9	BV	Contractor Trailer (6556ST9)
6556T	BV	Contractor Trailer (6556T)

Table H.2. Management and Integration (M&I) contractor facilities
As of July 19, 2002

Facility no.	Program	Bechtel Jacobs Company, LLC, contract facility
7002A	BV	Abandoned Underground Waste Oil Storage Tank 7002A
7002W		Waste Oil Storage Tank (7002W)
7019	BV	Thorium Storage Wells
7025	BV	Tritium Target Preparation Facility (7025)
7075		Waste Oil Storage Tank (7075)
7078A	BV	Contractor Trailer (7078A)
7078B	BV	Contractor Trailer (7078B)
7078C	BV	Contractor Trailer (7078C)
7078D	BV	Contractor Trailer (7078D)
7078E	BV	Contractor Trailer (7078E)
7078F	BV	Contractor Trailer (7078F)
7500	MV	HRE Reactor Building 7500
7502	MV	Radioactive Waste Evaporator for Bldg. 7500
7503	MV	MSRE Reactor Building (7503)
7503A	MV	Inactive LLLW Collection Tank 7503A
7505	WO	Contractors Headquarters
7506	WO	Contractor Shop
7507	WD	Hazardous Waste Storage Facility (7507)
7507W	WD	Mixed Waste Storage Pad (7507W)
7509	MV	MSRE Office Building (7509)
7511	MV	MSRE Filter Pit [Off-Gas Filter House (7511)]
7512	MV	MSRE Stack 7512
7513	MV	MSRE Cooling Tower 7513
7514	MV	MSRE Supply Air Filter House Bldg. 7514
7516		Field Service Shop (7516)
7554	MV	HRE Cooling Tower 7554
7555	MV	MSRE Diesel Generator House 7555 Former Storage Area
7556	MV	Homogeneous Reactor Experiment (HRE) Pond (7556)
7557	MV	HRE Charcoal Absorber Pit 7557
7558	MV	HRE Waste Evaporator Loading Pit (7558)
7559	MV	HRE Charcoal Absorber Valve Pit 7559
7560	MV	LLLW Collection and Storage Tank 7560
7561	MV	HRE Decon Pad/Shed 7561
7562	MV	LLLW Collection and Storage Tank 7562
7563	MV	Circulator Pump Pit for Bldg. 7500 (7563)
7567	WO	Central Pumping Station (Tanks T1 & T2) (7567)
7569	WO	Inactive LLLW Tank WC-20
7572	WD	CH-TRU Waste Storage Facility, 7572
7574	WD	NFS Waste Storage Facility
7576		7576
7577		7577
7578		7578
7579		7579
7580		7580
7582	WO	LGWOD Spare Parts Storage Facility (7582)
7602	MV	Integrated Process Demonstration Facility (7602)
7651	WD	Mixed Waste Storage Facility (7651)
7652	WD	Hazardous Waste Storage Facility (7652)
7653	WD	Chemical Waste Storage Facility
7654	WD	Long-Term Hazardous Waste Storage Facility (7654)
7658	MV	Closed Contractors' Landfill (7658)
7659	WD	Leaking Gas Cylinder Area
7659B	MV	Reactive Chemicals Disposal Area (7659B)

Table H.2. Management and Integration (M&I) contractor facilities
As of July 19, 2002

Facility no.	Program	Bechtel Jacobs Company, LLC, contract facility
7659C	MV	Soil Injection of Radioactive Gas (7659C)
7661	WD	Electrical Distribution Building (7661)
7662	WD	7662 Emergency Generator
7666	WD	Environmental Emergency Response (transfer effective 2/1/00)
7666A	WD	Haz. Waste Area Support Trailer (7666A)
7667	WD	Explosive and Shock-Sensitive Waste Detonation Area
7668	WD	Mixed Waste Storage Facility, Building 7668
7670	WD	HWOG Equipment Storage (Tent) Fac. (7670)
7700A	MV	Tower Shielding Facility
7700B	MV	TSF Outside Source Storage Area (7700B)
7711	MV	Process Waste Basin for Bldg. 7709 (7711)
7716	CR	Filter Pump House Main Pool (7716)
7720	MV	Civil Defense Facility (7720)
7759	MV	Cesium-137 Forest Research Area (7759)
7800	MV	SWSA 4 (7800)
7802	MV	SWSA 5 South (7802)
7802A	MV	Seep C Collection and Treatment System (7802A)
7802B	MV	Seep D Collection/Treatment System (7802B)
7802C	MV	Deep Monitoring Well #1 (7802C)
7802D	MV	Deep Monitoring Well #2 (7802D)
7802E	WO	Sludge Removal Test Tank (7802E)
7802F	MV	Radiation Monitoring Equipment Storage (7802F)
7802N	WD	SWSA 5 North TRU Trenches Disposal Area
7805	MV	Pit 1 (7805)
7806	MV	Pit 2 (7806)
7807	MV	Pit 3 (7807)
7808	MV	Pit 4 (7808)
7809	MV	Trench 5 (7809)
7810	MV	Trench 6 (7810)
7810A	WD	Interim Non-regulated Waste Storage Facility (7810A)
7811A	MV	Pilot Pits 1, 2 (7811)
7813	MV	White Oak Creek Dam (7813)
7818	MV	Trench 7 (7818)
7821	MV	Emergency Waste Basin (7821)
7822	MV	SWSA 6 (7822)
7822		Augured Holes SWSA 6 Area (7822)
7822A	WD	High Range Disposal Wells (7822A)
7822B	MV	Fissile Disposal Wells (7822B)
7822C	MV	Low Range Silos (7822C)
7822D	MV	High Range Silos (7822D)
7822E	MV	Hill Cut Disposal Test Facility (7822E)
7822F	MV	TUMULUS I (7822F)
7822G	MV	TUMULUS II (7822G)
7822H	MV	Asbestos Silos (7822H)
7822J	WD	Radioactive Solid Waste Staging & Storage Pad (7822J)
7823	WD	PCB Storage Area (7823 Waste Storage Building)
7823A	WD	Underground Storage Facility Wells TT1-TT8 (7823A)
7823B	WD	Temporary Waste Storage Facility (7823B)
7823C	WD	Temporary Waste Storage Facility (7823C)
7823D	WD	Temporary Waste Storage Facility (7823D)
7823E	WD	Temporary Waste Storage Facility (7823E)
7823F	WD	SWSA-5N Storage Shed (7823F)
7824	WD	Waste Examination and Assay Facility (7824)

Table H.2. Management and Integration (M&I) contractor facilities
As of July 19, 2002

Facility no.	Program	Bechtel Jacobs Company, LLC, contract facility
7824A	WD	WEAF Support Facility (7824A)
7826	WD	Retrievable Waste Storage Facility (7826)
7827	WD	High Level Alpha Waste Storage (7827)
7829	WD	Peach Bottom Storage Wells (7829)
7830	WO	Melton Valley Storage Facility (7830)
7830A	WD	Hazardous Waste Storage Tank
7831	WD	Field Office & Compactor Facility (7831)
7831A	WD	SLLW Storage Building (7831A)
7831C	WD	SLLW Storage Shed (7831C)
7831D	MV	SWSA 5 Storage Pad (7831D)
7834	WD	Retrievable Waste Storage Facility (7834)
7835	MV	Process Waste Sludge Basin WAG 5 (7835)
7841	WD	Equipment Storage Area (7841)
7841A		RAD Waste Storage Area Office Support Trailer (7841A)
7842	WD	SWSA 6 Waste Storage Facility (Building 7842)
7842A	WD	LWSP II Solid Waste Storage Pad
7842B	WD	SWSA 6 Temp Storage Facility
7842C	WD	SWSA 6 Temp Storage Facility
7846	MV	White Oak Lake and Embayment
7847	WD	Vehicle/Personnel Monitoring Station (7847)
7853	WO	OHF Storage Building (7853)
7855	WD	RH-TRU Retrievable Concrete Cask Storage Facility (7855)
7855A	WD	SWSA 5 Equipment Tent (7855A)
7856	WO	MVST Capacity Increase Project (7856)
7857	WO	IWMF Drainage & Collection Sys. & Biol. Freezers (7857)
7859		WAG6 MS1 Monitoring Shed
7860	WO	New Hydrofracture Facility
7863	WO	General Storage for Bldg. 7860 (7863)
7863A	WO	LGWOD General Storage Shelter
7863B	WO	LGWOD General Storage Shelter
7863C	WO	LGWOD General Storage Shelter
7876	WD	Health Physics Office Trailer (7876)
7877	WO	LLLW Solidification Facility (7877)
7878	WD	SWSA 6 Staging Facility (7878)
7878A	WD	Temporary Waste Storage Facility (7878A)
7878B	WD	Equipment Storage Facility
7879	WD	TRU Waste Staging Facility (7879)
7881	MV	Security Post #24 (7881)
7882	WO	Emergency Generator for Building 7877 (7882)
7883	WD	RH-TRU Bunker (7883)
7886	WO	Interim WM Facility Storage Pad 1 (7886)
7887	WO	Solid Liquid Separations Unit
7892		Storage Building for Bldg. 7856 Operations (Industrial)
7894		WAG6 MS3 Monitoring Shed
7906	MV	HFIR/TRU Waste Collection Basin (7906)
7907	MV	HFIR/TRU Waste Collection Basin (7907)
7908	MV	HFIR/TRU Waste Collection Basin (7908)
7919	WO	HFIR, TRU, and TURF Manhole Monitoring Station (7919)
7922A	WO	Data Concentrator #6 for WOCC Das (7922A)
7934	WD	CH-TRU Waste Storage Facility
7935	WO	Equipment Cleaning Facility Tank T-100
7935		Equipment Cleaning Facility (Industrial)
7952	WO	Melton Valley Process Waste Pumping Station (7952)

Table H.2. Management and Integration (M&I) contractor facilities
As of July 19, 2002

Facility no.	Program	Bechtel Jacobs Company, LLC, contract facility
7961	WO	Melton Valley Collection Tank Facility (7961)
7966	WO	LLLW Collection Tank for 7920 & 7930 (7966)
13822	BV	Tank 13822 - Helium Tank (13822)
HF-S1		Hydrofracture Experimental Site 1 (HF-S1) Grout Sheets
HF-S1		Hydrofracture Experimental Site 2 (HF-S2) Grout Sheets
HF-S1A		Hydrofracture Experimental Site 1, Soil Contamination (HF-S1A)
HF-S2A		Hydrofracture Experimental Site 2, Soil Contamination (HF-S2A)
SF-1226		Municipal Sewage Sludge Application Site (XF1226)
XG1404		Variable Dose Rate Irradiation Facility (VDRIF)
XG1410		Low Dose Rate Irradiation Facility (LDRIF)

APPENDIX I

Detailed Descriptions of Utility Improvements

Electricity

Electrical power needed to operate ORNL facilities at both the X-10 and Y-12 Sites is supplied by high-voltage transmission lines from the Tennessee Valley Authority (TVA) power grid. The 161-kV primary power system serving the Oak Ridge Reservation (ORR) is an integral part of the TVA power grid; therefore, system design, operation, and maintenance must be compatible with the rest of the TVA system. Currently, the Power Operations Group located in the Y-12 Facilities Maintenance Organization has responsibility for coordinating operations and activities on the distribution grid and for operating and maintaining the main substations serving each individual site. ORNL is assessed a portion of the total power operations charge based on the percentage of the total power used by all three sites in Oak Ridge to pay for the service provided by the Power Operations Group. ORNL remains responsible for providing any additional funding that is necessary for major maintenance to the substation, as well as monies needed for capital improvements. Electrical power used at ORNL is fed from the TVA network through two feeders. One feeder is approximately 8 miles long and extends from the K-27 substation at the East Tennessee Technology Park (ETTP) Site; the other is about 6 miles long and feeds from the Elza Substation located at the Y-12 Site. Each line is rated at 161 kV and is capable of supplying ORNL with approximately 110 MW. Transformers at the main substation at Building 0901 reduce the 161 kV to 13.8 kV. Current capacity of the feeders is sufficient to accommodate virtually any facility or program that may be located at ORNL, but the substation will need to be upgraded if total energy usage at the Laboratory increases significantly.

Eight 13.8-kV feeders distribute power to facilities throughout the Laboratory, where transformers further reduce the voltage to usable levels. Five secondary 2.4-kV substations, a 2.4-kV distribution system, switchgear, and numerous facility transformers complete the primary electrical distribution system that provides power to ORNL facilities. Fig. I.1 is a diagram of the primary electrical distribution system. The Spallation Neutron Source (SNS) construction site continues to expand, as does the need for temporary construction power. ORNL forces constructed a temporary electrical feeder into the construction area last year and continue to be called upon to extend the service and add new transformers and switches.

The electrical system includes 32 miles of overhead distribution lines, 4 miles of underground cable, 20 medium-voltage distribution switchgear assemblies, and over 200 facility transformers. Transformer installations vary in size from 10 to 7500 kVA and range from 1 to 55 years old. The system has a maximum capacity of 80 MW, but practical guidance limits current capabilities to approximately 40 MW. The present electrical load averages less than 20 MW for much of the year.

Many of the most critical operations and facilities are equipped with gasoline- or diesel-powered generators. These standby generators automatically start up to provide essential power to allow functions associated with environment, safety, health, quality, and infrastructure (ESHQ&I) to continue unaffected during power outages. They are a key component of safety systems designed to protect the public from the materials and hazards present on ORNL grounds.

Critical Infrastructure Condition and Needs

The oldest sections of the ORNL electrical system were built in the early-to-mid-1940s, and the age of the system is rapidly becoming a major problem. A number of projects have been completed that have greatly improved the safety and operability of the electrical distribution system. Currently, work is progressing on the Electrical Systems Upgrade Line Item. This project is correcting identified deficiencies and problems on a long overhead feeder, installing redundancy at the 4509 Substation, reworking bus-ties in the research complex, and installing additional meters to allow for improved efficiency. A second project, currently being proposed as an FY 2005

Electricity (cont'd)

Line Item, will upgrade the existing 2400-V distribution grid to 13,800 V and will address fire safety deficiencies and reliability issues at the 0901 main substation. The improvements to the primary electrical distribution system will result in a distribution system capable of serving the needs of the ORNL research community in the future.

General plant project (GPP) and general-purpose equipment (GPE) needs have also been identified and are in the planning base. The projects involve replacing oil-filled circuit breakers in the main substation with new SF6 units obtained from reindustrialization efforts at ETTP, replacing and rebuilding facility service entrances, changing out old unsafe switchgear, and replacing transformers at substations throughout ORNL. The electrical distribution system, while beginning to show signs of age, continues to provide reliable service to all customers in the Laboratory. If recommended improvements are completed, the system will easily support ORNL operations and facilities safely and reliably well into the next century.

Compressed Air

Compressed air powers all of ORNL's major pneumatically operated control systems. Loss of the air supply would disable many experimental programs and processes, as well as many building ventilation systems. Safety-related systems that are actuated or controlled using compressed air are designed to fail in the safe shutdown mode upon loss of air pressure. Safety-related systems may also have backup air compressors or large accumulators to provide a sufficient volume of compressed air to complete a safe shutdown of operations.

Clean, dry, instrument-quality, 100 pounds per square inch gage (psig) compressed air is produced at the Steam Plant for customers in the Bethel Valley area by one or more of six air compressors. In addition, a single diesel-powered air compressor is used in emergency situations such as power outages or when maintenance or breakdowns on the other compressors require their use. Four air receiver tanks, three prefilter units, and two air dryer systems operate in conjunction with the air compressors to provide a clean, reliable supply of compressed air to ORNL. Compressors 1 and 2 are old electric reciprocating piston air generators acquired for use when the Laboratory was built in 1943. The No. 1 air compressor is a late 1930s model, and the No. 2 air compressor has been dated to 1917. Each compressor can provide 900 cubic feet per minute (ft^3/min) of compressed air at the nominal delivery pressure of 100 psi. The No. 3 air compressor is an 1100-ft^3/min rotary piston unit that was installed at the plant in 1960. It has a dual-drive capability using either electricity or steam to provide power. The Nos. 5 and 6 air compressors are newer, oil-free, rotary-screw-type compressors. The No. 5 compressor is rated at 2000 ft^3/min and was installed in 1987, totally rebuilt in 1994, and underwent a slightly less intensive overhaul in the summer of 1997. Although operating hours are approaching 100,000, the machine has been well maintained and is considered to be in good condition. The No. 6 air compressor was installed in 1991 and can produce 900 ft^3/min. A 3000-scfm oil-free air compressor and a 400-kW diesel-powered generator were installed in FY 1999 and has now logged over 18,000 hrs. This unit is the primary air producer for the Laboratory, with the other, older units assuming a backup position. It is capable of providing all of ORNL’s current compressed air needs without help from other units and has allowed the removal of the two oldest reciprocating compressors from service. ORNL’s compressed air load typically runs between 2400 and 2800 ft^3/min, day and night, and the various compressors are operated to suit the demand and to allow for maintenance on the equipment.

A 1000-kW diesel generator was added in 1996 to provide emergency backup power to the Nos. 5 and 6 air compressors. The generator gives the Steam Plant added capabilities by being able to supply compressed air to customers during electrical outages.

The compressed air produced at the plant is distributed to customers in the Bethel Valley area through an arterial-looped underground and aboveground piping system (Fig. I.2). The compressed air distribution system in the eastern area of the Bethel Valley complex was replaced in conjunction with the replacement of the steam distribution system in 1989. The steam lines and compressed air lines were placed in concrete trench ducts with easily removable concrete lid sections. The outward appearance of the new trenches is like that of sidewalks and, in fact, some of the trenches actually replaced sections of sidewalks in some areas. Replacement of the west end distribution system was completed in 1998. Sections of the steam and air distribution systems were placed in concrete trench ducts to enhance overall Laboratory appearance, improve system reliability, and provide for easy access should maintenance be required.

Underground compressed air and steam lines in the old central section of the Bethel Valley site will not be replaced in the same manner because (1) many facilities in the area are inactive with only small portions of the buildings supporting operations, (2) plans are in place to decommission many of the facilities, and (3) much of the soil in the area is contaminated with chemical and radioactive materials which would make trenching a complicated and expensive activity.

Critical Infrastructure Condition and Needs

Clean, dry compressed air is used in many research, operation and maintenance activities in the plant and has long been considered one of the key infrastructure components. A significant investment over the last 15 years has upgraded the air production capability at the Steam Plant. The primary air producers at the plant are less than 5 years old and have proven themselves to be reliable air producers. While production of air is not considered a problem, being able to dry the air to a level that is needed by customers is becoming questionable. The air-drying system in the Steam Plant consists of two separate air-drying units. Both are C. M. Kemp units that have been in service for almost 40 years. At 38 years, the #1 Unit is the oldest and can now only provide marginal performance. It is used in a back-up position to the #2 Dryer, which is 35 years old. Both units need to be replaced, as a breakdown on either unit seriously affects the plant's ability to produce a usable air product. Distributing "wet" air is not an option and attempting to do so would cause operating and system control problems throughout the Laboratory. Moisture, even in minute quantities, will clog HVAC system control lines and, where it is used in research projects, would introduce undesirable contaminants into the experiment. A new, 4000 scfm dryer unit is identified in the infrastructure plan to replace the #1 Unit. The addition of this new dryer will further enhance the Steam Plant's ability to continue to provide clean and dry compressed air to its Laboratory customers. Compressed air is crucial to many activities at ORNL, and the replacement of both these older units is needed to support future projects and activities.

Natural Gas

The Duke Energy Company supplies natural gas to ORNL. This company owns, operates, and maintains the main line and the three pressure-reducing stations that make up the supply system to the ORR. DOE has delegated managing responsibility for this commodity to the Power Operations Department located at the Y-12 National Security Complex. This responsibility includes maintaining flow conditions within the supply contract limitations. No current supply limitations impact ORNL operations, as the system is designed with more capacity than is now demanded. However, contractual agreements do limit the amount of gas ORNL can demand. Under the current contract, ORNL can demand 1500 decatherms (1500 mcf) without incurring a penalty charge.

The ORNL natural gas tap is at Metering Station B, located north of Bethel Valley Road at the Melton Valley Access Road intersection. Natural gas from the East Tennessee Natural Gas Company (ETNGC) main is reduced to 100 psi at the metering station and passes through an orifice flange, where ORNL responsibility begins. Fig. I.2 is a diagram of the natural gas distribution system. The 6-inch ORNL supply line runs south to a tee where a 2-inch line branches off to supply gas to the 7000 Area reducing station. Gas pressure is reduced at the station to 10 psi for distribution to user facilities in the 7000 Area. Pressures are further reduced at each individual user facility according to the needs of that facility.

The gas supply for the remainder of ORNL runs southward from the tee for approximately 1000 feet before emerging from the ground. It then turns west and runs aboveground for approximately 7500 feet along the north side of Haw Ridge until it reaches the Steam Plant.

At the Steam Plant, there are seven pressure reducers at Reducing Station 2. Five of these reduce the 100-psi natural gas to 10 psi for use in the boilers in the Steam Plant. The other two reducers drop the pressure to 5 psi to supply the distribution grid which supplies gas to facilities located in the main ORNL Bethel Valley complex. The 5-psi distribution grid consists of approximately 3500 feet of 6-inch, 3-inch, and 1.5-inch steel pipe. Eleven buildings are connected to the distribution grid in Bethel Valley and, of these, only 8 currently use natural gas for any purpose.

The natural gas system at ORNL was constructed in 1948, with the only significant improvement coming in 1969, when the 100-psi main line was relocated to the north side of Haw Ridge to remove it from highly populated research areas. This aboveground line is in good condition, having been sandblasted and recoated in 1987; it should be able to continue to provide safe and reliable service for the next 15 to 25 years if the protective coating system is maintained. The underground portions of the line in the main plant area are in fair condition. Cathodic protection on these lines has prevented corrosion of the pipe. Only two leaks have developed on this underground section in the last 19 years, but due to the increasing line age, more frequent leaks can be expected in the future.

The SNS will be installing a tee off of the ORNL 6-inch, 100-psi line in Pit 1 located just south of Metering Station B. Natural gas service will be extended into the site to provide fuel for package boilers and other operational purposes.

The third-party development of the new campus will also need high pressure natural gas for activities in the Engineering Technology Facility and, possibly, for building heat. As proposed, there will be another 3-inch tap into the ORNL Metering Pit, and a new line will be extended down Bethel Valley Road into the development site. The challenge in the next few years will be in demand management. With more than one user on the system, it must be ensured that usage is monitored closely and that, when a demand charge is incurred, the user, whether it is the SNS, ORNL, or the third-party developer, pays the premium involved. Contract demand will need to be established to allow all three entities to operate, but should be low enough to provide the incentive to burn fuels efficiently.

Critical Infrastructure Condition and Needs

The aboveground section of the ORNL natural gas line was constructed in 1969 and was sandblasted and re-coated in 1987. This coating system remains in good condition, with only a few areas requiring a small touch-up to provide protection to the underlying steel line. A new coating will probably need to be applied in the next 5 years. It is expected that operating money will be used for this maintenance task. The underground portion of the Laboratory's natural gas distribution system was installed in 1948 and is now 54 years old. It is a coated, cathodically protected system that still appears to be in good condition. There have only been a few leaks on the line in the last 20 years, despite the line having surpassed its design life expectancy. The underground section of the gas system currently serves very few customer facilities and, as the facilities deactivation efforts increase, many of the facilities with natural gas service will be demolished or will be mothballed to await demolition. A new or rehabilitated natural gas system located in these older areas of the Laboratory is not needed, given the prospects for facilities in the service area. Those facilities that remain in the area, or new facilities proposed for the area, that require natural gas may need to look to bottled systems instead of the central system. It will be much more economical to provide a manifold and/or bottled gas system to these few users than to excavate and rebuild the existing system.

Potable And Process Water

Water for ORNL is taken from the Clinch River south of the eastern end of the Y-12 National Security Complex and pumped to the water treatment plant located on the ridge northeast of the Y-12 Plant. The treatment plant is owned and operated by the City of Oak Ridge and can supply water at a potential rate of 24 million gal/day (Mgd) to two storage reservoirs with a combined capacity of 7 million gallons. Water from the two reservoirs is distributed to the Y-12 Plant, ORNL, and the City of Oak Ridge.

Water to ORNL is provided via a single 24-inch line extending from the water plant and running approximately 7.5 miles across Chestnut Ridge into the ORNL plant site. This 24-inch line feeds the ORNL reservoir system, which consists of one 3-million-gallon capacity concrete reservoir and a new, 1.5-million-gallon capacity steel reservoir on the south slope of Chestnut Ridge and two 1.5-million-gallon steel reservoir tanks on Haw Ridge. These reservoirs provide the reserve capacity necessary to support ongoing day-to-day activities in ORNL facilities located in the Bethel and Melton valley areas. From these reservoirs, water flows by gravity into the plant distribution grid. The water is used for domestic, sanitary, fire protection, and process purposes. Water usage is approximately 2.5 Mgd on a winter day and 4 Mgd during the summer, though on a very hot day, water usage can approach 5 Mgd. A flow of 7 Mgd can be accommodated by the ORNL supply system under current operating conditions. Loss of the single supply line from the water plant, or any activity that would cause loss of the reserve capacity of one of the reservoirs, could impact ORNL operations within a short period.

The 3-million-gallon water storage reservoir on Chestnut Ridge is constructed of reinforced concrete and is in poor condition. Major spalling has occurred inside the reservoir on the roof and support beams, and steel reinforcement is exposed and decaying. Minor exterior cracks have developed and have been healed by calcium deposits. The reservoir underwent a thorough internal and external inspection in 1997, and the evaluator recommended that extensive repairs be performed to ensure that the reservoir can remain functional. A new, 1.5-million-gallon steel reservoir was completed in 2001 that will allow work to be initiated on rehabilitation of the concrete reservoir. Plans are currently being formulated that propose to remove it from service in the early spring of 2002 to identify and repair the leak(s) and to undergo an internal inspection by a team consisting of individuals from ORNL Engineering, the Utilities Complex, and a subcontract engineering firm that specializes in concrete design and construction. It is hoped that this team can use visual observations to develop a rehabilitation plan that will allow for an orderly, progressive repair of identified deficiencies over a period of 1 to 3 years to minimize the impact on the total ORNL utility cost.

The steel reservoir tanks on Haw Ridge were constructed in 1963 and are configured to normally provide reserve water capacity for ORNL operations located in Melton Valley (e.g., HFIR). Corrosion within the tanks necessitated replacing the steel roofs with aluminum dome-type structures in 1986. At that time, the tanks were also thoroughly sandblasted, and corrosion-resistant coatings were applied to both the interior and exterior surfaces. These reservoirs were inspected internally and externally in 1997 and were judged to be in good condition. The only deficiency noted was a breakdown in the external coating system that was causing rust “blisters” to develop. Maintenance personnel stripped, wire brushed, and pressure washed the tanks in the summer of 2000 prior to applying a new polyurethane/epoxy paint that should prevent corrosion from recurring for at least the next 10 years.

A third reservoir serves facilities in a remote area of ORNL. A small 30,000-gallon steel storage tank provides water to facilities in the area previously known as the Health Physics Research Reactor site. While the mission has changed in this area, the facilities continue to be occupied. This tank was inspected in 1997 and was judged to be in poor condition. Internal corrosion has occurred despite cathodic protection, and a new coating system is needed. Discussions with fire protection and operations personnel indicate that this reservoir capacity is no longer

necessary because the reactor has been shut down and moved. Plans are to continue to use the tank until it is no longer serviceable and then replace it with a smaller, 3,000- to 5,000-gal/day tank to serve the needs of buildings in the area. Water supply to this tank is provided from a booster pump station. At the station, there are two electrically driven pumps and one gasoline-engine powered pump. The gasoline pump is the source of concern from a fire protection standpoint because of its age. If capital funding can be obtained, the Fire Department has strongly advocated replacing this old pump and driver with a new diesel driven model.

The water distribution system at ORNL (Fig. I.3) consists of approximately 100,000 ft of cast iron and steel pipe and 900 valves ranging from 2 to 24 inches in diameter, of which the process water segment constitutes a relatively minor part. Contamination of the potable water system is prevented by backflow preventers at the major take-off points and near the points of use on the process system. During the 1970s, the piping in the 7000 Area was upgraded from steel to cast iron.

Critical Infrastructure Condition and Needs

Considering its age, the general condition of the water system is good, but some areas need improvement. Funding is needed to replace and upgrade the four major backflow preventer stations that supply water to the process water system. These stations are over 35 years old, and repair and replacement parts are difficult to obtain. Cross-connection control regulations prohibit the use of nonstandard parts when rebuilding backflow preventer valves; hence, the fabrication of unavailable parts for such units is not an option. Once current vendor inventories of parts are exhausted, the units will need to be removed from service when they fail to pass the annual inspection test. A few years ago, a GPP installed new motorized valves in the older sections of the system, but some older motorized valves and operators still exist and will need to be replaced with operating funds. The main line running east and west through the center of the Bethel Valley site has become brittle, and a major failure occurred in 1981 that was attributed to this embrittlement**.** Several improvements have been identified that would provide improved reliability, especially for fire protection, and would reduce the risk of flooding due to line breaks in low-lying areas. The Fire Protection Upgrade project design has been completed, and construction should begin in the spring of 2002. In addition to addressing a number of fire protection issues, the project will address the issues surrounding potential flooding of research facilities in the 6000 Area as a result of a failure of the 16-inch line passing through the site, as well as provide for a number of new water supply loops in the area to improve water supply for both fire protection and programmatic purposes.

Two other Line Item projects are in the outyear planning base. These two projects address legacy-type problems associated with water lines running through the older process areas within the plant. The soil there is known to be contaminated with radioactive nuclides. Leakage *from* the pipes could leach radioactive material into groundwater and surface water. Leakage *into* the pipes could contaminate the potable water supply itself. A number of studies have been performed on these projects, and risk assessments resulted in the installation of additional valves to allow quick isolation of leaks in these areas. These two projects remain in the planning stages because of the necessity to consider all plausible scenarios to ensure a safe water supply to employees at ORNL. These projects propose to replace the underground water system in contaminated areas with an aboveground water system. This is not considered to be a feasible option for a number of reasons, including the fact that it would be unsightly, difficult to operate, and would not address all the issues surrounding the problem. Any construction activity in these contaminated areas is extremely expensive, and the proposed projects still cannot guarantee with a high degree of certainty that a leak will not occur. It is hoped that, with advances in trenchless technology, new methods of rehabilitating or replacing these lines will become available in the next few years, allowing these areas to be addressed with a reasonable, cost-effective approach.

Potable And Process Water (cont'd)

Additional changes to the ORNL water distribution system will become necessary due to the third-party, State of Tennessee, and DOE facilities that will be constructed in what is now the east parking lot. A 24-inch, a 16-inch, and a smaller 8-inch water line will need to be moved for the 5 new facilities to be located in the area. As currently envisioned, the new piping configuration will move the existing lines north and south of the development area to allow the third-party contractor a clear site for construction. This work will precede the 6000 Area water system improvements by a few months, but when both are completed, the new system configuration should support any future development in the area.

Industrial Gases

Industrial gases used at ORNL facilities are provided in refillable containers by vendors from the local area. These gases include nitrogen, argon, helium, acetylene, and other specialty or high-purity gases required for laboratory and industrial-type uses. Gas cylinders are received at Central Stores and are distributed to the various user stations as requested. Many facilities have gas manifold systems which allow distribution of the gases to many users throughout the facility, while other facilities rely on a system whereby individual users are responsible for their own gases. Liquid nitrogen is an important resource to many facilities throughout ORNL. Bulk liquid nitrogen is delivered to the Laboratory by a vendor and transferred to a bulk storage tank which delivers it to individual users, either into bulk storage tanks or transportable Dewars.

ORNL maintains a storage facility for compressed gas cylinders which is physically removed from adjacent buildings. Safety assessments have been performed on this facility which helped determine stocking levels of hazardous and flammable gases. Stocks of these types of materials are maintained in the facility at these minimum levels to help ensure minimal impact in the event of an accident.

Chilled Water

The Central Chilled Water System (CCWS) centered at Building 4509 provides chilled water used in the air-conditioning systems of 13 buildings in the central portion of ORNL (Fig. I.4). The five branches of the system serve (1) Buildings 4500N (less Wing 5), 4501, and 4505; (2) 4500N (Wing 5), 5500, 5505, and 5507; (3) 5510, 5510A, and 6010; (4) 4515; and (5) 3500, 4508, and 4500S. The system is comprised of 9 chiller units with an aggregate capacity of 8600 tons, 9000 feet of piping, 3 cooling towers, 324 fans, 47 chilled water pumps, and 10 tower water pumps. The chilled water system serves approximately 1 million square feet of floor area, including offices, laboratories, computers, and accelerators. Many of these applications require cooling, regardless of the weather.

ORNL has 34 additional, self-contained chilled water systems, which are located within the individual buildings they serve (i.e., 2026, 2033, 6000, and 7900). These systems include 36 chillers, totaling 3958 tons capacity, with 13 cooling towers. Twenty-seven of ORNL's 45 chillers are less than 15 years old and utilize non-CFC refrigerants. Three CFC chillers have been converted to non-CFC refrigerants using operating funds, one has been abandoned, and four CFC-refrigerant chillers remain operational.

Critical Infrastructure Condition and Needs

The CCWS is in good condition, with a few exceptions. Five of the nine CCWS chillers are less than 5 years old and utilize non-CFC refrigerants. They represent 5800 tons, or 67%, of the cooling capacity available. One 1000 ton CFC chiller is out of service, but effort is under way to secure funding to replace this chiller. Three other units located in the 4500N basement have a combined total capacity of 1800 tons and are primarily used for backup of the newer chillers. Currently, the limiting variable is the capacity of the cooling towers. The Building 4510 cooling tower was rebuilt in 1997 and has a capacity of 4800 tons. The Building 4521 cooling tower was constructed in 1989 and has a 2000-ton capacity. A third tower, Building 4511, was built in 1959, is in extremely poor condition, and cannot be used. The two operating towers have a 6800-ton maximum capacity, which is less than the total available cooling capacity of 7600 tons. An extended outage on the Building 4510 tower will impair the ability to reliably provide cooling to all 13 buildings in any season other than winter. Once the 1000-ton chiller is replaced and the 4511 cooling tower rebuilt, sufficient capacity should be available to meet the needs of existing facilities into the future. Should additional facilities be tied into the central system, additional capacity should be added to ensure that sufficient cooling is always available to support the Laboratory's programs.

An ongoing CFC chiller replacement project has been in process since it was initiated in FY 1994. Thus far, this project has funded the replacement of 15 large CFC chillers with general-purpose equipment (GPE) funding. Additional funds have been earmarked for this program through FY 2003, with the intent to replace the remaining CFC chillers and non-CFC chillers that are deteriorated or have leak rates exceeding the allowable U.S. Environmental Protection Agency (EPA) limits (i.e., 3047E, 7910, 7603).

Five of 13 self-contained cooling towers serving individual facilities are less than 15 years old and most of the others, while old, are still considered to be in good condition because of an effective chemical treatment program that has been in existence since the late 1960s. The most prominent exception to this is the cooling tower serving operations in Building 6000. This tower is considered to be in poor condition and is considered to be somewhat undersized for current and future programs in the area. Funding is being sought to replace or repair this tower as soon as possible.

Chilled Water (cont'd)

An FY 2001 Laboratory Facilities HVAC Upgrade Line Item is under way to improve the chilled water system distribution and extend a new chilled water header to Building 4501. Work on this project is progressing with an expected completion in mid 2003.

The Facilities Management Division maintains an active database of projects and equipment needed to maintain cooling systems at the Laboratory. Funding has been requested from the various sources available, including Energy Saving Performance Contracting. The importance of maintaining this valuable infrastructure component is recognized by Laboratory Management, and adequate funding should be in the pipeline in the coming years to ensure its reliable performance.

Steam

The steam production system consists of four boilers and two package-type boilers, all of which are housed in the Steam Plant (Building 2519). The total capacity of the six boilers is slightly over 300,000 lb/h of saturated steam at 250 psig when firing on either natural gas or fuel oil. The Steam Plant supplies steam to the Bethel Valley facilities and the 7500 and 7900 Areas in Melton Valley. The Steam Plant also houses the necessary auxiliaries, such as boiler feedwater pumps, induced- and forced-draft fans, water-softener systems, the fuel oil pumping system, and the natural gas pressure-reducing station. The coal-handling system and the ash disposal system have been shut down, and various components are being demolished and removed from the facility as resources and conditions allow.

The Steam Plant was constructed in 1948 and underwent conversion from coal to natural gas/fuel oil in the early 1950s, and from natural gas/fuel oil back to coal in the late 1970s. The addition of the #6 Boiler two years ago allowed, once again, conversion of the plant back from a coal/natural gas plant to a natural gas/fuel oil plant. Much of the coal-handling equipment on the boilers has been removed and the coal storage yard has been closed and capped. The 2001 heating season is the first winter in 24 years that the Steam Plant has not been fired, at least partially, on coal. Natural gas and fuel oil are now the only fuels that can be used in the plant.

The 2001 boiler overhaul effort concentrated on trying to improve the firing efficiency of the older boilers by sealing air leaks into the boiler fire boxes. The moving grates in each boiler were covered with fire brick and refractory and insulation were added throughout the fire box. The result has been boilers that appear to be firing more efficiently and fewer boiler problems with combustion air and hot spots. Efforts to further improve the plant's efficiency will continue in FY 2002 as boiler controls for the #5 Boiler are upgraded and as more coal-related equipment is removed from each boiler, further allowing a tighten-up of the fireboxes.

About 90% of the steam produced is used primarily for heating approximately 135 buildings, and the remainder is used for process steam. The process steam drives the emergency off-gas turbines in the 3039 stack areas if there are power outages. Other uses include heating water and drying clothes in the Decontamination Laundry; dish, pot, and pan washing in the cafeteria; and processes to support R&D activities throughout ORNL.

The steam distribution system (Fig. I.5) is sized to handle the total capacity of the six boilers. The system includes approximately 27,000 feet of piping and involves approximately 360 major valves, 50 steam-regulating stations, and 70 steam pits. Steam is produced at 240 psig and routed from the northeast and southeast corners of the Steam Plant through an 8-inch line along Central and White Oak Avenues to form a loop around the Building 4500 complex. Steam lines to the 7000 Area are connected to the loop near Building 5505. A project to replace the steam and compressed-air lines in the eastern portion of the Bethel Valley complex, with new lines in concrete trench ducts, was completed in 1989. These trench ducts have easily removable concrete lids and, because they were set below grade in most areas, have the outward appearance of sidewalks. Work was essentially completed in 1998 on a similar upgrade of the western portions of the steam and air distribution system. New lines were installed in the below-grade pipe trenches, and 18 buildings were tied into the new looped system. Some additional minor demolition work on the old system remains to be done and will likely be performed using operating funds when resources allow.

Critical Infrastructure Condition and Needs

While the Steam Plant remains reliable, the major equipment systems, including the boilers, have exceeded useful design life. A Steam Plant study was completed that identifies replacement and upgrade projects that will be necessary if the plant is to continue to operate reliably and efficiently. It is doubtful that funding will be available in the foreseeable future to finance the construction of a new steam plant to make any type of wholesale improvements to the steam generation system. Because of this, it appeared that a master plan needed to be developed to determine the least costly means to ensure continued operations. Many pieces of major equipment and a number of critical systems will need to be replaced in the next 10 years. The plan identifies these needs and will allow funding to be allocated to these projects in manageable portions. The result should be (1) relatively stable steam costs after the first few years of equipment and system close-out costs and (2) significant capital cost avoidances from not having to repair and replace major coal-related systems.

A number of other projects are also under way or will be in the upcoming years. Funding will be allocated within the next couple of years to replace the economizers on Boilers 1 and 4, after completion of a successful project which replaced the same components on Boilers 2 and 3 during the summer of 1998.

The East End Water Softener System softens boiler feedwater and serves as a backup to the primary West End Softener System. This old system was installed in 1963 and desperately needs upgrading. Currently designed to treat boiler feedwater to produce up to 100,000 lb/h of steam, its performance has degraded steadily over its years of use. The system needs to be replaced with a new unit designed to accommodate the normal maximum winter steam output in order to be an effective backup system.

The Boiler No. 6 project that was completed in September 1999 provided the key component in the coal-to-natural-gas-conversion strategy. Its addition gave the Steam Plant the capability to produce year-round steam loads without using coal. With this capability, ORNL will be able to rehabilitate the old coal boilers, one at a time, and convert them from coal stoker boilers to natural gas and fuel oil firing. The rehabilitation effort will include installation of new steam tubes and drums, replacement of all refractory brick and insulation, and removal of all coal-handling equipment and replacement with a new fuel manifold system to allow maximum output from gas or fuel oil. Projects have been proposed to perform this upgrade over a span of years to ensure that the Steam Plant remains viable well into the future.

No improvements are currently planned for the steam supply to facilities in the Melton Valley area, including the HFIR. If future funding allows, and programmatic requirements dictate, an additional feed line will be run from the Steam Plant and tied into the existing Melton Valley line at a point just north of the HFIR Area. The addition of this new feed will allow maintenance outages to occur on the supply lines without affecting HFIR or other facility operations.

Stormwater

The stormwater collection system consists of drainage ditches, catch basins, manholes, and collection pipes which convey stormwater, condensate, and cooling water flows to the receiving streams. White Oak Creek traverses the site and ultimately receives all the discharges from ORNL, as well as normal flows from the four tributaries which feed it. Rainfall, snow-melt, and other authorized flows are directed to the gravity-drainage system which conveys the water from buildings, parking lots, streets, and roofs to specific outfalls. The collection system itself was installed in an unplanned manner over the years as ORNL developed and matured, which has resulted in the existence of 146 National Pollutant Discharge Elimination System (NPDES)- Permitted stormwater outfalls discharging into the receiving streams. To comply with current stormwater regulations and ORNL's NPDES Permit, each of these outfalls must be periodically sampled and characterized to determine the makeup of the discharge stream and to ensure that it complies with permit requirements.

Significant effort must be expended to keep up with compliance-related issues associated with these outfalls and their discharges. During the last few years, three liquid-feed dechlorinators have been installed on outfall pipes that carry large volumes of once-through cooling water. Smaller, tablet-feeder dechlorinators have also been installed on numerous outfalls that convey smaller continuous or periodic flows of cooling water. Due to the strict in-stream chlorine concentration limits imposed on ORNL by the NPDES Permit, it is imperative that these wastewater streams are chlorine-free prior to their discharge.

A comprehensive storm drain survey was completed at ORNL in the summer of 1997. This survey was mandated by a court order that resulted from the Friends of the Earth vs DOE lawsuit. It consisted of a comprehensive survey of all pipes, sinks, and other connections to the storm drain system. Facility managers, subject matter experts, and members of the support services staff walked-down and dye-checked all the drains in 846 facilities, buildings, and other structures located within the ORNL Complex. The results of this survey are maintained in a central database, updated annually, and continue to be used to eliminate inappropriate discharges into the stormwater system and to identify sources of once-through cooling water that can be treated, rerouted, or eliminated. Both the liquid-feed and smaller, tablet-feed dechlorinators are being used to treat chlorinated discharges, but because of the costs involved in the maintenance and upkeep of these units, substantial efforts are being made to eliminate the sources of the discharges. Through these efforts, it is hoped that compliance can be consistently achieved with a minimum of expense and effort.

In all areas, ORNL has adopted a "best management practices" approach as an economical and practical way to achieve compliance. A *Stormwater Pollution Prevention Plan* describing these practices is in place and serves as a guidance document to help identify potential problem areas and to recommend possible mitigating actions that can be taken to avoid permit noncompliances. Its emphasis is on prevention, and members of the compliance staff actively participate in project development and oversight activities to ensure that every possible effort is taken to prevent stormwater-related problems.

Construction activities at the Spallation Neutron Source continue, and contractors working on the project have instituted a proactive stormwater management approach. The entire 125-acre site has been ringed with silt fencing and straw bales, with special emphasis on drainage swales and runoff corridors. To assist in the long-term management of stormwater flows from the facility, two new stormwater retention ponds have been constructed. These ponds collect stormwater flows and allow solid particles to settle out before the water is discharged. Thus far, they have been very effective in preventing the carry-over of silt into the surrounding watershed.

Critical Infrastructure Condition and Needs

Despite its somewhat haphazard and undocumented installation, the condition and performance of the stormwater collection system is very good. Under all but the worst of conditions, the system removes storm flows from the Laboratory grounds without flooding or causing other damage. The issues related to the stormwater system have to do with the widespread use of once-through cooling water and the need to dechlorinate those flows. Maintenance and upkeep of the dechlorinators, particularly the tablet-feed type is intensive and time consuming. During rainy periods, keeping them supplied with tablets can become a near full-time job. A second issue relates to the chemical used to dechlorinate. It is a toxin as well as an oxygen scavenger and, if it becomes too concentrated in the creeks, it can cause fish kills and other problems. The problems related to the stormwater system have nothing to do with the system itself, but rather with how the system is used. If the Laboratory can pursue the installation of recirculating cooling systems to eliminate the once-through flows, many problems associated with the stormwater collection system, as well as the pollution prevention program in general, will be eliminated.

Conventional Waste

Conventional wastes include sanitary/industrial wastes, sanitary sewage, process wastewater, and stormwater. Solid conventional wastes are regulated by the Tennessee Solid Waste Management Act.

Sanitary/Industrial Wastes

Sanitary/industrial waste consists of paper, garbage, wood, metal, glass, plastic, demolition and construction debris, sanitary and food wastes from cafeteria operations, sludge from water and air treatment, and other special wastes. The Y-12 National Security Complex Centralized Sanitary Landfill II is used for disposal of nonhazardous materials such as construction debris and most other sanitary wastes.

Sanitary Sewage Collection and Treatment

Sewage Collection. The sewage collection system (Fig. I.6) consists of over 32,000 ft of clay, cast iron, and polyvinylchloride (PVC) pipe ranging in size from 4 to 12 inches. Access to this system is obtained through 194 brick and concrete manholes. The system itself has grown as ORNL has grown. The early parts of the system, located roughly between First Street and Fifth Street, were constructed in 1943 when ORNL was built and consists primarily of vitreous clay pipe with packed joints and manholes constructed entirely of brick. The rest of the collection system was constructed as the Laboratory grew and developed. The construction methods used in these areas reflect construction practices used when they were built, with some collection grid lines constructed from vitreous clay, concrete, cast iron, and PVC. Manhole construction also reflects this diversity, as some are built entirely from brick, others are part brick and part concrete, some are poured-in-place concrete, and the newer manholes reflect the current practice of using precast units.

In the early 1980s, a leak test was performed on the system which indicated areas where illegal taps had been made and where infiltration was a problem. The illegal taps were removed and restrictions placed to help prevent the recurrence of the problem. The survey also was used as the basis for the first GPPs in the mid-1980s directed at lessening infiltration into the system. During 1984 and 1985, approximately 60% of the sewage collection grid lines 6 inches and larger were rehabilitated using a then-new process called Insituform. The Insituform process installs a new, joint-free liner inside the existing pipe, creating a slick, leak-free system. The success of this effort was immediate, with daily average flows falling from the 250,000 gpd range to the 150,000 gpd range.

This proved not to be the ultimate solution to infiltration problems. Within a year after these lines were rehabilitated, volumes began to slowly increase. Investigation of the problem indicated that the groundwater flow which previously had been entering the pipe through open joints, cracks, and breaks was now flowing along the outside of the pipe and entering the system either through the manholes or through a section of pipe which had not been lined.

Because of this problem and other weaknesses identified in the sewage collection system, a Line Item project to upgrade the sanitary sewage collection system was initiated in the late 1980s and funded in 1993. This project successfully upgraded most of rest of the collection system by installing cured-in-place lining in all sewer lines 6 inches and larger, sealing all manholes with a high-build polyurethane, and making other improvements. There are currently only a few short sections of the main collector lines, as well as the individual building service laterals, that could not be rehabilitated. Developments in the trenchless technology industry that would allow further sealing of the collection system with a minimum of excavation are being monitored.

Sewage Treatment. The ORNL Sewage Treatment Plant consists of a DAVCO 300,000-gpd packaged, extended aeration plant which provides primary and secondary treatment and a sand/gravel filter and disinfection chamber to provide tertiary treatment. The plant was constructed in 1985 and has performed continuously since that time. Treated flows averaged 182,841 gpd during FY 1999; 190,215 gpd in FY 2000; and dropped slightly to 186,458 gpd in FY 2001.

Efforts aimed at improving overall operations at the Sewage Treatment Plant continue with some notable successes. A tank has been procured and is being installed that will allow easier disposal of the plant's digested sludge at the City of Oak Ridge's West End Treatment Plant. Sampling and analytical uncertainties are greatly reduced by having a static volume of sludge to handle. By using the tank, 15,000 gallons of digested sludge can be accumulated over time and then sampled and analyzed prior to being taken to the City. Previously, sampling occurred in the sludge digester tank at the Sewage Treatment Plant, which was constantly receiving additional sludge. The analytical results only provided a snapshot in time. The new tank will allow greater confidence in the sampling and analytical process and will allow greater accuracy in determining whether the sludge meets the acceptability requirements established with the City.

The ozonator system installed at the Sewage Treatment Plant has been in operation for over a year and is operating satisfactorily. The back-up chlorinators were removed and chlorine is no longer stored or used at the Sewage Treatment Plant. The use of this system has helped reduce the amount of chlorine being released into the receiving streams resulting in a reduction in the amount of dechlorination chemicals needed. Dechlorination chemicals are a problem because of the tendency to deplete oxygen levels in the creeks.

The Spallation Neutron Source (SNS), the Life Sciences Complex, the new third-party campus, and their associated processes will generate new flows into the Sewage Treatment Plant. Planning is under way to ensure that their needs will be accommodated in both the construction and operational phases of these projects. A computer model of the sanitary sewage collection system has been created, and the new flows from these and other facilities have been modeled. Some potential problem areas have been identified in the pumping stations at 4512 and 3501. Pumps at the stations are not currently operating at their rated capacity, and plans are being made to determine the cause of these problems. The model indicates that, while these stations are currently able to accommodate the flows from the new facilities with their present level of operating performance, there are some peak loading scenarios that could cause surcharge conditions. The system underwent smoke testing during the summer of 2001 to determine possible problem areas and potential sources of infiltration and other unauthorized inflows. A number of areas where infiltration could possibly occur were identified. Most were broken or missing clean-out plugs, but there are a few areas where it appears a line may be broken that could allow rainfall or runoff to enter the collection system. Plans have been made to repair all of the deficiencies.

Critical Infrastructure Condition and Needs

The only deficiency currently identified within the sewage collection and treatment system is an improvement needed to the east end of the collection system to accommodate the new flows generated by the SNS and the population shift brought about when the third-party facilities are occupied. The computer model of the system indicates that this is a non-critical problem that may manifest itself during periods of heavy flow brought about by inclement weather. The proposed improvements have not been thoroughly defined, but will likely include the upgrading of the sewage pumping stations and possibly enlarging a short section of line in the 6000 Area.

Conventional Waste (cont'd)

The remainder of the collection system, with the exception of the 4-inch- and smaller-diameter service laterals, is in excellent condition. Improvements and upgrades made by the 1993 Line Item project were successful in providing a relatively tight, leak-free system that is impervious to root infiltration. The exception, as noted previously, is with the small-diameter service laterals. These are the lines that run from the main collector trunk lines back up to the individual buildings. Access to both ends of these pipes is impossible without excavation within the buildings themselves. Plans are to continue to monitor developments in trenchless technologies that will allow rehabilitation of these service lines with a minimum of excavation and disruption of service.

The Sewage Treatment Plant is a package unit with a 25-year design life. The plant is currently 17 years old, meaning that, in about 5 years, planning should begin to replace the plant. This time window works well with current plans in the Laboratory. In 5 years, the SNS should be operational, the new campus facilities occupied, and the other facilities to be built by the State and DOE should be functional. The plant population shifts will have stabilized as employees move from the older facilities into the new structures. Likewise, the flow characteristics of the sewage collection system will have changed and stabilized, allowing for accurately determining the baseline information needed to begin specifying a new treatment plant.

A pollution prevention project is also planned for the Sewage Treatment Plant. A denitrification system has been identified that will remove most of the nitrates from the plant's effluent stream. A portion of the Laboratory's toxic release inventory consists of the nitrates released from the Sewage Treatment Plant. The removal of this waste stream, while not compliance driven, will reduce pollutant discharges into the environment and will help the Laboratory achieve its waste reduction goals.

Transportation Infrastructure

ORNL main site locations are accessible only by road. The southern areas of the Laboratory's environmental research areas border the Clinch River, but no barge facility has been developed. Such a facility could be developed if future needs arise that will require moving large, heavy objects. ORNL has access to and has used two different barge facilities in the past; one at the East Tennessee Technology Park (ETTP) and the other at the Tennessee Valley Authority's Bull Run Steam Plant. Rail access is limited as well, as no tracks run to the ORNL site. Access to rail service can be made either at the ETTP or at the Y-12 National Security Complex, both of which are served by a rail spur.

Motorized vehicle circulation at ORNL may be divided into two sectors: off-site and on-site. Off-site circulation consists of staff movements to and from work and between the various other Oak Ridge installations and offices for work assignments and for material pickup and delivery. Off-site roads include State Route 95 (White Wing Road), located approximately 1 mile to the west of the Laboratory's main complex, and State Route 62 and Scarboro Road, which provide access to the Laboratory and ORNL facilities at Y-12 from the east. Bethel Valley Road extends between Highways 95 and 62 by running approximately 8 miles through the center of the Oak Ridge Reservation (ORR) and is the main artery serving the Laboratory. Though Highways 95 and 62 run through the ORR, maintenance and emergency services on these roads is provided by the State of Tennessee and the City of Oak Ridge. Bethel Valley Road, on the other hand, is owned by DOE, and maintenance services are subcontracted. Security and emergency services are provided along Bethel Valley Road by Wackenhut Services, the City of Oak Ridge, the State of Tennessee, or, as is often the case, a combination of these three entities. The State of Tennessee is considering routing a west interstate bypass around the Knoxville metropolitan area. A number of alternative routes are being considered, including one route across the ORR (Fig. 2.16).

On-site motor vehicle circulation consists of employee movement between and among work sites within ORNL and the delivery and pickup of materials, tools, and equipment used to support routine operations. In addition to walking, employees use cars, trucks, golf carts, and bicycles to move among the widely dispersed facilities at the Laboratory. A paved bicycle trail extends from the west end of the plant to provide a safe and efficient way for cyclists to move about Laboratory facilities.

Principal roads serving ORNL's Bethel Valley Site are shown in Fig. 3.1. The main road is Bethel Valley Road, an east-west thoroughfare that provides access to the site and leads to all of the main parking lots. The road was resurfaced in 2001, from the ORNL 7000 Area to the main entrance and from the First Street intersection westward approximately 3/8 mile. The need for improved security at ORNL and along Bethel Valley Road has brought about a change in the vehicle access to ORNL. Beginning in December 2001, vehicle access to Bethel Valley Road and the use of Bethel Valley Road is restricted to those who have official business with the Laboratory. There are manned guard portals at either end of Bethel Valley Road to check badges or review cargo manifests to ensure that vehicles traveling on Bethel Valley Road have a need to do so. It will no longer be used as an east-west shortcut for vehicles to avoid the City of Oak Ridge or the Interstate system around Knoxville. This restricted access will be beneficial to the Laboratory in a number of ways. Most importantly, a greater degree of security can be provided to all Laboratory facilities and employees if vehicles traveling within a few hundred feet of the plant have passed through a security checkpoint. By extending the security envelope to the edge of the reservation, ORNL can also pursue its goal of becoming a more open facility without compromising the safety or security of its facilities or employees.

Completion of several construction and expansion projects has alleviated chronic parking problems experienced at the Bethel Valley facilities over the last couple years. Parking lot conditions, in general, are good. Most asphalt lots are holding up well but could stand a general re-striping to delineate parking spaces.

Gravel lots typically serve to provide parking under overflow conditions, such as during the heavy guest and visitor months in the summer. These lots are well constructed and provide safe parking for employees, but should be paved to meet the intent of ORNL's Stormwater Pollution Prevention Plan. Rains cause erosion and rutting in the gravel lots and the sediment picked up during rains is carried into the area's receiving streams.

A number of proposals for new facilities have them located in what are now parking lots. The "Mouse House" is conceptually sited in the parking lot immediately west of Building 1000. Parking spaces displaced by this building will be relocated to a gravel lot located north and west of the building. The new research campus is proposed for different areas of what is now the East Parking Lot. Vehicles displaced from this lot will need to find spaces in two recently paved lots in the 6026 Area, in a new lot that will be constructed south of the 6000 Area of the Laboratoryd or in the expanded 4500N Flag Pole Lot. Other construction projects will also affect parking in existing lots. Because of this, additional parking has been provided in a new Sixth Street Lot, a new lot at the east end of Southside Drive, a new parking area above what used to be the Gunite Storage Tanks, as well as in smaller lots located along White Oak Avenue and other smaller areas yet to be developed. The gravel lots at the HFIR Complex will also be paved in FY 2002.

On-site transportation is provided by an arterial grid system of streets running through ORNL. North-south access is provided by numbered streets, starting with First Street at the west end of the plant and ending with Eighth Street in the east. The main east-west corridors are Central Avenue and White Oak Avenue. Most main routes have sidewalks running parallel to them to ease employee accessibility and improve safety. Sidewalk conditions throughout ORNL are considered good, with only small sections needing repair or replacement each year. Vehicles used for casual transport, as well as those used to haul materials and make deliveries, utilize the same traffic grid, though traffic volumes and such problems are rare.

The main roads in Melton Valley are Melton Valley Drive, Ramsey Drive, Melton Valley Access Road, Lagoon Road, and HPRR Access Road (Fig 3.2). These roads lead to the principal experimental facilities, including the High Flux Isotope Reactor (HFIR), Robotics and Process Systems Complex, and the Radiochemical Engineering Development Center, as well as to the numerous Solid Waste Storage Areas (SWSAs) and waste processing sites in the valley. Road conditions need to be improved on both Melton Valley Drive and Lagoon Road. Both roads predate ORNL and were designed only to provide access to the farm community that was in the area prior to 1943. Melton Valley Drive east of the HFIR entrance has not been paved or upgraded since the 1960s and has deteriorated significantly. The old asphalt surface has many cracks and irregularities, and subsurface drainage systems show signs of failing, causing areas of undermining of the base material. Traffic volumes, both vehicular and pedestrian, dictate that the road be realigned and leveled to provide a safe driving surface for employees and guests who must use it. Lagoon Road is similarly affected. Age and use, coupled with a poor initial design, make this road dangerous, particularly in wet weather. The road has many hills and curves and needs to be straightened and leveled to improve safety. The northern section of the road, extending from the Chemical Waste Area Access Road to Melton Valley Drive, runs adjacent to ORNL's SWSA 4. This section of the road will be rebuilt and relocated while construction forces install a new cap and seal over the old burial ground area.

Copper Ridge has one main route, Gravel Hill Road, which connects the old DOSAR Facility and the Tower Shielding Facility to State Route 95. The road is a single-lane, unimproved gravel access road running along a power line right-of-way. Since the Tower Shielding Facility has been turned over to CROET for reindustrialization, access into the area by anyone other than a small group of utility service providers is

being discouraged. The road will continue to be adequate for these users if properly maintained.

By far, the largest portion of off-site traffic circulation is generated by ORNL personnel commuting to and from work. The average commute of an ORNL employee working in Bethel Valley is about 35 miles. Peak traffic occurs between 6 and 8 a.m. with the arrival of workers at the site and between 3:30 and 5 p.m. with their departure. Minimal traffic delays are experienced during these peaks since work shifts are staggered, car and van pooling are practiced, and most deliveries to and shipments from ORNL are timed to avoid the rush hour. Road maintenance and the movement of heavy equipment or escorted shipments typically occur during the workday after traffic flow has subsided.

Critical Infrastructure Condition and Needs

- Parking Lot Construction
- Bethel Valley Road Improvements
- Melton Valley Road Improvements
- On-Site Transportation Initiatives

APPENDIX J

Detailed Description of Security Improvements

Detailed Description of Security Improvements

The ORNL Laboratory Protection Division (LPD) has the overall responsibility for providing classified matter protection and control, a foreign national visits and assignments program, a foreign travel program, nuclear materials control and accountability, nuclear materials management, personnel security, physical security, security program management and planning, and visitor services to all ORNL organizations and operations. The objective of the LPD is to implement appropriate security measures needed to protect against events that may cause adverse impacts on national security, the environment, and the health and safety of Laboratory employees and the public, while maintaining an environment conducive to the conduct of scientific research and development and the efficient operation of the installation.

Under a prime DOE Oak Ridge Operations Office contract awarded in September 1999, Wackenhut Services, Inc. - Oak Ridge (WSI-OR) started providing ORNL with selected security services on January 10, 2000. Although WSI-OR provides some select security services to the laboratory, overall management responsibility for ORNL's multi-faceted security programs remains with UT-Battelle. WSI-OR, however, does have programmatic responsibility in two specific areas: ORNL Protective Force (PF) operations and the Personnel Security Assurance Program (PSAP).

J.1 ORNL PROTECTION STRATEGY

ORNL protection strategies are dependent upon the establishment of concentric layers of increasing security measures, starting at the Laboratory's outer boundary and moving inward toward the site's and DOE's specific security interests, to include special nuclear material and classified matter storage and handling facilities. Under this concept of layered security, the probability of deterring or detecting hostile acts, as well as increasing difficulty and delay in perpetrating these acts as a potential adversary approaches the site's interior target areas, increases progressively. Conceptually, this requires reliance upon a graded approach in protecting four fundamental types of security areas:

Material Access Area (MAA): Area where Category I and II quantities of special nuclear material are processed, used, or stored. MAAs are located within a Protected Area, have additional access controls and intrusion detection, and are defined by physical barriers. Unescorted access to an MAA requires a "Q" clearance and special approval. MAAs exist within the National U-233 Repository, in Building 3019.

Protected Area: Security area utilized to protect Category I and II quantities of special nuclear material and protected by physical barriers, such as walls and fences, and equipped with intrusion detection and access control systems. Unescorted access to a Protected Area requires a "Q" clearance and special approval. The Laboratory's sole Protected Area is situated within Building 3019.

Limited Area: Security area established for the protection of classified matter and/or Category III quantities of special nuclear material. An "L" or "Q" clearance is required for unescorted access within these areas, which are generally located within buildings. The Laboratory has a number of different Limited Areas at disparate locations.

Property Protection Area (PPA): Security area having boundaries identified with barriers and access controls established to protect government-owned property. Uncleared personnel with proper identification (a DOE photo-identification badge or ORNL Visitor Identification) may have unescorted access. Most areas at the laboratory are designated as PPAs.

Activation of intrusion detection alarm systems in security areas at ORNL which house special nuclear material will result in a tactical response from the ORNL Protective Force within a predetermined period. Special nuclear material located in ORNL facilities is provided a level of security commensurate with its safeguards quantity and attractiveness level.

Classified matter is stored and processed in Limited Areas at ORNL. Access to these areas is limited to "L"- or "Q"-cleared individuals with appropriate need-to-know or to personnel accompanied by authorized escorts. Classified areas have been developed, when required, to support various classified projects using the "security island" concept. This concept ensures that only the physical space required for the classified work receives the necessary additional restrictions and increased level of protection.

Access Control. Most of ORNL is designated as a PPA. To enter a PPA, employees and visitors must wear identification badges, but they do not have to possess a security clearance. No classified matter may be stored in these areas, nor may classified subjects be discussed. PPAs are generally defined by either chain-link fences or building perimeters. Access points are controlled by the ORNL PF or proximity card-reader (automated access control) doors, gates, and/or turnstiles, or, alternatively, are administratively controlled via receptionists or restrictive signage. Construction of new access control portals along Bethel Valley Road was completed during FY 2002. The new portals provide a more efficient and effective control mechanism for maintaining authorized staff and visitor access to the site. Vehicular access to the main campus area during other-than-normal work hours is further restricted.

Fencing and Other Barriers. The most common perimeter security barrier currently used at ORNL is chain-link fencing; however, in concert with an “open” campus policy for areas of the Laboratory where the principal focus is “science”, there are some areas which are not enclosed by fencing. When fencing is used without intrusion-detection devices, it has limited ability to detect unauthorized entry and serves more as a psychological barrier. A more effective physical barrier can be the walls of a building. Most wall materials are more solid and difficult to penetrate than the fence fabric; however, these materials must be carefully selected and properly designed when used as a barrier for a Limited Area or higher.

Lighting. Protective illumination is provided to enhance the ability of observers to detect and assess potential adversaries and to reveal the presence of unauthorized persons.

Signs and Other Postings. Security signage is posted as required by DOE M 5632.1C-1, “Manual for Protection and Control of Safeguards and Security Interests,” at portals and along the defined site perimeter. Signage includes No Trespassing, Prohibited Articles, Subject to Search, and the Nuclear Material Rewards Act signs.

During both FY 2001 and 2002, steady progress has been and will continue to be made on reconfiguring the security posture of the Laboratory. This reconfiguration has led to a migration of personnel access controls to the building level rather than relying solely on site perimeter boundary access controls. This reconfiguration of site access control policy, coupled with a DOE-approved move to take control of Bethel Valley Road, will result in improvement of overall site security and in an enhancement of the layered approach to protecting assets needing the most protection. New access control measures will improve the Laboratory’s ability to better control the specific area access of foreign national visitors and guest assignees and will result in enhanced protection of unclassified sensitive information.

Security Improvements. Planning for continuous improvement of ORNL security will continue to focus on applying the right mix of security measures to (1) assure the protection of DOE security interests and the site populace against events that may cause adverse impacts on national security, the environment, and personnel health and safety, while continuing to (2) maintain a work environment most conducive to ORNL's science mission. Full implementation of an Integrated Safeguards and Security Management (ISSM) program in FY 2002 will result in increased line management accountability and responsibility for security and will lead to enhanced overall site security.

J.2 ORNL AT THE Y-12 NATIONAL SECURITY COMPLEX

The Y-12 National Security Complex also operates under a graded safeguards approach and defense-in-depth, or layered, security concept. All of the ORNL facilities at the Y-12 National Security Complex, with the exception of Building 9204-3, are located in the PPA. This access area comprises the eastern and the extreme western portion of the Y-12 Complex and contains security fences, gates, and portals that control access and prohibit movement of unauthorized persons into areas with higher levels of security. The Life Sciences Complex, which is situated in the same valley as the Y-12 National Security Complex, is a separate ORNL facility which falls under the ORNL security program.

Building 9204-3 is located within the Y-12 National Security Complex Protected Area. In this area, Security Police Officers from the Y-12 Protective Force and other internal controls are used to prevent access to classified matter and special nuclear material by unauthorized persons. A "Q" clearance is required for unescorted access to this area.

Infrastructure Needs

- CCTV Replacement Project ($1.3M)
- Hardened Central Alarm Station (CAS) ($1.5M)
- Upgrade Intrusion Detection Alarm System Infrastructure ($100K)
- Upgrade Automated Access Control System and Infrastructure ($300K)

APPENDIX K

Candidates for Disposition
and Space Management Plan Summary

Table K.1 Candidates for disposition (as of July 19, 2002)

Site Location	Facility Number	Facility Name	Responsible D&D Program	Gross Sq Ft	Year Built	Year Targeted for Deactivation
Y-12	9105	ENGINEERING OFFICE BUILDING	DP	7,400	1977	FY01
Y-12	9207	BIOLOGY BUILDING	EM	247,500	1945	FY01
Y-12	9211	CO-CARCINOGENSIS	EM	76,600	1945	FY01
Y-12	9220	MOLECULAR BIOLOGY FACILITY	EM	22,350	1967	FY01
Townsite	XC1402	AMSE MUSEUM	SC	55,000	1974	FY02
X-10	0964	WASTE INSPECTION BUILDING	SC	200	1996	FY02
X-10	2000	SOLID STATE ANNEX	EM	22,660	1948	FY02
X-10	2001	INFORMATION CENTER COMPLEX	EM	25,338	1948	FY02
X-10	2013	WEST MAINTENANCE SERVICE CENTER	SC	11,969	1943	FY02
X-10	2017	EAST RESEARCH SERVICE SHOP	EM	228	1943	FY02
X-10	2029	OFFICE TRAILER	SC	1,173	1974	FY02
X-10	2030	OFFICE TRAILER	SC	720	1976	FY02
X-10	2087	STORAGE I-E	EM	187	1948	FY02
X-10	2088	EMERGENCY GENERATOR BUILDING FOR 2000	EM	161	1948	FY02
X-10	2092	STORAGE	EM	114	1959	FY02
X-10	2506	P&E MAINTENANCE SHOP & SUPPORT BUILDING	SC	10,620	1943	FY02
X-10	2647	CONSTRUCTION ENGINEERING TRAILER	SC	2,160	1965	FY02
X-10	3508	I&C METROLOGY AND CALIBRATION	EM	13,863	1951	FY02
X-10	3531B	TRAILER	SC	666	1996	FY02
X-10	3534	STORAGE BUILDING	SC	180	1961	FY02
X-10	3534A	HEALTH PHYSICS TRAILER	SC	320	1970	FY02
X-10	3534B	HEALTH PHYSICS TRAILER	SC	320	1970	FY02
X-10	3537	HYDROGEN & OXYGEN DISTRIBUTION	SC	3,000	1961	FY02
X-10	3541	ENGINEERING DEVELOPMENT LAB	EM	870	1965	FY02
X-10	3550	RESEARCH MATERIALS PREPARATION FACILITY	EM	14,036	1943	FY02
X-10	3550T	INTERCOMPARISON STUDY DILUTIONS LAB.	SC	480	1965	FY02
X-10	3592	COAL CONVERSION FACILITY	EM	694	1952	FY02
X-10	4005	SENTRY POST 8C, 5TH ST. PORTAL	SC	80	1995	FY02
X-10	5506	SENTRY POST 1B, EAST PORTAL	SC	544	1963	FY02
X-10	5553	SENTRY POST 1E, WHITE OAK E. P	SC	60	1964	FY02
X-10	6003	PHYSICS OFFICE BLDG.	SC	6,552	1976	FY02
X-10	6026A	OFFICE TRAILER	SC	1,728	1990	FY02
X-10	6026B	OFFICE TRAILER	SC	1,728	1990	FY02
X-10	6026C	OFFICE TRAILER	SC	1,728	1990	FY02
X-10	6026D	OFFICE TRAILER	SC	1,728	1990	FY02
X-10	6026E	OFFICE TRAILER	SC	1,728	1990	FY02
X-10	6026F	CONFERENCE AND OFFICE SUPPORT TRAILER	SC	1,728	1990	FY02
X-10	6026G	OFFICE TRAILER	SC	1,728	1990	FY02
Y-12	9102-1	ENGINEERING TECHNOLOGY OFFICE BUILDING	DP	6,250	1964	FY02
Y-12	9102-2	ENGINEERING TECHNOLOGY OFFICE BUILDING	DP	6,200	1976	FY02
Y-12	9108	ENGINEERING TECHNOLOGY OFFICE BUILDING	DP	7,510	1981	FY02
Y-12	9201-3	ENGINEERING TECHNOLOGY ADMIN. AND LAB BLDG.	DP	187,300	1944	FY02
Y-12	9610-3	ENG. TECH. FLAMMABLE MATERIAL	DP	512	1990	FY02
Y-12	9720-39	COLD STORAGE BUILDING	DP	8,000	1984	FY02
X-10	0942	ESD TRAILER	SC	160	1970	FY03
X-10	0961	ORNL VISITOR OVERLOOK	SC	3,596	1983	FY03
X-10	2011	ELECTRIC & AC SERVICE CENTERS	EM	5,618	1943	FY03
X-10	2024	QUALITY ASSURANCE INSPECTION OFFICE BLDG.	EM	10,300	1969	FY03
X-10	2093	ENVIRONMENTAL STORAGE BUILDING	SC	420	1953	FY03
X-10	2102	PCM TRAILER	SC	128	1990	FY03
X-10	2652A	TRAILER, RADIOLOGICAL SURVEILLANCE	SC	1,728	1990	FY03
X-10	2652B	TRAILER, RADIOLOGICAL SURVEILLANCE	SC	1,728	1990	FY03
X-10	2652C	TRAILER, RADIOLOGICAL SURVEILLANCE	SC	1,464	1990	FY03
X-10	3013	ENERGY DEVELOPMENT STORAGE BUILDING	SC	616	1946	FY03
X-10	3503	HIGH RAD. LEVEL CHEM. ENG. LAB	EM	13,716	1948	FY03
X-10	6556E	FOREST MANAGEMENT TRAILER	SC	980	1989	FY03
X-10	6556Q	FOREST MANAGEMENT TRAILER	SC	648	1989	FY03
X-10	6556S	FOREST MANAGEMENT TRAILER	SC	128	1989	FY03
X-10	7964B	RESEARCH REACTORS OFFICE TRAILER	SC	2,088	1987	FY03
X-10	7964D	RESEARCH REACTORS OFFICE TRAILER	SC	672	1988	FY03
Y-12	9204-1	ENGINEERING TECHNOLOGY	EM	196,700	1944	FY03
Y-12	9401-1	ENGINEERING TECHNOLOGY LABORATORY FACILITY	EM	12,000	1945	FY03
Y-12	9743-2	PIGEON QUARTERS	EM	2,200	1949	FY03

Table K.1 Candidates for disposition (as of July 19, 2002)

Site Location	Facility Number	Facility Name	Responsible D&D Program	Gross Sq Ft	Year Built	Year Targeted for Deactivation
Y-12	9770-02	RADIATION SOURCE	EM	155	1945	FY03
Townsite	1060COM	1060 COMMERCE PARK DRIVE	SC	54,365	1990	FY04
Townsite	111UNV	111 UNION VALLEY ROAD	SC	9,629	2000	FY04
X-10	1000	ENGINEERING OFFICE BUILDING	SC	59,503	1946	FY04
X-10	2019	LASER LABORATORY	SC	800	1951	FY04
X-10	3037	CHEMICAL TECHNOLOGY OFFICES	EM	8,008	1951	FY04
X-10	3504	GEOSCIENCES LAB	EM	3,952	1951	FY04
X-10	3523	RIS SENSOR DEVELOPMENT, SOUTH ANNEX	EM	1,170	1954	FY04
X-10	3542	STORAGE BLDG. FOR 3506 & 3517	EM	576	1965	FY04
X-10	3587	INST LAB ANNEX & CLOTHING STOR	SC	5,473	1950	FY04
X-10	3605	TSD STORAGE BUILDING	SC	416	1985	FY04
X-10	3610	STORAGE BUILDING	SC	400	1989	FY04
X-10	5000	MAIN PORTAL BUILDING	SC	4,360	1952	FY04
X-10	7600	CONTAINMENT BUILDING	EM	72,891	1960	FY04
X-10	7609	STACK MONITORING HOUSE	EM	780	1965	FY04
Y-12	9201-2	FUSION ENERGY ADMINISTRATION & LABORATORY BLDG.	EM	257,200	1944	FY04
Y-12	9210	MAMMALIAN GENETICS	EM	65,700	1945	FY04
Y-12	9224	MOLECULAR BIOLOGY FACILITY	EM	10,100	1968	FY04
Y-12	9422	LCTF COMPRESSOR	EM	2,500	1980	FY04
Y-12	9610-2	FLAMMABLE MATERIALS STORAGE	EM	683	1990	FY04
Y-12	9983-FX	ESD TRAILER	SC	680	1991	FY04
Y-12	9999-1	MOTOR GENERATOR	EM	500	1986	FY04
Y-12	9999-3	ELECTRICAL SWITCHGEAR AND RECTIFIER	EM	2,400	1978	FY04
Y-12	9999-4	ELECTRICAL EQUIPMENT	EM	300	1979	FY04
Other	XE1451	BARN B	SC	5,120	1971	FY05
Other	XF1301	BARN D	SC	8,025	1965	FY05
Other	XF1303	BARN E	SC	8,025	1964	FY05
Other	XF1304	SILO E	SC		1964	FY05
Other	XF1401	TWIN I	SC	4,160	1964	FY05
Other	XF1576	SHED D	SC	2,000	1961	FY05
Other	XF1577	SHED W	SC	1,440	1999	FY05
Other	XF1578	SHED E	SC	1,440	1999	FY05
Other	XF1579	NEW SWINE BARN	SC	9,805	1984	FY05
Other	XF1580	TWIN 1 BARN	SC	5,120	1971	FY05
Other	XF158X	SOLWAY BARN	SC	5,120	1902	FY05
Other	XG1401	FREELS BEND LOG CABIN	SC	1,490	1825	FY05
Other	XG1402	FREELS BEND, MACHINE STORAGE SHED	SC	245	1966	FY05
Other	XG1403	FREELS BEND, VAN GILDER BARN	SC	4,356	1949	FY05
Other	XG1404	FREELS BEND, VARIABLE DOSE IRRADIATION FACILITY	SC	3,623	1968	FY05
Other	XG1405	FREELS BEND, SHED	SC	1,008	1970	FY05
Other	XG1406	FREELS BEND, EXPOSURE FIELD CONTROL ROOM	SC	190	1958	FY05
Other	XG1407	FREELS BEND BLOCK BUILDING	SC	128	1958	FY05
Other	XG1408	FREELS BEND ALUMINUM BUILDING	SC	80	1958	FY05
Other	XG1409	FREELS BEND PUMP HOUSE	SC	80	1958	FY05
Other	XG1410	FREELS BEND DONKEY ARENA	SC	2,375	1958	FY05
Other	XH1326	FREELS BARN	SC	5,120	1958	FY05
Other	XH1327	DONKEY BARN	SC	880	1958	FY05
Other	XH1401	SHEEP BARN	SC	3,000	1958	FY05
Other	XH1402	FREELS WHITE BARN	SC	12,500	1958	FY05
Other	XH1403	LAGOON (2) FREELS	SC	14,400	1958	FY05
Other	XH1404	UNDERGROUND SILO	SC	3,800	1958	FY05
Other	XH1405	SILO, 14 X 41	SC	574	1958	FY05
X-10	2008	ORNL WHOLE BODY COUNTER	SC	4,368	1946	FY05
X-10	2009	CAFETERIA WAREHOUSE	SC	4,368	1943	FY05
X-10	2010	ORNL CAFETERIA	SC	13,099	1951	FY05
X-10	2517	HRDP/TRAINING	SC	2,880	1943	FY05
X-10	3003	SURFACE MODIFICATION & CHARACTERIZATION FACILITY	EM	10,806	1943	FY05
X-10	3017	CHEM TECH DIVISION ANNEX	SC	10,140	1952	FY05
X-10	3036	RADIOISOTOPE MATERIAL SHIPPING & PACKAGING	EM	1,529	1951	FY05
X-10	3080	SUPERCONDUCTIVITY LABORATORY	SC	1,872	1953	FY05
X-10	3100	SOURCE & SPECIAL MATERIAL VAULT	EM	1,686	1960	FY05
X-10	3115	SOLID STATE OFFICES	SC	2,792	1970	FY05
X-10	3136	EQUIPMENT TEST FACILITY-3019	EM	600	1984	FY05

Table K.1 Candidates for disposition (as of July 19, 2002)

Site Location	Facility Number	Facility Name	Responsible D&D Program	Gross Sq Ft	Year Built	Year Targeted for Deactivation
X-10	3543	MACES STORAGE BUILDING	SC	651	1968	FY05
Y-12	9204-3	ISOTOPE SEPARATIONS	EM	216,200	1945	FY05
X-10	7953A	RESEARCH REACTORS OFFICE TRAILER	SC	1,416	1996	FY06
X-10	7953B	RESEARCH REACTORS STORAGE TRAILER	SC	1,416	1996	FY06
X-10	7953C	CONSTRUCTION TRAILER AT HFIR	SC	1,344	1993	FY06
X-10	7957	OFFICE TRAILER FOR 7920	SC	500	1976	FY06
X-10	7964A	RESEARCH REACTORS OFFICE TRAILER	SC	2,088	1987	FY06
X-10	7964C	RESEARCH REACTORS OFFICE TRAILER	SC	2,124	1988	FY06
X-10	7964E	RESEARCH REACTORS OFFICE TRAILER	SC	2,400	1980	FY06
X-10	7964F	RESEARCH REACTORS OFFICE TRAILER	SC	1,288	1988	FY06
X-10	7964G	HFIR OPS/CHANGE HOUSE	SC	1,440	1992	FY06
X-10	3019A	RADIOCHEMICAL DEVELOPMENT FACILITY	EM	37,191	1944	FY08
X-10	7964H	SOLID STATE OFFICE TRAILER	SC	1,970	1970	FY08
X-10	7964I	SOLID STATE OFFICE TRAILER	SC	1,970	1970	FY08
X-10	7965A	CHEMICAL TECHNOLOGY OFFICE TRAILER	SC	1,620	1988	FY08
X-10	7965B	CHEMICAL TECHNOLOGY OFFICE TRAILER	SC	1,620	1992	FY08
X-10	7965C	CHEMICAL TECHNOLOGY OFFICE TRAILER	SC	1,620	1992	FY08
X-10	7968	TRAILER	SC	192	1990	FY08
		Total		**2,006,638**		

Table K.2. Space Management Plan summary
(as of July 19, 2002)

FY-Qtr	Facility/action	New/reuse location	Comments
02-Q2	Building 3550 - Deactivate	Buildings 3504 and 5500	FY 03-1Q - Transfer to EM
	Building 2506 - Deactivate	Buildings 2518, 4500S, and 7002	FY 02-4Q - Demolish
	Building 5510 - Modernize and reuse	Building 4500S	Occupancy TBD
	Building 5510A - Modernize and reuse	Building 4500S	Occupancy TBD
	Building 9769 (Y-12) - Vacate	Building 4500S	Complete
	Building 2013 - Deactivate	Buildings 5500 and 3013	FY 02-4Q - Demolish
	Building 6003 - Deactivate	Building 6011	FY 02-4Q - Demolish
02-Q4	Building 2011 - Deactivate	Building 2525	FY 03-1Q - Cheap to keep
	Building 9401-1 (Y-12) - Partial vacate	National Transportation Research Center	FY 03 - Transfer to DP
03-Q1	Building 9204-3 - Vacate	Building 5510	FY 05-1Q - Transfer to DP
	Building 2024 - Deactivate	Building 4500S	FY 03-2Q - Cheap to keep
03-Q3	Building 6010 - Partial vacate	Computational Sciences Building	Physics Division reuse
	Building 6011 - Partial vacate	Computational Sciences Building	Reuse
	Building 6012 - Partial vacate	Computational Sciences Building	Reuse
	Building 6025 - Partial vacate	Computational Sciences Building	Physics Division reuse
	Building 4500N computer rooms - Modernize and reuse	Computational Sciences Building	Reuse
	Building 9210 (Y-12) - Deactivate	Laboratory for Comparative and Functional Genomics	Demolish
03-Q4	Building 9104-1 (Y-12) - Vacate	Research Office Building/Engineering Technology Facility	Vacate
	1060 Commerce Park - Vacate	Research Office Building	Terminate lease
	111 Union Valley - Vacate	Research Office Building	Terminate lease
	Building 3546 - Vacate	Research Office Building	Reuse
	Building 7601 - Designated personnel moves for reuse	Research Office Building	Reuse
	Building 6010 - Vacate	Research Office Building	Physics Division reuse
	Building 6011 -Vacate	Research Office Building	Reuse
	Building 6012 - Vacate	Research Office Building	Reuse
	Building 6025 - Partial vacate	Research Office Building	Physics Division reuse
	Building 9201-2 (Y-12) - Vacate	Research Office Building and 7600 Area Buildings	FY 05 - Transfer to DP

Table K.2. Space Management Plan summary
(as of July 19, 2002)

FY-Qtr	Facility/action	New/reuse location	Comments
	Building 9201-3 (Y-12) - Vacate	Engineering Technology Facility	FY 02 - Transfer to DP
	Building 9204-1 (Y-12) - Vacate	Research Office Building/Engineering Technology Facility	FY 04 - Transfer to DP
	Building 9401-1 (Y-12) - Vacate	Engineering Technology Facility	FY 03 - Transfer to DP
	Building 7606A - Personnel	Research Office Building	Reuse
04-Q1	Building 5500 (M&C Division personnel) - Vacate	Advanced Materials Characterization Laboratory	Reuse
	Building 3605 - Deactivate	Building 3500	Demolish
04-Q2	Designated UT and guest personnel	Joint Institute for Computational Sciences	N/A
	Designated UT and guest personnel	Oak Ridge Center for Advanced Studies	N/A
	701 Scarboro/SNS - Vacate	Central Laboratory and Office Building	Terminate lease
	115 Union Valley/SNS - Pending	Pending	N/A
	Building 5000 - Deactivate	Research Support Center	Demolish
04-Q4	Building 9224 (Y-12) - Vacate	Building 4500S	FY 05 - Transfer to DP
05-Q1	Building 2517 - Deactivate	Research Support Center	Demolish
05-Q2	Building 3003 - Deactivate	Central Campus Research Building	Demolish
	Building 3036 - Deactivate	Central Campus Research Building	Demolish
	Building 3080 - Deactivate	Central Campus Research Building	Demolish
06-Q1	Buildings 3017 and 3013 - Deactivate	Buildings 5500 and 5510	Demolish
06-Q2	Designated UT and guest personnel	Joint Institute for Biological Sciences	N/A
	Trailer 7953 - Vacate	7900 Area Office Building I	Salvage trailer
	Trailer 7964 - Vacate	7901 Area Office Building I	Salvage trailer
07-Q2	Designated personnel from existing facilities	Center for Nanophase Materials Sciences	N/A

APPENDIX L

Under Construction - Please call (865) 576-4183 for additional information

APPENDIX M

Master Plan Projects

Project Descriptions by Master Plan Phase

M.1 PHASE I PROJECTS (FY 2002–06)

M.1.1 Line Items – Phase I

Spallation Neutron Source (ADS S97D0046, FY 1999 Landlord LI)

The SNS is a new world-class experimental facility designed to meet the national need for neutron scattering and related research. The facility will be available to scientists from universities, from industry, and from other federal laboratories. The SNS will be equipped with an initial complement of advanced instruments for neutron beam research.

The facility will be built around a spallation neutron source. Combining the higher source power with improved experimental facilities will create a useful neutron flux significantly higher than is now available at any facility in the world. There will be beam lines for neutron scattering instruments or other neutron research equipment in experimental halls. The potential also exists for the development of entirely new lines of scientific research based on the enhanced capabilities that will be available in the SNS facilities.

The primary objectives in the design of the site and buildings for the SNS are to provide the optimal facilities for utilization of neutron beams and to address the mix of needs associated with the operating facility and the user community.

The objectives stated above are being met with a group of major structures which include an ion source, a linear accelerator, a klystron building, an accumulator ring, beam transport, an experimental hall that includes detectors and instrumentation, and capabilities for remote servicing of the spallation targets. Also included on the site are facilities to support the needs of operations staff, technical support staff, and users.

In a related project, ORNL, The University of Tennessee (UT), and the State of Tennessee have initiated plans for a Joint Institute for Neutron Sciences (JINS). This facility will enhance the utility of the SNS and the High Flux Isotope Reactor (HFIR) by providing meeting facilities, offices, laboratories, a communication center, and housing for scientists and engineers from universities, industries, and the international research community. It will also be a focus for expanding neutron science R&D with UT, other regional universities, and industrial collaborators and will serve as an interface and economic development gateway for outside access to ORNL's neutron science facilities.

Electrical Systems Upgrade (ADS C97D0106, FY 2000 Landlord LI)

The ORNL electrical distribution system requires significant restoration and expansion to assure the continued operation in support of the research and operation missions of the Laboratory. Electrical components throughout the Laboratory are obsolete and increasingly dangerous to operate. Specific funded activities associated with this LI include the following:

- *Overhead Feeders 244 and 264 Upgrade.* The 13.8-kV overhead feeders run from the ORNL Primary Substation to the 7600 Area Robotics and Process Systems Division facilities. The feeders serve the 6010 Oak Ridge Electron Linear Accelerator, the 6011 Computing and Telecommunications Facility, the 6012 Computer Science Research Facility, and the 5510 Analytical Mass Spectrometer Laboratory; they also serve as a dual-feed to the 4509 and 2632

major 2.4-kV secondary substations within the Laboratory. The feeders will be completely rebuilt to ensure reliable continuation of service.

- *Electrical Metering System Installation.* A computerized electrical metering system will be installed in the ORNL electrical distribution system. Electrical meters will be installed on major distribution feeders and on significant facilities throughout the Laboratory.

- *Building Electrical Service Entrance Upgrades*. Obsolete and inadequate switchgear, transformers, and conductors will be replaced at the main service entrances of Buildings 2519, 4501, 4500S, and 5500. New switchgear and cabling will be added to the bus ties in Buildings 4500N and 4500S.

- *Substation 4509 Improvements.* Secondary Substation 4509 will be upgraded by installing two new 13.8/2.4-kV, 7500-kV transformers, and new 2.4-kV switchgear to form a 13.8-kV primary selective arrangement and a 2.4-kV transformer and switchgear double-ended arrangement. Existing 13.8-kV switchgear "A" will be reinsulated and refurbished. A 13.8-kV primary selective system arrangement will be provided for two internal Building 4509 service transformers.

Laboratory for Comparative and Functional Genomics (ADS S97D0043, FY 2001 Programmatic LI)

This project will construct the Laboratory for Comparative and Functional Genomics, housing about 50,000 mice. The laboratory employs expertise in mouse genetics mutagenesis to generate and analyze mutations that add functional information to specific human DNA sequences. These mutant stocks are a matchless resource for advancing understanding of the complex mechanisms underlying the development and functioning of biological systems. In addition to space for 50,000 mice, the facility will provide ancillary laboratories for experimental breeding and necropsy activities, a specific pathogen-free design, a 100% fresh air facility with 12 to 15 air changes per hour, temperature and humidity control, variable intensity lighting, an emergency power supply, a loading dock, "silent" low-frequency fire alarms, and vermin-proofed caulking and sealing.

The facility will be located on the ORNL reservation at the west end of the site, which will be convenient to researchers and guests without concern over restricted access. The laboratory will be adjacent to the new Environmental and Life Science Laboratory, Building 1060, Life Sciences Division Buildings 1061 and 1062, and will be convenient to the Environmental Sciences Division for cooperative research collaborations.

Fire Protection Systems Upgrade (ADS A99D0018, FY 2001 Landlord LI)

The following projects/tasks of the proposed upgrades are in support of the ORNL fire protection systems:

- Extend automatic, wet-pipe sprinklers throughout offices, corridors, and under the attic floor slabs in Wings 1-4 of the Central Research and Administration Building (4500N). These specific areas are not currently protected with a fire suppression system.

- Replace numerous fire alarm control panels with modern fire alarm equipment and modify alarm device/evacuation horn circuits to utilize the full capability of the new control panels. Many fire alarm control panels and annunciators at ORNL are 30 to 40 years old and operate via antiquated technology (springs and shunts) which do not permit interface with modern fire detection and fire alarm initiation devices. These older panels also do not perform self

monitoring of fire alarm and evacuation horn circuits as required by mandated National Fire Codes, and replacement parts are not available to facilitate timely maintenance/repairs.

- Upgrade the Central Fire Alarm Receiving Station at the ORNL Fire Department Headquarters to replace antiquated equipment currently performing this vital function. This 20-year-old equipment monitors the condition of fire alarm systems and provides notification of fire alarm system activation for more than 200 buildings at the ORNL main site. It is imperative that this equipment remain highly reliable and that replacement parts be readily available. As the equipment ages, replacement parts are more difficult to procure and maintenance costs increase, resulting in questionable reliability.

- Upgrade fire alarm system for Building 4505. The fire alarm upgrade includes the following: replacement of the shunt-trip type fire alarm annunciator panel, elimination of heat-actuated devices throughout the facility and replace with water flow switches for zone annunciation, and replacement of the horn panel in the east stairwell controlling all evacuation horns in the building.

- Upgrade fire alarm system for Building 4501. The fire alarm upgrade includes the following: elimination of one of two master fire alarm boxes (MFAB) which serve 4501, replacement of two shunt-trip type fire alarm annunciator panels adjacent to the two existing MFABs and an auxiliary annunciator panel near the sprinkler system risers in the basement, elimination of heat-actuated devices throughout the facility to be replaced with water flow switches for zone annunciation, and replacement of the horn panel in the east stairwell controlling all evacuation horns within the building.

- Replace the 55-year-old, 16-inch underground water main in the 6000 Area of ORNL with approximately 7000 feet of new lines. Associated isolation valves, pressure reducing valves, hydrants, and valve pits will be installed with the new water main.

Laboratory Facilities HVAC Upgrade (ADS A99D0017, FY 2001 Landlord LI)

This project will upgrade HVAC systems that serve most of ORNL's major multiprogram research and related support facilities that have been in service for over 30 years and are in need of renovation, upgrade, or replacement due to age. This deteriorated condition is resulting in a growing number of repeated operational interruptions, prolonged equipment downtime, and increasing maintenance cost. Repair is often complicated by difficulty in finding replacement parts for units that are now obsolete. The interruptions are affecting experimental quality assurance for a significant number of the laboratories and are causing problems for supporting computer systems and service shops.

The scope of work will include (1) installation of the primary/secondary central chilled water plant pumping system in 4509; (2) installation of a 4501/4505 chilled water tie-in; (3) installation of a chilled water coil inside 3500E air handler; (4) replacement of 4501 and 5500 air handlers; and (5) replacement of the 4500S reheat system.

SANS Guide Hall, HFIR (ADS AA0D0050, FY 2001 AIP LI)

This small angle neutron scattering (SANS) Guide Hall will provide space for new SANS instruments on cold beam guides from the HB-4 beam port of the DOE High Flux Isotope Reactor (HFIR) at ORNL. The scope of work will involve the relocation of utilities and the construction of the following: foundations and a reinforced concrete slab, metal building structure with overhead crane, electrical services, HVAC system, rest rooms, and limited sample preparation space. This new

facility will house two SANS machines and some small laboratory spaces. Additional instruments, including spectrometers from Brookhaven, SNS, and other facilities, can also be accommodated.

Center for Nanophase Materials Science (ADS AA1D0002, FY 2002 Programmatic LI)

The Center for Nanophase Materials Science (CNMS) will consist of a new multistory, multipurpose building of approximately 80,000 square feet. It will be located near the Spallation Neutron Source Complex and will house the core support facilities, offices, and laboratories necessary to ensure the mission of the CNMS. The location and synergy of the functions planned for this facility will provide valuable support and services to a broad user base of educational, industrial, and research organizations.

Since the late 1980s, there has been a recognized need to enhance U.S. capabilities and ensure leadership in the synthesis of materials. The CNMS will integrate nanoscale research with neutron science, synthesis science, and theory/modeling/simulation, bringing together four areas in which the United States has clear national research needs. The CNMS will play an important role in elevating the U.S.-based neutron science R&D community to levels found elsewhere in the world and helping it assume a scientific leadership role in emerging research on nanoscale materials and processes. ORNL will become a world-class leader in CNMS-based research.

Research Support Center (ADS A99D0056, FY 2002 Landlord LI)

The Research Support Center will consist of a new multistory, multipurpose building of approximately 50,000 square feet. It will be located north of the Central Research complex and will house the core support service facilities required in support of the effective operation of a national research laboratory. The Research Support Center will serve as the cornerstone and focal point of the East Research Campus envisioned in the Facilities Revitalization Project. This building will be an attractive state-of-the-art facility with easy visitor access, reflective of the Laboratory’s stature and as functionally flexible as possible. The location and synergy of the functions planned for this facility will provide valuable support and services for the nationally respected ORNL research community, visitors and guests, and DOE. This building will include an auditorium and conference center, cafeteria, visitor reception and control area, and support offices for approximately 50 occupants. Sustainable design features will be incorporated where practical. The estimated payback period for this project is two years.

4500 North and South Modernization Upgrades (ADSs – AA0D0056, AA0D0057 Multiyear Landlord LI)

The proposed projects are integral parts of the new Facilities Revitalization Project (FRP) for revitalization of ORNL's research capabilities and infrastructure in support of the DOE-SC initiative to modernize their national laboratories. Consistent with DOE's approved Institutional Plan for ORNL, new laboratories, supporting offices, and the necessary support facilities are being proposed for construction as part of an integrated new campus environment in the area north and east of the 4500 North and South Buildings complex. The 4500 North and South complex will be modernized to provide laboratory, office, and support functions. The overall goals of this facilities revitalization initiative are to reduce the burdensome costs of maintaining the current inventory of facilities 50 years and older, provide a safer environment for current staff activities, and ensure ORNL's ability to conduct world-class science in the 21st century, including attracting and retaining world-class research scientists. The payback period is approximately six years. There are eight separate upgrade projects in these two facilities. 4500N (Wing 4) and 4500S (Wings 1 and 4) are in Phase I.

Radioactive Ion Beam (RIB) Upgrade (ADS A99D0043, FY 2002 AIP LI)

This project will provide for improvement of the Oak Ridge Isochronous Cyclotron (ORIC) and the associated tandem electrostatic accelerator. The proposed project is located in the Holifield Radioactive Ion Beam Facility (HRIBF), Building 6000, at ORNL.

ORIC's light-ion primary beams are used to produce radioactive atoms from fusion reactions in thick targets on a Radioactive Ion Beam (RIB) Injector. Ions from the RIB injector are mass analyzed, accelerated with the 25-MV tandem electrostatic accelerator, and used for the RIB experimental program. RIB intensity is proportional to the ORIC light-ion beam intensity, and accelerated RIB energy and quality are determined by the tandem electrostatic accelerator. The number of hours of beam-on-target per year is impacted by reliability of both accelerators and ORIC component activation.

Major ORIC improvements are needed to reduce activation and radiation exposure to operations personnel and to assure reliable, high-intensity operation. Similarly, tandem electrostatic accelerator improvements are needed to assure reliable, high-availability operations and the ability to efficiently accelerate and transport very low intensity RIBs. Expected benefits include increased upper limits on ORIC beam intensity, reduced ORIC activation, improved ability to handle activated components consistent with ALARA principles, improved operation efficiency, reduced down time, and reduced operating costs.

Energy Reliability and Efficiency Laboratory (ADS AA1D0041, FY 2004 Programmatic LI)

This project will construct a new multistory building of approximately 52,000 square feet, the Energy Reliability and Efficiency Laboratory (EREL). The EREL will be located at the north entrance of ORNL and will provide facilities for research and development activities in support of DOE's Office of Energy Efficiency and Renewable Energy (EERE) program initiatives in distributed energy resources, electricity transmission and distribution, and net zero energy building systems. The EREL will be an attractive state-of-the-art facility designed to operate as a demonstration of energy efficiency technology. Energy Star® certification will be sought for applicable portions of the building, which will include on-site power generation, virtual laboratory capabilities, and built-in flexibility to incorporate new research and development and next-generation technologies. Approximately 80% of the building's net usable space will be dedicated to research facilities including highbay space for large equipment and integrated systems demonstration. Two 2-ton cranes will be provided. The remainder of the space will contain offices for approximately 40 occupants, conference/meeting room(s), and break rooms. The building structure will be steel and will be clad with an aesthetic low-maintenance exterior. An advanced heating, ventilating, and air-conditioning (HVAC) system will provide cost-effective, energy-conserving space conditioning utilizing the waste heat from on-site power generation. Land improvements will include service drives, walkways, drainage, and landscaping. Utilities will be extended from the existing distribution systems adjacent to the site and upgraded as required. The EREL will be a showcase for sustainable energy technologies and design practices. It will be designed and engineered to achieve a silver rating based on the Leadership in Energy and Environmental Design (LEED™) rating system developed by the U.S. Green Building Council.

ORNL Primary Substation Upgrades (ADS AA0D0094, FY 2004 Landlord LI)

The ORNL Primary Substation Upgrades project will replace and restore components of the ORNL Primary Substation. It will replace an aged and inefficient power transformer and regulating transformer, and will replace the Bus No. 1 13.8-kV Oil Circuit Breakers (OCBs) with new metal-clad switchgear-containing vacuum-insulated circuit breakers. The project will replace existing

mechanical relays with advanced microprocessor-based protective relay systems. Grounding improvements will be provided to improve the safety of the substation. Other aged and deteriorated components of the substation will also be replaced. This project is part of a phased infrastructure upgrade to restore the electrical distribution system serving ORNL. The ORNL primary substation is the only source of electrical power to the ORNL site. Most of ORNL's electrical distribution system was installed in the early 1940s and the mid 1960s. A phased upgrade of deteriorated and deficient electrical systems was started in the 1980s. Estimated return on investment for this project is 25.8%, with a simple payback period of approximately 10 years.

Proteomics and Protein Complex Analysis Laboratory (ADS AA2D0115, FY 2004 Programmatic Landlord)

The Proteomics and Protein Complex Analysis Laboratory will consist of a 130,00-square-foot, $150M laboratory /office complex. This building would house facilities for cell growth, molecular biology, protein chemistry, mass spectrometry, protein analysis, and computational biology. To meet the needs of the Genomes to Life (GTL) program, these facilities would be highly automated to permit high-throughput analysis of proteins and protein complexes. An important part of this facility is the development of new biological, analytical, and computational tools to improve sample throughput and information content required for the GTL program. This research will take advantage of multidisciplinary teams comprised of biological, physical, engineering, and computational scientists from across ORNL and outside laboratories. The Proteomics and Protein Complex Analysis Laboratory will be designed to be a unique national resource to provide critical information on proteins and protein complexes to the biological community and to be a focal point for development of new analytical and computational capabilities in support of the GTL program.

Manipulator Repair Facility (ADS AA0D0017, FY 2005 Landlord LI)

The Manipulator Repair Facility will provide a consolidated facility for hot cell manipulator repair and refurbishment in support of all of the ORNL hot cell operations. It will consist of approximately 20,000 square feet of clean and contaminated manipulator wash areas, a boot fabrication shop, and all necessary support facilities to support the repair and decontamination of master/slave and electromechanical manipulators. The facility will be sited to best service the primary users of manipulators and will include process and liquid low-level waste line tie-ins and HEPA filtration systems for contamination control.

Potable Water System Upgrade Phase I (ADSs C97D0061, FY 2005 Landlord LI)

The Potable Water System Upgrade, Phases I and II, will replace or refurbish aged water lines serving the primary research and support facilities in the central campus area of the Laboratory. The main lines running along Central Avenue and the north side of the Building 3508/3517 Area will be replaced in the first phase of the project with the Laboratory facilities north of Central Avenue in the vicinity of First Street and the 3047 Isotopes Area. Because of the subsurface contamination concerns within the central campus, multiple technologies are being evaluated for this project, including standard below-grade pipe replacement, above-grade insulated piping, and in-situ lining of existing lines where appropriate and feasible. A preliminary estimate of return on investment (ROI) is 10% with a payback period of seven years.

Laboratory Facility Ventilation System Upgrade, Phase I (ADS A98D0007, FY 2005 Landlord LI)

The Laboratory Facility Ventilation System Upgrades, Phases I and II, are projects that will modernize ventilation and exhaust systems in approximately ten ORNL facilities, totaling over

200,000 square feet of space. Ventilation and exhaust systems in many ORNL facilities are in serious need of upgrade to continue service at any level. Some laboratory areas are not used for research because of a lack of proper ventilation. Systems feature 35-year-old equipment applied in a 35-year old design concept. In many systems, the exhaust ducting and filter housings are seriously corroded and have only a marginal future life expectancy. New exhaust fans, ducts, hoods, and an EPA-compliant stack are needed for compliance with regulations. The majority of these duct/housing units are contamination zones that will require closely controlled work conditions. A preliminary estimate of a payback period for this project is seven to nine years.

M.1.2 State of Tennessee Funded Facilities – Phase I

Joint Institute for Computational Sciences and Oak Ridge Center for Advanced Studies (ADS AA1D0039, FY 2002)

This 45,000-square-foot state-funded building will house the following:

The Joint Institute for Computational Sciences (JICS), a user- and visitor-oriented facility to provide access to high-performance computers, inspire collaborations and outreach between ORNL and partnering universities, facilitate enhanced high-speed networking systems, and facilitate auxiliary technologies. This facility will house computing system laboratories, offices, and meeting space for collaborations.

The Oak Ridge Center for Advanced Studies (ORCAS), a theoretical and applied R&D-oriented facility to explore grand queries, big thoughts, and major potentials for long-term program development for ORNL and core universities. This facility will house state-of-the-art collaboration meeting rooms with teleconferencing and computing networking, offices, and an information resource center.

Joint Institute for Biological Sciences (ADS AA0D0085, FY 2004)

The Joint Institute for Biological Sciences will be a State-funded center for the promotion and development of collaborative education and research in the biological sciences of functional genomics, structural biology, and computational biology and bioinformatics. This 60,000-square-foot facility will house office, laboratory, process, and meeting space for collaborations.

Joint Institute for Neutron Sciences (ADS AA0D0088, FY 2005)

ORNL, The University of Tennessee (UT), and the State of Tennessee have initiated plans for a Joint Institute for Neutron Sciences (JINS). This facility will enhance the utility of the SNS and the High Flux Isotope Reactor (HFIR) by providing meeting facilities, offices, laboratories, a communication center, and housing for scientists and engineers from universities, industries, and the international research community. It will also be a focus for expanding neutron science R&D with UT, other regional universities, and industrial collaborators, and will serve as an interface and economic development gateway for outside access to ORNL's neutron science facilities.

M.1.3 Private Sector Funded Facilities – Phase I

Computational Science Building (ADS AA0D0091, FY 2002)

The Computational Science Building will provide over 82,000 net square feet of state-of-the-art computer labs, offices, and a petascale climate-controlled supercomputer machine room to provide research space for the fastest-growing mission area at ORNL. This facility is essential to

accommodate the anticipated 50% staff and funding annual growth, as well as to maintain ORNL's standing as one of DOE-SC's premier computational facilities. The building will allow for consolidation of almost 300 research staff from six existing ORNL facilities and will result in over 50,000 square feet of usable space being made available for ORNL-wide staff consolidation. Return on investment (ROI) is anticipated to exceed 15% annually, with a payback of less than 10 years.

Engineering Technology Facility (ADS AA0D0092, FY 2002)

The Engineering Technology Facility (ETF) will allow for the consolidation of staff and research operations from the ORNL facilities at the Y-12 National Security Complex to the main ORNL campus. Almost 170 staff will be housed at the ETF, with a net reduction of over 300,000 square feet of high-cost, 40-year-old legacy facilities. State-of-the-art engine testing labs, wet/dry research labs, a clean room, and high-bay space will provide continued growth opportunities for this important research division. Due primarily to the elimination of expensive Y-12 space, an ROI of almost 20% is expected, with a payback period of six to seven years.

Research Office Building (ADS AA0D0090, FY 2002)

The Research Office Building will provide over 80,000 net square feet of space for consolidation of research and support staff from substandard space at ORNL and from various off-site leased buildings. A total of over 450 staff will be housed in this office-only building, with approximately 25% of that space reserved for staff from the 4500N and 4500S complex who will be temporarily dislocated from their offices during that multi-year laboratory rehabilitation. Considering the value of maintaining efficient operations during these renovations and the elimination of over 125,000 square feet of substandard space at ORNL, the ROI for this facility is expected to be in the 10 to 15% range, with a payback period of less than 10 years.

M.1.4 Major GPP Projects – Phase I

Laboratory Expansion for Nanoscience Metrology and Instrumentation (ADS A99D0020, FY 2000 Landlord GPP)

An upgrade to laboratory space in Building 3500 is proposed. The modifications in the east wing of Building 3500 will provide approximately 3000 square feet of additional usable modular clean room laboratory space and reconfigurable office space for the proposed Laboratory Expansion for Nanoscience Metrology and Instrumentation.

Rooms 7, 8, 9, and 10, located on the east side of Building 3500, currently house a small conference room, laboratories, and shop/storage areas. Modifications to these rooms will create usable space to accommodate a modular clean room and its associated services. The modifications will include replacement of the room’s west wall, removal of the room’s ceilings, and relocation of existing services. In addition, Room A-19 in Building 3500 will be converted from laboratory space to an electron microscope facility. The conversion will require modifications to the room HVAC system and possible foundation modifications for vibration isolation.

Fire Protection Systems Upgrade (ADS C97D0071, FY 2001 Landlord GPP)

Fire protection systems at facilities within ORNL are increasingly demonstrating lack of reliability and degradation of system components relative to age and exposure to corrosive conditions. This project will provide the following improvements:

- Upgrade of fire sprinklers in the Central Research and Administration Building (4500S). This upgrade will include the extension of fire sprinklers into some areas not currently protected and interface modification between the sprinkler systems and the fire alarm systems.

Future year projects:

- Replace identified aged and failure-prone automatic preaction sprinkler system deluge valves with highly reliable automatic wet-pipe sprinkler system alarm valves in the High Voltage Accelerator Laboratory (5500), the High-Level Radiochemical Laboratory Building (4501), and the Experimental Engineering Building (4505).

- Replace identified aged and maintenance-intensive automatic dry-pipe sprinkler systems with reliable and effective automatic wet-pipe sprinkler systems in the General Stores, Shipping, and Receiving Complex.

- Upgrade 4500N Wing 5 alarm system and connect it to the 4500N alarm system.

- Upgrade antiquated fire alarm systems in the HFIR Building.

- Upgrade antiquated fire alarm panels in various ORNL buildings.

- Replace fire doors in 4500N between the wings and main corridors.

- Upgrade fire barriers in ORNL facilities. National Fire Codes and regional/DOE-adopted building codes contain requirements to limit the spread of fire to a certain square foot area. The Life Safety Code requires physical separation in protected means of egress. Both code requirements must be met by installed fire barriers, which are rated by Underwriters' Laboratories, Inc. (UL) to withstand a fire for a time period (e.g., one-hour rated, two-hour rated, etc.). These two old, very large administrative and research facilities do not currently have required fire barriers in place.

- Install early warning smoke detectors to provide area protection in the CESAR and give early indication of an incipient fire to fire response forces. High-value robotics research is conducted at the CESAR Laboratory in Building 6010. High-value, one-of-a-kind robotics equipment and work stations in this densely populated laboratory create the potential for a fire loss exceeding $1 million.

- Replace the manually operated gasoline engine driver and water pump in Pumphouse Number 7953, which were installed in the early 1960s. This pump supplies fire protection and potable water to the DOSAR Site, which includes the Radiation Calibration Laboratory (7735), laboratories handling radioactive material in Building 7710, and Building 7709, which is currently being utilized for storage of unique, one-of-a-kind replacement parts for the HFIR. Recent tests of the aged pump and pump driver resulted in a failure to operate. This project will replace the manually operated pumping system with an automatic starting pump, along with updating the aged maintenance-intensive equipment with modern equipment.

- Install a fire alarm system in Building 7604, which is used for storage of experimental and test equipment such as development hardware, computers, and instrumentation. A portion of the building is used periodically as a control room for experiments conducted in adjacent areas outside the building. No personnel are housed full time in this building, but some personnel enter the building on a regular basis as part of their responsibilities, particularly when there is experimental activity in the control room area. The building has no fire protection system other than portable fire extinguishers. This activity adds a fire protection alarm system to Building

7604. Fire and smoke detectors will be installed in Building 7604 and will be connected to an existing fire alarm system in adjacent Building 7601.

East Campus Electrical Systems Upgrade (ADS AA0D0058, FY 2001 Landlord GPP)

This ADS will provide the resources necessary to extend the existing 13.8-kV electrical feeder #254 into the new east end campus area and set transformer stations, as needed, to provide electrical service to the new facilities to be located there. For aesthetic purposes, the new electrical services will be run underground in a concrete ductbank and placed in an established utility easement that will be flexible enough to provide for future expansion within the area without requiring constant utility relocations.

7603 Highbay Upgrade (ADS A99D0098, FY 2001 Landlord GPP)

This project will provide a needed upgrade to the highbay of Building 7602 to return a portion of an unused facility under EM40 into a vital ORNL work and research space. The project will involve covering the pit area with the fabrication and installing pit cover blocks, removing and dispositioning contaminated equipment, decontaminating floors and walls, and painting of surfaces.

6026 Gravel Lot Extension/Paving (ADS AA1D0037, FY 2001 Landlord GPP)

This project will provide for paving the existing gravel lot and expanding the existing 6026 Gravel Parking Area south of the 6026 Trailers. This expansion is necessary to replace parking areas eliminated due to construction of new facilities in existing parking east of 4500 North. The expansion will provide space for approximately 200 additional spaces in this existing lot.

ORNL Wayfinding Signs (ADS AA2D0095, FY 2002 Institutional GPP)

This project will provide new signage and associated landscaping at various entrance locations along Bethel Valley Road and on-site within the bounds of the 7000 Area and the west end of the Laboratory.

6026 North Parking Lots (ADS AA1D0047, FY 2001 Landlord GPP)

This project will provide for the expansion of the 6026 north parking lot in order to provide additional parking areas to support the ORNL Facilities Revitalization Project.

5th Street/Southside Avenue Parking Lot (ADS AA1D0048, FY 2002 Institutional GPP)

This project will provide for additional parking areas north and south of Southside Avenue, just to the west of 5th Street, to support the ORNL Facilities Revitalization Project.

5th Street Entrance (ADS AA1D0049, FY 2002 Institutional GPP)

This project will provide employees and visitors with improved access to the ORNL East Campus Area and to new parking located north of 4500N. The current access will be eliminated due to construction of new buildings in support of the ORNL Facilities Revitalization Project.

Central Avenue Extension (ADS AA2D0111, FY 2002 Institutional GPP)

This project provides for the extension of Central Avenue into the newly developed East Campus area. Landscaping features, including walkways, outdoor gathering areas, etc., will be provided along the extension of Central Avenue.

East Campus Entry and Parking Area (ADS AA2D0112, FY 2003 Institutional GPP)

This project will provide a new entry drive into the East Campus area, a parking court for visitors, and an interpretive terrace connecting the new state funded Joint Institute for Computer Science/Oak Ridge Center for Advanced Studies with the DOE funded Research Support Center.

Quadrangle Common Area (ADS AA2D0059, FY 2003 Institutional GPP)

This project provides for the development of the central area of the East Campus area with pedestrian ways connecting the surround facilities, and landscaped plazas adjacent to the facilities to enhance the utility of the exterior space between the facilities

Advanced Materials Characterization Laboratory (ADS AA0D0063, FY 2001 Landlord GPP)

The Advanced Materials Characterization Laboratory, a new 15,000-square-foot structure that will provide the high-quality environment required to optimize performance of sophisticated characterization equipment essential for the next generation of advanced materials R&D, will provide for the centralization of advanced materials structural characterization equipment. Electron microscopes, atom probe microscopes, and nanoindenter mechanical properties equipment are now housed in buildings that barely meet the manufacturers' requirements for optimum operation of this equipment. It is clear that the current buildings will not allow ORNL to maintain state-of-the-art instrumentation for the next generation of this equipment.

Rebuild Steam Station and Supply Piping, 7920 (ADS A01D0019, FY 2002 Institutional GPP)

All components of the existing steam supply, distribution, and containment systems in 7920 are aging and rapidly approaching the end of their operational lives. "Pinhole" leaks have developed in threaded lengths of fittings, valves, joints, and junctions (tees, unions, y's, etc.).

There are several steam stations throughout the facility that will require fittings, pressure reducers, and blowout protection.

Service Entrance - 100 psig steam comes into 7920 at the northeast corner of the mechanical equipment room (This room houses a GE chiller, etc.)

A 100 psig header splits off to two separate headers, one at 100 psig and one at 15 psig.

The 15 psig lines are routed throughout the facility, to feed preheaters and reheaters on all of the HVAC systems.

The 100 psig steam lines provide steam for evaporators and steam jets throughout the hot cells and pipe tunnels.

An interesting safety issue involves the use of copper lines to conduct the steam to various places in the facility.

Scope of Work also includes for the 15 psig headers - two steam stations and about 300 feet of steam line 2 to 4 inches in diameter. For the 100 psig header there would also be two reducing stations and about 100 feet of steam line.

7600 Highbay Building (ADS AA0D0072, FY 2003 Landlord GPP)

The Fusion Energy Division (FED) is an ORNL facility located at the Y-12 National Security Complex on Bear Creek Road. For the past several years there have been several attempts to relocate the FED facilities to the ORNL site because of the increasing costs of maintaining the old World War II structures in which the FED is presently located. Other reasons for leaving the Y-12 site are the access problems for foreign nationals, with which FED collaborates, legacies of contamination in the FED building itself, and the increasing (and uncertain) mission burden at the Y-12 Plant. The most recent efforts for the Laboratory revitalization have placed the FED in the 7600 Area. The primary reason that the 7600 Area was selected for the FED is because of the availability of electrical power. FED requires 161-kV power distribution with 13.8-kV feeders for their basic infrastructure.

Currently, the relocation of FED personnel to the 7600 Area, in accordance with the ORNL Revitalization Program, indicates there is a shortfall in available laboratory space. In order to achieve the relocation of FED to the ORNL campus, a new highbay laboratory will be required in the 7600 Area to carry out current and future programs and projects. This project will provide a highbay facility with a bridge crane of approximately 8000 square feet.

Upgrade Sewage Collection System (ADS AA1D0016, FY 2002 Institutional GPP)

This project will make improvements to the ORNL Sanitary Sewage Collection System that are necessary to accommodate the facility modernization plans. Facility modernization and additions will result in a shift in population centers at the Laboratory that will require upgrading sewage collection piping and sewage pumping stations. Additional facilities in the area to the east of 4500N and to the west of Building 1000 will place new loads on collection piping and sewage pumping stations currently in place. Line size will need to be increased to meet State requirements and pump station capacity will be increased to accommodate the new inflows.

HFIR Permanent Pool Storage Tanks Project (ADS AA1D0007, FY 2003 Programmatic GPP)

The project scope includes the design, construction, and installation of new aboveground tanks on support foundations to replace the underground pool water storage tank which has been abandoned. Three tanks (two 30,000-gallon and one 20,000-gallon) will be used for a total capacity of 80,000 gallons. The piping arrangement will allow the tanks to be filled and drained together to function as a single tank or as individual tanks, as may be required.

The new tanks will be double-walled stainless steel. The piping will include monitoring and secondary containment features. Appropriate electrical controls will be provided. Any leakage will be routed to the process waste drain system.

HFIR Maintenance Building (ADS AA0D0053, FY 2004 Programmatic GPP)

The current HFIR maintenance shop is contained in Building 7910, which is also an office building. The shop is about 3500 square feet. This building was built in 1963. The maintenance facilities are not adequate to maintain and support reactor operations in the manner required by today's standards. The reactor is expected to operate another 30 years, and the operating components must be maintained, replaced, and upgraded. The current facility is not adequate to do this work. Improvements are needed to resolve concerns with adequate materials control, records storage, materials storage, and housekeeping. These concerns deal with adequate controls of equipment and documentation necessary to ensure safe operations and shutdown. A new 10,000-square-foot maintenance facility will be constructed west of the HFIR Building.

FED Cooling Tower System (ADS AA0D0082, FY 2002 Programmatic GPP)

The Fusion Energy Division (FED) is an ORNL facility located at the Y-12 National Security Complex on Bear Creek Road. For the past several years, there have been several attempts to relocate the FED facilities to the ORNL site because of the increasing costs of maintaining the old World War II structures in which the FED is presently located. Other reasons for leaving the Y-12 site are the access problems for foreign nationals with which FED collaborates, legacies of contamination in the FED building itself, and increasing (and uncertain) mission burden at the Y-12 Plant. More importantly, the new UT-Battelle management team has stressed the need to have all ORNL facilities located within the bounds of the ORNL campus. The most recent efforts for the Laboratory revitalization have placed the FED in the 7600 Area. The primary reason that the 7600 Area was selected for the FED is the availability of electrical power. FED requires 161-kV power distribution with 13.8-kV feeders for the basic infrastructure.

The FED maintains a sizeable infrastructure required for performing fusion and related projects/programs. Included in the infrastructure are high-voltage power supplies, rf transmitters, cooling systems, and numerous laboratories.

As part of the proposed move to the ORNL campus, FED will be required to dismantle an existing cooling system or purchase a new cooling system. FED has the opportunity to acquire a complete 6-MW cooling system from the Massachusetts Institute of Technology (MIT), paid for by DOE. This system is presently located in Palo Alto, California, at a CPI (formerly Varian) site and is approximately 10 years old. This would be a two-phase funding. The first phase of the project will be the dismantlement and shipment of the MIT cooling system from California to Tennessee. The second phase will require the installation of the system. All data is provisional, estimate only.

HFIR Secondary Coolant System Life Extension (ADS A01D0046, FY 2004 Programmatic GPP)

HFIR's current secondary system, with the exception of the cooling tower, is more than 35 years old. Much of the 36-inch and 42-inch carbon steel piping is underground, and degradation has been observed. In addition, the emergency/backup secondary system pump, PU-14, needs replacement because it is nearing its end-of-life.

Recent construction of a new cooling tower indicated a need to replace the tower basin drain valves because the current ones are leaking and are near end-of-life. In addition, the tower blowdown system is in need of reconfiguration for better control of release of blowdown to the creek. The chemical addition and control system also needs replacement.

Material Handling Facility Addition (ADS A01D0049, FY 2006 Programmatic GPP)

An addition to the 7900 facility will allow for radioactive material handling, waste characterization, and material and equipment staging. Very limited laydown areas are currently available for radioactive surveys, hazardous material staging, material and equipment transfer, and waste satellite storage.

Current areas utilized in the HFIR are the beam and experiment rooms, which contain scientific personnel performing experiments, and the water wings, which contain in-service process equipment. Radiological surveying can only be performed in very limited areas due to relatively high radiation backgrounds resulting from reactor operation. A building physically attached to HFIR (Building 7900) would provide proper engineering controls for performing these tasks, increase personnel safety, and reduce potential environmental impact.

FED-Foundation For Cooling Tower System (ADS AA1D0059, FY 2003 Programmatic GPP)

The Fusion Energy Division (FED) is an ORNL facility located at the Y-12 National Security Complex on Bear Creek Road. For the past several years there have been several attempts to relocate the FED facilities to the ORNL site because of the increasing cost of maintaining old World War II structures in which the FED is presently located. Other reasons for leaving the Y-12 site are the access problems for foreign nationals with which the FED collaborates, legacies of contamination in the FED building itself, and increasing (and uncertain) mission burden at the Y-12 Plant. More importantly, the new UT-Battelle management team has stressed the need to have all ORNL facilities located within the bounds of the ORNL campus. The most recent efforts for the Laboratory revitalization have placed the FED in the 7600 Area. The primary reason that the 7600 Area was selected for the FED is the availability of electrical power. FED requires 161-kV power distribution with 13.8-kV feeders for the basic infrastructure.

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As part of the proposed move to the ORNL campus, FED would be required to dismantle an existing cooling system. FED has the opportunity to acquire a complete 5-MW cooling system from the Massachusetts Institute of Technology (MIT), paid for by DOE. This system is presently located in Palo Alto, California, at a CPI (formerly Varian) site and is approximately 10 years old. Efforts to acquire this system through alternate funding sources are in progress. This ADS proposal is to acquire GPP funding for the concrete work required for an outside foundation, which must precede the arrival of the system. This cooling system (including power supplies) will be used for multi-FED programs requiring high-pressure, high-volume cooling water. All data is provisional, estimate only.

7000 Area Parking Lot Expansion (ADS AA1D0050, FY 2002 Institutional GPP)

This project will provide for additional parking areas adjacent to the existing 7000 Area parking lot to support the ORNL Facilities Revitalization Project. The 7000 Area lot must be expanded to accommodate vehicles currently parking in the 7012 lot adjacent to Bethel Valley Road. The 7012 lot will be eliminated by a proposed landscaped berm in this area to screen the 7000 Area facilities from traffic on Bethel Valley Road.

Facility Preparations for PU-238 Product (AA1D0015, FY 2003 Programmatic GPP)

This project provides certain infrastructure modifications for Building 7930 to allow for future installation of chemical processing equipment. The project is a direct result of a recently issued Record of Decision to reestablish domestic Pu-238 production using Building 7930 for target fabrication and chemical processing. The project will provide for additional hot cell shielding to an existing wall, additions of stainless steel barriers to protect existing hot cell walls, and modification of an in-cell waste line to facilitate future maintenance, etc.

Bethel Valley Road Access Control Improvements (ADS AA2D0009, FY 2002 Programmatic GPP)

This project will provide new entrance portals on Bethel Valley Road east and west of the main ORNL site to enhance access control to the ORNL site. Previously, Bethel Valley Road was open to all traffic. In December 2001, traffic was limited to personnel with official business at ORNL.

Temporary portals will be located on Bethel Valley Road until the new portals are completed. At each portal location, Bethel Valley Road will be widened to accommodate one outbound and three inbound traffic lanes and an island for a prefabricated portal building. A turnaround loop will also be constructed for vehicles denied access.

East Campus Telecommunications Upgrades (ADS AA1D0051, FY 2003 Landlord GPP)

This project provides for installation for the telecommunications cabling and equipment required to support the development of the East Campus area.

3515/3524 SIOU Parking Lot (ADS AA1D0056, FY 2004 Institutional GPP)

This project will provide for additional paved and lighted parking areas over the surface of remediated surface impoundments 3513/3524. The additional parking areas are in support of the ORNL Facilities Revitalization Project.

1503 Greenhouse Renovation (ADS A00D0043, FY 2003 Landlord GPP)

This GPP is intended as a preferred alternative to two other GPP requests, Seismic Upgrades, 1506 (ADS A99D0055) and Renovation 1506 Greenhouses (ADS S97D0005). In response to a seismic evaluation driven by Executive Order 12941, it was found that Building 1506 was in the "Definitely Needing Repair (DNR)" category. This was based on the conclusion that a possible failure scenario has been postulated because of a lack of roof diaphragm action. The lack of a topping slab to ensure diaphragm action in the roof is the primary contributor to this postulation.

There are currently four greenhouses that are attached to the 1506 structure. They are nearly unusable as functional greenhouses, which makes it difficult to respond to recent sponsor research needs across several DOE Offices.

Given the seismic risk and the current conditions of greenhouses, this GPP request is aimed at moving all activities from 1506 to 1503, where modern laboratory space would be created, the existing spaces would be renovated to create a head house, and new greenhouse structures would replace the existing ones (the existing greenhouses at 1503 are also no longer functional).

The following tasks/activities are covered by this GPP request:

- Renovate the 1503 conference room to accommodate two large laboratories currently in 1506. This will include construction of a new wall, electrical upgrades, installation of bench space, laboratory sinks, fume hoods, eyewash/shower units, etc.

- Modify other rooms in 1503 to accommodate activities currently housed in multiple 1506 instrument rooms.

- Convert the current maintenance shop in 1503 into a head house to support greenhouse operations.

- Demolish existing 1503 greenhouses and construct replacement units on existing foundations.

- Construct an addition to the south end of 1503 to house new environmental growth chambers and move select growth chambers from 1506 into modified spaces in 1505.

- Erect a large pre-engineered storage building in the lot south of 1503 to accommodate ESD sample and equipment storage needs.

- Move equipment essential to programmatic research needs from 1506 to the renovated 1503.

Upgrade HOG/GBOG System in Building 3047 (ADS A01D0037, FY 2003 Programmatic GPP)

The original mission of Building 3047 did not include the processing of alpha emitting radioisotopes, but rather was focused on processing, handling, and separations of relatively large quantities (curies) of beta- and gamma-emitting radionuclides within the confines of heavily shielded 3-foot-thick wall concrete hot cells. However, at some time (probably early 1970s), there began an alteration of laboratories and off-gas systems in the West End of 3047 Labs 110, 208, 209, 210, 211, 212) to process alpha emitters. Thus, a glove box off-gas system was installed in the area. It consisted of one or two major control valves, two vacuum relief devices, a wide array of pipe fittings, 100-200 feet of high integrity stainless steel piping (2-3 inches ID), inlet and exhaust HEPA filters and capacity for 8-10 glove boxes, theoretically. Also, the most important component was an alpha hot cell capable of being outfitted with shielding and glove box capabilities. The recent loss of pressure event has led to the request for some of the work described here. All components of the GBOG system, as described above, should be tested to determine priority of replacement, particularly HEPA filters, filter houses, the main control valves, and vacuum relief dampers. If the pressure drop has become too large in the system, sections of 2- and 3-inch off-gas duct should be replaced with 4-inch I.D. all-welded 304L stainless steel pipe.

For the back-up GBOG vent option, a section of pipe (as specified above) with appropriate valving and instrumentation, shall be installed between the existing main control valve and the 3028 filter house. This tie-in will be radioactively contaminated and must be done carefully, with planning and work sequences and ALARA considerations. The suction end will be tied into an existing sleeve in the wall of Cell A, thereby supplying the COG (cell off-gas) as the backup for the GBOG system. As the COG is only -1.0 to -2.0 ins w.g., it can only be temporary. No operations should be performed until full negative pressure is restored.

Road and Parking Lot Paving - ORNL (ADS C97D0104, FY 2002 Institutional GPP)

This project will provide for the paving of gravel parking lots which have been constructed in recent years. These lots include the HFIR Area lot, the 2000 and 2001 lot, and other smaller areas that meet capitalization criteria for new paving.

Building 7920 Expansion for Master/Slave Manipulator (ADS A98D0013 FY 2003 Programmatic GPP)

The work, equipment, and insulation activities that will be required for completion of this facility addition will include major structural additions with footings and foundations, concrete block walls, new energy-efficient fluorescent lighting, fire protection piping, concrete floors, internal structures for holding master-slave manipulators, double doors on the south side, and a south side dock to match the existing dock.

The manipulator storage addition to Building 7920 will be located on the west side of the building just north of the existing external crane and double doors on the first floor, which are currently used for receipt and acceptance of manipulators in Building 7920 when ordered by the operator, and the double doors at the second level which are used for receipt and acceptance of drums and materials for the chemical makeup room for hot cell work. An existing elevated dock provides access to the first- level double doors. The addition to Building 7920 will be a two-story facility 24 feet high, 19.5

feet in the north-south direction, and 24 feet east-west near the wall of the existing roll-up door. The construction will be two story with no access between the two stories. However, the upper room will be accessed from the landing and the stairwell. The new roof will be flat with standard built-up roofing. No cooling system will be required for the normal function of the facility. If a fire protection system must be installed to meet the requirements of the National Fire Protection Association (NFPA) codes, a heating system of some sort will also have to be provided. Diking of some sort must be provided for the lower floor only. The engineering details of this dike or sump will be worked out in the design. Support utilities should be minimized; that is, lighting will be provided as is necessary for ES&H requirements, and electrical receptacles as required by code.

The addition to Building 7920 will now be required to serve at least two functions. First, it will provide space for staging of the crucial master/slave (series F) manipulators without which the work of 7920 cannot be accomplished; second, it will provide a location for the replacement of a VOG scrubber that is necessary to maintain long-term operation of 7920. The original VOG scrubber, which serves the primary role of controlling/containing the highly active alpha activity processed in the hot cells, was installed in Cell 7 in 1964/65 and has reached the end of its usable life. Addition of the scrubber will require expansion of the floor spec (by 100 sq. ft) of the originally prepared add-on facility. New additions will include utilities (process water, steam, etc.), hot LLLW drains, plumbing/piping to connect the new scrubber to Cell 7 and then to the off-gas treatment train, and a heavily shielded (3- to 4-foot thick walls) hot cell cubicle to shield the scrubber. An HVAC system will also be required.

SWSA 2 Parking Lot (ADS AA1D0058, FY 2006 Institutional GPP)

This project will provide for additional paved and lighted parking spaces over the filled area above SWSA 2. This additional parking is in support of the ORNL Facility Revitalization Project.

Multiple Projects 3500E Flexible Laboratory Shell (ADS A01D0058, A01D0059, A01D0060, A01D0061, A01D0062, FY 2005, FY 2006, FY 2007, FY 2008, FY 2009 Landlord GPP)

An upgrade to the east side of the Building 3500 complex is proposed to allow the implementation of flexible, special-purpose laboratories needed for support of future and ongoing research projects. As ORNL moves into newer nanotechnology, biological and life sciences, advanced neutron sciences, and nano/micro-instrumentation research, additional special purpose laboratory space will be needed to support new initiatives. To allow rapid design, construction, and modification of special-purpose laboratory space, it is proposed that the east side of Building 3500 be upgraded to provide a flexible shell with flexible utilities to allow rapid implementation of special-purpose laboratories within this space.

Existing wall partitions and utilities will be removed and replaced with a flexible matrix of utility feeder systems to allow special-purpose laboratory space to be rapidly erected, modified, or dismantled as future project requirements change. Legacy hazardous building materials in the existing 3500E Area will be removed to mitigate future problems with constructing and modifying special- purpose laboratories. Special utilities required include electricity, communications and network wiring, potable water, distilled water, compressed air, compressed nitrogen, vacuum, and precision environmental control of temperature and humidity. Overall environmental control of the shell is required, as well as systems required to condition individual special-purpose labs. This will mean that an overall building environmental management system will be required and up to four additional environmental control subsystems for individual labs will also be required. Lab exhaust systems will be needed, as well as laboratory makeup air systems. Waste chemical holding systems will also be required.

Metrology Service and Measurement Lab (ADS AA2D0053, FY 2002 Institutional GPP)

An upgrade is proposed to modify Building 5510A to provide a laboratory facility for the Quality Service Division, Metrology Services and Measurement Standards group (QSD/MS7MS). This will be accomplished by renovating two labs in the building to provide better humidity control.

Replace Cooling Tower 4511 (ADS A98D0016, FY2006 Landlord GPP)

The 4511 cooling tower wooden structure is deteriorating at a rapid rate under dry conditions and becomes increasingly hazardous to maintain. This project will replace the cooling tower superstructure.

Building 1059 Modification (ADS AA2D0004, FY 2004 Programmatic GPP)

Building 1059 will be connected to the Laboratory for Comparative and Functional Genomics (LCFG), which is scheduled to be constructed by July 2003. Modifications to 1059 are required to accommodate the research to be conducted in LCFG as research staff and equipment are transferred to the new facility from Building 9210 at Y-12. Microinjection laboratories, cryopreservation facilities, and radiotracer operations are needed to support the research in the LCFG but cannot be located in that facility because of requirements to make this a clean animal facility with limited access. Because these laboratories utilize the animals in LCFG, they must be located adjacent to that facility.

6000 Area Cooling Tower Replacement (ADS A01D0004, FY 2004 Institutional GPP)

A cooling tower presently exists to provide water to the Building 6000 Area for chilled water/HVAC and heat exchange purposes. The cooling tower was constructed around 1960 and is deteriorating after approximately 40 years of service. It has already exceeded normal cooling tower lifetime.

This project will replace the 6000 Area cooling tower in its entirety by extending plant chilled water lines (which presently run to the area south of Building 6010) to Building 6000. The cooling tower will be demolished and some modification to the existing Building 6000 utilities will be required. Two chiller units will be removed and heat exchangers and related components upgraded to accommodate the lower-temperature water.

Implementation of Fire Hazards Analysis (ADS A01D0047, FY 2003 Programmatic GPP)

During revision of the HFIR SAR and review by DOE, a new Fire Hazards Analysis was requested for HFIR. It will include a new section for Safe Shutdown Analysis for the Facility. Although this analysis is not yet completed, it is anticipated that considerable plant modifications may be required to implement the recommendations/requirements from this analysis. These modifications will be required to be implemented by April 10, 2003.

Power Supply Building - 7600 Area (ADS AA1D0010, FY 2004 Programmatic GPP)

The Fusion Energy Division (FED) is an ORNL facility located at the Y-12 Plant on Bear Creek Road. For the past several years there have been several attempts to relocate the FED facilities to the ORNL site as a result of increasing cost to maintain old World War II structures in which the FED is presently located. In keeping with this initiative, the UT-Battelle management team has committed to having all ORNL facilities located within the bounds of the ORNL campus. In accordance with the ORNL Revitalization Plan, FED is to be relocated to the 7600 area. This area was selected because of the electrical power requirements required by FED for current and future programs.

In the spirit of the ORNL Revitalization Plan, FED proposes to move infrastructure which will not interfere with program milestones or sponsor requirements. High Power/high voltage capabilities are a key to the existence of the FED. The power supplies required for the fusion programs can be placed outside. The power supplies require a concrete on-grade slab approximately 42 feet by 120 feet with a self-contained, pre-engineered metal enclosure. The enclosure will not require A/C or heating capabilities; fan cooling will suffice. Thus, the objective of this ADS is the construction of a self-contained metal enclosure with an on-grade slab for power supplies. These power supplies are generic, with the capability to drive high-current magnets for plasma science and technology programs. All data is provisional, estimate only.

HVAC Upgrades (ADS S97D0051, FY 2005 Institutional GPP)

This project provides the installation of new HVAC systems and replacements of deteriorated air conditioning components which provide environmental control for Laboratory facilities. A prioritized listing of activities included in this project is maintained by FMD. All equipment on this list has exceeded its life expectancy. Replacing these deteriorated components will improve air conditioning reliability and reduce operating and maintenance cost.

Infrastructure Improvements, HFIR (ADS AA0D0051, FY 2006 Programmatic GPP)

This project will design and relocate the overhead electrical power lines (13.8 Kv, 480- and 240-V), fiber optics, broadband cable, and telephone utilities to the south of the existing waste tanks; and install new pole-mounted power transformers (167 Kva) and new underground duct banks for the area. The relocation will provide upgraded power supplies for the southern quadrant of HFIR and neutron sciences research activities in this rapidly expanding area. The project will also provide a new access road to be located south of the existing waste tanks. All of these infrastructure improvements will reduce interferences (e.g., vehicular-pedestrian interactions) and open the research area into a more campus-like facility.

Transmitter Relocation - 7600 Area (ADS AA1D0009, FY 2004, Programmatic GPP)

The Fusion Energy Division (FED) is an ORNL facility located at the Y-12 Plant on Bear Creek Road. For the past several years there have been several attempts to relocate the FED facilities to the ORNL site as a result of increasing cost to maintain old World War II structures in which the FED is presently located. In keeping with this initiative, the UT-Battelle management team has committed itself to have all ORNL facilities located within the bounds of the ORNL campus. In accordance with the ORNL Revitalization Plan, FED is to be relocated from Y-12 to the 7600 Area at the ORNL main site. This area was selected because of the electrical power requirements required by FED for current and future programs.

In the spirit of the ORNL Revitalization Plan, FED proposes to move infrastructure which will not interfere with program milestones or sponsor requirements. One key component is the BBC Transmitter. The power supply required for the transmitter can be placed outside, as it is comprised of a self-contained enclosure. The power supply requires a concrete on-grade slab approximately 25 feet by 30 feet. The remainder of the BBC Transmitter will be placed inside a building at the 7600 site. Thus, the objective of this ADS is the construction of an on-grade slab for the power supply associated with the BBC transmitter. All data is provisional, estimate only.

Flow Monitoring Stations for Low-Flow Verification (ADS A99D0027, FY 2005 Institutional GPP)

This project provides for the installation of permanent flow monitoring equipment at upper First and Fifth creeks in the ORNL main plant area. The equipment will be designed such that ORNL can collect continuous flow data at a point above ORNL wastewater discharges. The ORNL NPDES Permit currently includes stringent effluent limits for several outfalls on First and Fifth creeks, and compliance is difficult. These limits are based on conservative regulatory assumptions about baseline flow rates in these two ORNL receiving streams and have been appealed by DOE. A long-term flow record is expected to allow ORNL to verify or disprove flow rate assumptions on which NPDES Permit requirements are based. This will position DOE to propose and negotiate more realistic and achievable NPDES Permit requirements for discharges to these streams.

HFIR Highbay Storage Building (ADS AA0D0078, FY 2005 Programmatic GPP)

HFIR warehouse storage for safety-related parts and equipment and nonsafety-related equipment is currently being stored in nine different locations, four of which are remote from HFIR. These remote locations are as follows: 3095, 7019, 7039, and 7709. Materials are also being stored in 7914, 7915, 7953B, and two tents located adjacent to 7917. Of these locations, 7709, 7915, and 7953B are conditioned space. HFIR safety-related equipment and parts must by law be stored in conditioned space. Buildings 7914 and 7915 were construction sheds that were used by the contractor when HFIR was built in 1963. They were temporary then. The two tents are an attempt to meet the need with no funding. Significant operational funds are expended every year for moving material and parts between storage places to try to make room for something else that must be stored or for moving things to the reactor site so that they can be used.

A single building with conditioned space on-site would allow HFIR to meet requirements and improve efficiency. Costs for riggers should be reduced. Currently, there are 11,640 square feet of unconditioned warehouse space and 6,420 square feet of conditioned space in use. A minimum of 18,000 square feet is required for continued operation of HFIR for another 25 years.

Ventilation Systems, Ductwork, and Fume Hood Upgrade (ADS C97D0054, FY 2005 Landlord GPP)

Work will include activities to upgrade ventilation systems, filtration systems, interconnecting ducting, and equipment for fume hood and exhaust systems located in facilities at ORNL.

Deteriorated fume hoods and associated exhaust ductwork will be selectively repaired or replaced from hood to filter housing. Repairs will replace all corroded ductwork (with stainless steel or equivalent) and provide leakproof construction with gasketed, flanged joints required for installation/removal. Duct size will be standardized as 12-inch-diameter for hood service. Existing exhaust ductwork from fume hoods will be considered a contaminated material in all cases and will require strict conformance to local work procedures during all repairs and/or replacements.

Fume hoods not previously replaced by interim improvements will be replaced with new fume hoods that conform with the new system concept. The intricate requirements for building airflow balance

will be carefully considered in deciding the type of fume hoods and exhaust system arrangement to be employed. Variable-volume fume hoods (airflow regulated by sash position) provide a more appropriate application for these buildings than do auxiliary air hoods (as related to DOE 6430.1A, 1161-4 and 1161-5). Variable-volume fume hoods allow much less complication of controls and should require less total air volume to be heated and filtered (as supply and as exhaust) through system life.

Deteriorated HEPA filter housings will be replaced with new single-filter housings with prefilter space (thus allowing prefilter use to be optional). To achieve full airflow for an 8-foot Class II fume hood (1300 ft^3/min), two single-filter housings are required, using manifolding with interconnection to a single exhaust fan (or header connection). Specifically, these housings and fans will require stacking similar to that now practiced to conserve space. Unit modules will be standardized to use 24- by 24-inch prefilter elements and 24- by 24- by 11.5- inch HEPA filters. All new ductwork and filter housing will be made to conform with current regulations to allow its continued use in the future.

Replace Hood/Secondary Confinement Exhaust – 7920 (ADS A00D0032, FY 2005 Landlord GPP)

The scope of this project includes the following tasks:

1. Replace the flexible connections on the inlet of exhaust fans AJ-120, AJ-121, AJ-122, and AJ-123. Existing deteriorated materials should be fully removed, metal edges made smooth and non-protruding, and new material installed. New material should be double-layered, 30-ounce neoprene impregnated glass cloth (Ventglas) with joints overlapped and edges folded under the securing bands to prevent stretch and tearing under constant suction loading.

2. Replace the backdraft dampers in the suction ducting (at the plenum wall) of exhaust fans AJ-120, AJ-121, AJ-122, AJ-123 on the roof. The existing dampers have deteriorated to the point of being unreliable and are inaccessible for easy inspection and repair. Replacement units need to be better suited to the application and must fit into the existing (same) niche in the plenum wall, with concern for blade clearance immediately downstream due to the converging suction ducting. Viewing ports in the wall of the existing plenums will be provided to allow visual inspection using the existing internal lighting.

3. Replace/rebuild fans AJ-120, 121, 122, and 123 and install new vibration isotopes for these new replacement exhaust fans, specifying protective coating for isolators, coils, surfaces, etc., to provide resistance from long-term exposure to systems entrained moisture.

4. Replace control systems.

5. Verify structural integrity of roof support steel and replace it as necessary.

6. Replace corrected plenum.

6.1 Replace the deteriorated exhaust air filter plenums on the roof to eliminate the inleakage of rainwater and air. Seam leaks and corroded sections of sidewall must be repaired with particular concern for shedding rain (water) that can be sucked into internal compartments. Top areas can be roofed with extended coverage over fans and drives. Bottom curbs must be resealed after metal repairs and restoration of coatings. Particular care must be exercised in cutting and welding in the vicinity of mounted filters and when plenums are under suction. These plenums are essential single path components of these exhaust systems and, as such, they must be maintained in a fully serviceable condition at all times.

6.2 Install a system of monitoring that will detect the accumulation of water that may be collected in each compartment of the exhaust plenums on the roof. Existing curbing causes compartmentation that must be individually sensed so areas having water fault can be identified before accumulated water violates the contamination zone by overflow or backleakage at the perimeter joints. The lack of a drain system in the plenums requires an alternate method of water control to avert serious damage that would be caused by inleakage into the roof plenums.

6.3 Replace the deteriorated and failed backdraft dampers (BDD) in exhaust ducts with new flanged replacement BDDs having external accessories that will afford easier maintenance and better inspection. It is recommended the three BDDs in the main exhaust ducts on the roof be removed but not replaced because they are a duplication of backdraft devices inside the building, i.e., they represent a second device (in series) for the same exhaust streams. The six devices on exhaust streams inside the building will afford better maintenance conditions (than the roof area) and provide individual isolation from backdraft via the ducting for the six areas served.

6.4 Clean the main exhaust duct over the ceiling of Laboratory 209 of any and all debris (trash) that may have deposited that would impede drainage and/or airflow. It is essential that the valved drain in the heel of this main duct be kept clear and operable as the route to relieve any heavy water inleakage occurring in the exhaust plenum on the roof.

6.5 Replace exhaust ducting on the roof where failed backdraft dampers (BDDs) must be removed and replace balancing dampers in the new ducting to supplant those displaced by necessary duct removal. Because of the real limitation of welding new to existing coated ductwork, it is recommended that duct sections be replaced from existing flanged joint to existing flanged joint. This will enable new sections to be shop-fabricated to lessen downtime of the exhaust system and eliminate any welding to existing ducts. After welding existing coated ducts, it is impracticable to restore the internal coating system. Access to existing duct interior surfaces is essentially non-existent, so reworking existing ducts limits quality assurance control.

6.6 Modify pressure-sensing tubing for gages that sense differential pressure valves for filters in the plenums on the roof. The tubing must be arranged to separate any collected moisture without distorting gage readings and to resist clogging due to corrosion of exposed in-stream surfaces. This change is necessary to ensure the indicated values will truly reflect the status of the filter banks contained in the plenums.

6.7 After all renovations and repairs are completed, install new air filters in the exhaust filter plenums on the roof. In-place DOP testing of all HEPA filter installations will be provided to prove compliance with ORNL criteria for these systems. System airflow levels will require adjustment to normal volumes (19,860 cfm for Laboratory Exhaust and 15,905 cfrm for Cell Support Areas) after new filters are installed via the new manual control stations in Control Room 116. Also, adjustment of the new main duct exhaust dampers will be required to restore the needed distribution of exhaust airflow.

Dosimetry Laboratory (ADS A01D0020, FY 2006 Landlord GPP)

In support of the Facility Revitalization Project, the radiation dosimetry activities at the Laboratory will be consolidated into one facility (approximately 5000 square feet). The internal dosimetry located in 4500S, Wing 4, and the external dosimetry located in the 2652A Trailer will be housed in the new facility. The internal dosimetry will be impacted by the first renovation of 4500S. These operations will have to be relocated prior to initial construction activities. The external dosimetry is housed in trailers where deterioration of infrastructure is occurring at a rapid pace. Both operations are accredited by DOELAP to perform operations. The structure will be located adjacent

to the 2008 Whole Body Counting Facility, and they will have five laboratories, a counting room, and auxiliary offices and storage rooms.

Water System Upgrades, 1000 Area (ADS A98D0009, FY 2006 Institutional GPP)

This project will provide a needed infrastructure upgrade for the potable water system in the west end of the ORNL complex. This area is now supplied by a single feed of 6- and 8-inch water mains. This system will be inadequate for planned future development in this area and now provides only marginal fire water supply to the area. This project will install approximately 3000 feet of 16-inch main to the west end of the ORNL complex, along with the associated pressure-reducing valves, isolation valves, fittings, hydrants, and valve pits.

West Campus Infrastructure Improvements (ADS AA0D0068, FY 2006 Institutional GPP)

This activity provides for the construction of infrastructure roads, parking, and common areas associated with the new West Campus development portion of the ORNL Facilities Revitalization Project. This infrastructure improvement will support the West Campus reconstruction by providing new or improved parking lots north of Buildings 1000, 1060, and 1505 to replace the primary parking lots that will be the site of new buildings and common areas. The project also provides for construction of associated new roads and common areas (landscaped quadrangle) in the center of the West Campus. Approximately 0.2 miles of roads will be upgraded or replaced, 5.0 acres of parking upgraded/constructed, and 1.0 acre of landscaped common area provided.

M.1.5 Major GPE Projects – Phase I

Revised Access Controls (ADS AA0D0084, FY 2001 GPE)

This project will provide access control features that eliminate the need for ORNL perimeter fencing except at selected facilities. The present perimeter (fence) will be reconfigured to an access control system located closer to the resources being protected (building, room, etc.). Proximity cards and administrative means will be utilized for access control. This project will provide the necessary badge reader systems for Laboratory buildings.

Backup Diesel Generator for #6 Boiler (ADS AA0D0016, FY 2001 GPE)

This project involves the purchase and installation of a diesel generator at Building 2519 to provide backup power to the No. 6 Boiler. This project will be a turnkey job and provide 480V, 600 Amp service in the event normal power is lost.

SAP Server Upgrade Program (ADS A01D0018, FY 2002 GPE)

ORNL's SAP system supports the Laboratory's financial, human resource, and procurement functions, including such mission-essential areas as human resources, payroll, financial reporting (e.g., DOE, Tennessee, and Internal Revenue Service), and vendor payments.

The computing infrastructure supporting ORNL's SAP system was originally purchased beginning in 1997 and is reaching the end of its expected life span. A 4-year plan has been developed to (a) replace aging components, (b) curtail degrading response times at peak periods, and © upgrade where necessary to support growing system requirements.

(a) Regarding the age of the systems, a 3- to 5-year component life is typical for mission-essential servers in this class. Aging system components result in higher maintenance costs, higher support

costs (to deal with compatibility issues between current software and aging hardware), more frequent service outages, and increased risk of unplanned outages. This upgrade program will result in an overall replacement life of 4 to 7 years for most components.

(b) Response times at peak processing have been deteriorating recently, with certain key reports taking about 2 minutes to generate (expected times are about 10 seconds). A planned upgrade to Version 4.6 of SAP in late 2001 is expected to increase system requirements by 25 to 35% based on estimates from SAP.

© Additional functionality continues to be deployed and/or is planned for deployment over this time frame. Running costs weekly instead of monthly, implementing several "employee self-service" functions within Human Resources, implementing SAP's time collection and absence management functions, and assessment of the SAP maintenance module are all being considered or actively worked.

An overall upgrade plan is the most cost-effective mechanism to address all of these needs in a coordinated manner over multiple years with minimal impact to the ongoing production environment.

High-Resolution Mass Spectrometer (ADS A98D0091, FY 2004, GPE)

This project will purchase a replacement isotope ratio mass spectrometer to maintain analytical capabilities required to fulfill the needs of critical programs, including REDC, HFIR, the Mark-42 program, the Cf program, the Pu-238 program, the MOX program, the stable isotopes program, the SNS, ORNL environmental compliance, Rad waste certification, ISPO, and NSPO.

The mass spectrometers currently used to support these programs were constructed in-house in the 1960s and are now virtually in their last days. Maintaining these instruments now takes the full-time services of an I&C technician, in addition to division manpower and the services of two part-time consultants. These two consultants are retirees who built the instruments nearly 40 years ago and are the only people who fully understand their operation. The personal commitment of these two retirees is heavily relied upon to maintain operations. In addition, with aged equipment, replacement parts are becoming increasingly difficult to obtain. The high level of labor required to operate and maintain these mass spectrometers is resulting in increasingly higher operational costs. Increased downtime makes the ability to respond to customers' needs increasingly unreliable. This situation is severely impacting (1) the capability to support current ORNL programs, which jeopardizes their existence, and (2) the ability of ORNL to compete for new programs. Without acquisition of new instrumentation, ORNL is in imminent danger of losing our capability to provide the required analytical support for these programs. Although some of this work (primarily low-level rad) could be done at a few other DOE sites (e.g., LANL), loss of the necessary analytical capabilities at ORNL would significantly increase the costs (and turn-around time) for the ORNL programs due to increased shipping and transportation requirements for these rad samples. In other cases, no other available option exists for these analyses, which would put many ORNL programs at risk. At present, ORNL is recognized as the lead laboratory in the DOE complex for these types of analytical measurements, reflecting our historical strength in this area; however, external perception of difficulties in ORNL isotope analysis capabilities makes us increasingly vulnerable to loss of programs to other national laboratories.

The proposal is to purchase a modern multicollector isotope ratio mass spectrometer for ORNL. This will allow ORNL to continue to provide the analytical capabilities required to support current programs and pursue new funding opportunities. This instrumentation will modernize our

capabilities for isotope ratio analysis, reducing analytical costs and improving data quality for a variety of ORNL programs and projects, including:

1. Isotope production at REDC (process control and product certification)
2. Analytical support to EM30 and EM50 work by CTD, CASD, Waste Management, etc.
3. MOX fuel program
4. Pu-238 program
5. Radioactive waste characterization to meet compliance requirements, particularly in the area of criticality safety requirements
6. Generating legally defensible data for environmental samples
7. ORNL's Stable Isotope Program
8. Domestic and international safeguards programs. This system could help generate new funding from several sources, among which are safeguards and other programs with IAEA.

Convert Steam Plant Boilers to Natural Gas Firing (ADS C98D0142, FY 2005 GPE)

This task will entail the retrofit of the existing boiler structures to remove coal-related equipment and to install new burner arrangements to allow the boilers to each produce 50,000 pounds of steam per hour with gas and oil fuel.

M.2 PHASE II PROJECTS (FY 2007–11)

M.2.1 Line Items – Phase II

4500 North and South Modernization Upgrades (ADSs AA0D0098, AA0D00102, AA0D0103, AA0D0104, Multiyear Landlord LI)

The proposed projects are integral parts of the new Facilities Revitalization Project (FRP) for revitalization of ORNL's research capabilities and infrastructure in support of the DOE-SC initiative to modernize their national laboratories. Consistent with DOE's approved Institutional Plan for ORNL, new laboratories, supporting offices, and the necessary support facilities are being proposed for construction as part of an integrated new campus environment in the area north and east of the 4500 North and South Buildings complex. The 4500 North and South complex will be modernized to provide laboratory, office, and support functions. The overall goals of this facilities revitalization initiative are to reduce the burdensome costs of maintaining the current inventory of 50+-year-old facilities, provide a safer environment for current staff to work in, and to ensure ORNL's ability to conduct world-class science in the 21st century, including attracting and retaining world-class research scientists. The payback period is approximately 6 years. There are eight separate upgrade projects in these two facilities. 4500N (Wings 1,2, and 3) and 4500S (Wings 2 and 3) are in Phase II.

ORNL Center for Systems Biology (ADS A98D0087, FY 2007 Programmatic LI)

The ORNL Center for Systems Biology, a 50,000-square-foot facility with a modular complex of buildings, equipment, and supporting infrastructure to be located in the West Campus, will provide space for research programs for functional genomics, structural biology, proteomics, and systems biology. It will also provide staged facilities to house the Center for Systems Biology user facilities. A preliminary estimate of payback for this project is seven years.

Potable Water System Upgrade Phase II (ADSs C97D0062, FY 2007 Landlord LI)

The Potable Water System Upgrade, Phases I and II, will replace or refurbish aged water lines serving the primary research and support facilities in the central campus area of the Laboratory. The main lines running along Central Avenue and the north side of the Building 3508/3517 area will be replaced in the first phase of the project with the Laboratory facilities north of Central Avenue in the vicinity of First Street and the 3047 Isotopes Area. Because of the subsurface contamination concerns within the central campus, multiple technologies are being evaluated for this project, including standard below-grade pipe replacement, above-grade insulated piping, and in-situ lining of existing lines where appropriate and feasible. A preliminary estimate of return on investment is 10% with a payback period of seven years.

Laboratory Facility Ventilation System Upgrade, Phase II (ADS A98D0055, FY 2007 Landlord LI)

The Laboratory Facility Ventilation System Upgrades, Phases I and II, are projects that will modernize ventilation and exhaust systems in approximately ten ORNL facilities totaling over 200,000 square feet of space. Ventilation and exhaust systems in many ORNL facilities are in serious need of upgrade to continue service at any level. Some laboratory areas are not used for research because of a lack of proper ventilation. Systems feature 35-year-old equipment applied in a 35-year old design concept. In many systems the exhaust ducting and filter housings are seriously corroded and have only a marginal future life expectancy. New exhaust fans, ducts, hoods, and an EPA-compliant stack are needed for compliance with regulations. The majority of these duct/housing units are contamination zones that will require closely controlled work conditions. A preliminary estimate of a payback period for this project is seven to nine years.

M.2.2 Major GPP Projects – Phase II (FY 2007–11)

7900 Area Office Building I (ADS AA0D0043, FY 2011 Landlord GPP)

Research Reactors Division currently has 75 people housed in trailers. Several of these trailers were installed in 1987–89 and were used trailers when they were installed. Specifically, Trailers 7964A, 7964B, 7964D, 7964F, and 7964G have numerous recurring problems such as roof leaks, window leaks, HVAC unit malfunctions, mold, mildew, and rodent problems. Additionally, some of these units have deteriorated to the extent that they have serious odor problems associated with decaying facilities.
significantly since 1987, and the level of staffing will probably never return to the pre-1988 level. An office building is needed to revitalize the campus and improve working conditions for the Research Reactors staff and DOE HFIR site representatives.

Documents that are required by law to be maintained are currently being stored in 12 different locations. Some of these locations are trailers, and some consist of unairconditioned space despite requirements calling for the space to be air conditioned. Radiographs of the HFIR vessel and systems and QA records are examples of documents not stored in compliance. Many of the records are required to be stored for the lifetime of the facility, which is projected to be 2035. Requirements also include maintaining all maintenance work packages as records. The proposed office building should The trailers were all intended to be temporary structures. The operating environment has changed include 3000 square feet for document control.

6010/6025 Renovation (ADS AA0D0080, FY 2006 Landlord GPP)

This activity provides for the renovation of office and laboratory space in Buildings 6010 and 6025 to accommodate the needs of Physics Division staff moving into the vacated space. Both buildings will also require upgrading of computer access, including installation of twisted-pair connections to offices and laboratories. Both buildings will require modernization of conference rooms to enable utilization of modern projection techniques and the addition and/or renovation of laboratory space to ensure adequate electrical power, water, and bench space. Specific issues to be addressed in 6010 include conversion of the present Center for Engineering Systems Advanced Research (CESAR) Laboratory space into laboratory space (and possibly some office space) appropriate for Physics Division needs, conversion of some office space back to laboratory space on the first floor, and increased women's rest room space (likely to be required). Originally, 6010 had only one floor and no light switches were installed in offices; therefore, light switches should be added as appropriate. Painting will be required.

In 6025, the central area of the building originally contained large office/laboratory space, which since has been converted to offices. Renovation will include converting these offices back to appropriate laboratory/open space. There has been significant settling of the subsurface of 6025, with resulting cracks in the walls, particularly in the south end of the building. This issue will need to be addressed. There is a small sub-basement, which contained a small neutron generator (no longer there) that was covered over during conversion to office space. This area needs to be located and may need attention. Air conditioning has often been a problem and needs to be reviewed for adequacy, particularly in the central areas. Incidental maintenance will also be needed to ensure appropriate office space (unblocking of doors, patching of cracks, painting, etc.).

Restoration of the Natural Gas Distribution System (ADS S97D0020, FY 2010 Landlord GPP)

This project will restore the existing natural gas distribution grid located in the Bethel Valley area of the Laboratory. Restoration activities will include replacement of line segments, valves, and pressure regulators, where warranted, and will use trenchless technology techniques to rehabilitate pipe where these methods can be proven cost effective. All cathodic protection systems currently in use to prevent corrosion of the system will also be upgraded.

The natural gas piping system is a steel piping grid that provides gas to research facilities throughout the center portions of the Bethel Valley complex. It was constructed in 1948 and has been in continuous use since that time. While it has been largely trouble-free, design life has been exceeded, and it is expected to develop problems over the next few years. Given the serious nature of accidents caused by natural gas leaks, it is imperative that measures be taken to restore this system to "as-new" condition before degradation of piping and valves can cause a leak.

Upgrade Motor Control Centers/Switchgear – REDC (ADS A01D0036, FY 2009 Landlord GPP)

The scope of this project includes the following tasks:

1. Replace the motor control centers for Building 7930.

2. Replace the switchgear outside Building 7920 (substation east of main building).

3. Replace the motor control centers in both of the REDC generator shacks (7921, 7931 - safety inspections have shown the precarious condition of wiring inside 7931).

4. Even though the wire electrical conductors, enclosed within a concrete containment enclosure which travels underground between 7920 and 7930, were last replaced about 1992, the presence of the underground steam line in such close proximity to this concrete electrical wireway impels ORNL's electrical system experts to relocate the main electrical feed for 7930 from the underground wire way (concrete tray) to the existing 14KVA power lines in the area (circuit 294?). The exact route to be taken is not yet clear. The project would have to be aware of the rabbit transfer line (7920 and 7930) and other north/south underground piping in that area.

The ORNL Line Item most recently initiated to fix electrical systems in Bethel Valley facilities (4501, 4505, 4500N) focused heavily on service entrances and motor control centers.

Bethel Valley Road Traffic Calming Measures (ADS A00D0017, FY 2007 Landlord GPP)

This project will relocate 1.3 miles of Bethel Valley Road approximately 1000 feet to the north of its present location. It will be a lower-speed roadway containing three 12-foot lanes and two 14-foot shoulders. The proposed relocation will reroute “through” traffic around an area proposed for near-term development of new facilities, reducing the potential for public traffic to enter Laboratory roadways. The proposed relocation will eliminate the dangerous "S" turn located at the Laboratory's main entrance.

Building 4509 Maintenance Shop Addition (ADS C97D0089, FY 2007 Landlord GPP)

This project will construct an addition of approximately 2500 square feet to Building 4509, which houses the Air Conditioning Compressor maintenance activities for the Laboratory. The addition will allow space for maintenance personnel to work on major air conditioning units and support equipment. The addition will improve safe operations for maintenance personnel who work with gasses having the potential for significant hazards.

Electrical Service Upgrade - Building 7601 (ADS A00D0027, FY2007 Landlord GPP)

This project will upgrade the electrical system serving the offices in Building 7601, provide additional clean conditioned power to the office areas to support office equipment (computer) operation, and add electrical outlets and individual light switches to each office.

Upgrade Electrical Systems (Buildings in the 3000, 6000, and 7000 Areas) (ADSs C97D0069 and ADS C97D0070, FY 2007 Landlord GPPs)

This project will replace obsolete and inadequate switchgear and transformers at the main electrical service entrances of buildings in the 3000, 6000, and 7000 Areas. These electrical devices are the control points for the main electrical systems in these facilities. Much of this equipment has been in service for 50 years and must be replaced to ensure reliable electrical service to the customers and provide a safe environment for building occupants, system operations, and maintenance personnel.

Eyewash, Safety Shower Stations, and Supply Piping, 7920 (ADS C97D0081, FY 2008 Institutional GPP)

The scope of this activity includes the upgrade of water supply systems and encompasses the following: (1) installation of safety showers and eyewashes with potable water supply, (2) replacement of piping and associated components used to supply and remove process water, and (3) replacement of piping and associated components used for heating.

This project will consist of (1) the removal and replacement of any existing eyewash stations and safety showers in the laboratories and corridors of 4501 and 4505 (to meet OSHA standards, potable water headers will be installed to supply the water for the safety showers and eyewash stations) and (2) the upgrade of safety showers and eyewash stations in 4500N and 4500S to meet standards during the Line Item renovations proposed in the FY 2000 *Strategic Facilities Plan.*

Central Campus Research Building (ADS AA0D0077, FY 2007 Landlord GPP)

This activity provides for the construction of a research building of approximately 14,000 square feet. This facility will house a number of research programs currently located in Buildings 2024, 3115, 3080, and 2019. These very old and high-maintenance buildings provide substandard space for many high-profile research programs. The new facility will house multidivision programs supported by a number of agencies within the Office of Science (KC, EW, and EB) with direct ties to other national laboratories and industry.

Multiple Projects 3500E Flexible Laboratory Shell (ADS A01D0061, A01D0062, FY 2007, Landlord GPP)

An upgrade to the East side of the Building 3500 complex is proposed to allow the implementation of flexible, special-purpose laboratories as needed for support of future and ongoing research projects. As ORNL moves into newer nanotechnology, biological and life sciences, advanced neutron sciences and nano/micro-instrumentation research, additional special purpose laboratory space will be needed to support new initiatives. To allow rapid design, construction, and modification of special-purpose laboratory space, it is proposed that the east side of Building 3500 be upgraded to provide a flexible shell with flexible utilities to allow rapid implementation of special purpose laboratories within this space.

Existing wall partitions and utilities will be removed and replaced with a flexible matrix of utility feeder systems to allow special-purpose laboratory space to be rapidly erected, modified, or dismantled as future project requirements change. Legacy hazardous building materials in the existing 3500E Area will be removed to mitigate future problems with constructing and modifying special- purpose laboratories. Special utilities required include electricity, communications and network wiring, potable water, distilled water, compressed air, compressed nitrogen, vacuum, and precision environmental control of temperature and humidity. Overall environmental control of the shell is required, as well as systems required to condition individual special-purpose labs. This will mean that an overall building environmental management system will be required and up to four additional environmental control subsystems for individual labs will also be required. Lab exhaust systems will be needed, as well as laboratory makeup air systems. Waste chemical holding systems will also be required.

New Fire Headquarters Facility (ADS A01D0056, FY 2010 Landlord GPP)

This ADS is for the relocation and construction of a new Fire Headquarters Facility. The new facility will have approximately 13,000 square feet of floor space and will, at a minimum, house the following: (1) ORNL fire alarm central receiving station; (2) indoor parking for fire, EMS, and other emergency response apparatus; (3) administrative offices; (4) training classroom facility; (5) conference room; (6) shop space for equipment (i.e., SCBA, fire extinguishers, etc.) maintenance; (7) changeroom facilities; and (8) storage space for fire department/fire alarm/fire suppression equipment and supplies.

The current facility (Building 2500) was constructed in the 1960s and is co-occupied with Wackenhut Security. Available floor space and building configuration is inadequate to accommodate

the increased roles and responsibilities of the fire department. Additionally, the existing facility is not optimally located to service major population shifts in ORNL's configuration and the Spallation Neutron Source site.

Computer Network Upgrades (ADS AA1D0001, FY 2012 Landlord GPP)

This project will cover refurbishment of the ORNL network to include:

1. Installation of new fiber optic cabling and equipment for the "backbone". This fiber replacement is required for dense wave division multiplexing (DWDM). This technology uses multiple colors of light. The dispersion characteristics of standard fiber optic cabling are incompatible with this technology over long/moderate distances. Implementing this technology would give a 10-100 increase in capacity. (Year 1)

2. Rewiring legacy buildings with current technology copper and fiber to the desktop and replacement of "edge" electronics in all buildings to take advantage of the faster backbone. (Years 2 and 3)

3. Installation of wide area broadband wireless networking. (Years 3 and 4)

Water System Upgrades, 7600 Area (ADS A98D0010, FY 2010 Landlord GPP)

This project will provide a needed infrastructure upgrade for the potable water system in the east end of the ORNL complex. Presently, there is only a single feed to the 7600 Area of ORNL where there is major potential for a fire loss. Relocation of the Fusion and Engineering Technology facilities from Y-12 to this area is also planned for the future. This project will install approximately 9000 feet of 16-inch main to the 7600 Area at the far east end of the ORNL complex, along with the installation of associated isolation valves, fittings, hydrants, and valve pits.

Radioactive Liquid Wastes Collection System (ADS A00D0025, FY 2008 Programmatic GPP)

Liquid Low Level Waste (Hot Drains)

Purpose: The system provides a means for collection, storage, and transferring of radioactively contaminated liquids.

Isolation: The LLLW system is a gravity drain system and contains no valves for isolation from the Isotopes Area LLLW header.

Major Loads: The LLLW system provides drains from:
- hot cells;
- glove boxes, hoods, and enclosed hoods within the laboratories;
- decon shower in Room 105; and
- drains in the cell blisters.

Proposed change to the LLLW System: Currently, there are plans to install a Liquid Waste collection tank (~300 gallons) in Cell C. The existing drains in each cell will be modified such that it will act as a sump and not allow liquid to flow through the underground LLLW header. The sump will collect any liquid waste which will be vacuum-dragged into the Cell C collection tank. When the tank needs to be emptied, the liquid will be jetted (air jet) to the outside of RDL via existing ½-inch stainless steel lines (the lines are located in the east-west pipe trench in the floor of Room 215). It is currently uncertain how the waste will be delivered to the ORNL LLLW System. Possibilities include installing a new underground doubly contained pipe which will connect to an existing header

or transferring the liquid to a specially designed truck at the concrete pad outside the southwest corner of RDL.

Renovation of 4515 (HTML) (ADS AA0D0076, FY 2009 Institutional GPP)

This activity will support the relocation of several grinding machines, electric furnaces, and other potential sources of either vibrational or electrical/magnetic interference from HTML (Building 4515). This is necessary to make HTML suitable for the emplacement of M&C's research projects in support of accelerator and electron optic instruments. It also includes support for the installation of the instruments (including necessary modifications to electrical systems, water system, ventilation, etc.) removed from 4515 into space in Building 4500S. Renovation of the laboratory space in 4500S is the subject of a separate ADS.

Transportation and Packaging Management Facility (ADS S97D0058, FY 2011 Landlord GPP)

This project will provide a one-story building, 85 feet by 130 feet, with 3400 square feet of space. The building will provide three managers' offices, 16 employee offices, a shipping area 30 feet by 20 feet, a loading dock, and a hazardous/nonhazardous and radioactive packaging area. The facility will provide space for packaging, quality assurance checks, and shipment which will comply with regulatory requirements.

The current operation for the transportation and packaging of facility materials occurs in three different locations, and these facilities have levels of fixed contamination. The construction of the new facility will reduce potential exposure to personnel.

East Campus Service Building (ADS AA0D0064, FY 2010 Landlord GPP)

This project involves the construction at ORNL of a 20,000-square-foot multistory office building, the Central Services Building, to be built just north of 4500N. This project will allow consolidation of photography, graphic arts, and duplication services, which currently are located in the basement area of 4500S. These functions will be relocated to a new facility that will more effectively and efficiently serve ORNL's mission and also provide needed space in the 4500S basement to allow the Metals and Ceramics (M&C) Division to vacate 5500 and consolidate its activities in this space. This new building will provide approximately 50 offices for staff that will be displaced by the planned construction efforts of the 4500N Line Item. The Central Services Building will be constructed on the current site of Building 5000.

M.2.3 Major GPE Projects – Phase II (FY 2007–11)

New External Web Server (INFOSRV1) (ADS A00D0003, FY 2010 GPE)

This request is for a new external Web server that will become part of the new external Web server cluster. The external Web server is getting more and more hits, and the CPU is running at or close to 100% utilization a large percentage of the time. This is the critical piece of computing infrastructure for ORNL's external Web presence.

The current external Web server is a single computer system with attached disk and tape storage subsystems. The proposed architecture would consist of two essentially identical computer systems that are made to appear as if they were one system through the use of a smart switch. This switch would be the "traffic cop" for incoming connections from clients' Web browsers. The switch would balance the load between the two servers by continually measuring responsiveness. If either server were to fail for any reason, the switch would immediately stop handing connections to that server. Until that server could be restored, the service might appear somewhat slower to clients, but it would continue operating. A second switch would be configured to provide redundancy in case the first

switch failed. The two computer systems would each be configured with RAID-based disk storage subsystems to provide redundancy for the most common type of failure, a disk failure. Data would be replicated automatically from one computer's storage system to the other at regular intervals to maintain the single-system appearance to all clients.

Two Web proxy servers would also be set up in a redundant configuration. These proxy servers would satisfy security concerns about users browsing malicious Web sites and control access to Web servers on the corporate network.

HVAC Upgrades (ADS C97D0083, FY 2010 GPE)

This project will replace deteriorated air conditioning components which provide environmental control for Laboratory facilities. Job scope includes removal and replacement of old equipment and subsequent tie-in support. Many HVAC units are used for loads and purposes other than their original designs, resulting in many developing operational problems, which create occupant health hazards. The equipment listed in the scope of this project has exceeded its life expectancy. Replacing these deteriorated components will improve air conditioning reliability and reduce operating and maintenance costs. The reliability of these HVAC systems is critical to proper operation of laboratory equipment (microscopes, lasers, etc.) and calibration of research apparatus.

Replace Steam Plant Economizers (ADS C98D0179 FY2009 GPE)

The economizers in the coal-fired boilers in the Steam Plant have deteriorated significantly and must be replaced. The economizers are a critical subsystem used in the production of steam in the Steam Plant. Hot flue gases pass through the economizers, transferring heat to the boiler feed water. Because of the sulfur content, these flue gases are corrosive and erode away the tubes over time. Many tubes have been repaired, and the frequency of failure is increasing. Tube wall thickness continues to decrease on the heat exchangers and without replacement, many tubes will need to be plugged. This will not only decrease the efficiency of the economizer but also of the boiler itself as cooler feed water will require more fuel to generate steam.

Data Network Layer 2 Upgrades (ADS A00D0040, FY 2009 GPE)

This capital request is for layer 2 networking devices to ensure that all edge devices provide the features necessary to implement cyber security techniques. New hardware procured as a result of this request will utilize switched technology and eliminate shared media devices at ORNL. Other features that may be deployed as a result of this request are global tagged Virtual Local Area Networks (VLANs) and automated blocking to ensure that unregistered users are not granted access to the network. Utilizing the latest layer 2 networking switches all the way to the edge of the network will allow management systems to be implemented that automatically provide certain registration information and block increased level of security network-wide. This request includes hardware to improve the condition of the network to the edge of the entire network, both "public" and "private." This request also provides for the upgrade of network wiring where necessary to allow for the use of the latest hardware.

The last time significant funds were dedicated to a network rebuild was in 1992 when the current Fiber Distributed Data Interface (FDDI) hardware was procured and installed to make up the backbone. In addition, in 1992 fiber optic cable was installed to allow for this FDDI backbone. Technology has leapfrogged and the FDDI is now obsolete. Also, there has never

been a major project funded to build or replace the layer 2 devices, which are the devices closest to the users.

Recent efforts have resulted in the installation of layer 3 gigabit Ethernet in a new backbone, which is nearing completion. This new backbone has been procured for the most part utilizing funds from "public" network users and, in fairness, is currently limited to use by divisions that are willing to pay these rates. Due to funding constraints, deployment of new hardware is done in a fragmented, piecemeal way.

This capital request is for layer 2 networking devices to ensure that all edge devices provide the features necessary to implement cyber security techniques. New hardware procured as a result of this request would utilize switched technology and eliminate shared media devices at ORNL. Other features that may be deployed as a result of this project are global tagged Virtual Local Area Networks (VLANs) and automated blocking to ensure that unregistered users are not granted access to the network. Utilizing the latest layer 2 networking switches all the way to the edge of the network will allow management systems to be implemented that automatically provide certain registration information and block access to the network if the user refuses to provide the remaining required information. This will provide an increased level of security network-wide. This request includes hardware to improve the condition of the network to the edge of the entire network, both "public" and "private," and provisions for the upgrade of network wiring, where necessary, to allow for the use of the latest hardware.

Tube Furnaces and Process Gas Handling (ADS A99D0100, FY 2009 GPE)

This project will procure and install diffusion and passivation tube furnaces and a process gas handling station. As part of the microfabrication infrastructure for ORNL, tube furnaces for precision controlled heating of silicon wafers and other substrates under precision-controlled exposure to a variety of cover gases is required to produce a variety of passivations and substrate dopings. The substrate passivations form masks for subsequent chemical processing of micro- and nano-devices and structures. These passivations can also form mechanical features of devices and structures. Substrate doping is used to form varying semiconducting regions in devices to form active electronic devices or to form regions within the substrate bulk that differ in reaction to subsequent chemical processing. These tube furnaces in combination with high-purity gas metering and control systems form the primary means to form mechanical features on the surface and in the bulk of substrates.

APPENDIX N

Project Cost Tables

Table N.1
Landlord Line Item List
Date: August 5, 2002
($ x 1000)

ADS #	Title	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
A99D0056	RESEARCH SUPPORT CENTER (LI)	1500.0	5000.0	9600.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA0D0056	4500N, WING 4, LAB UPGRADES & RENOVATION	0.0	0.0	1890.0	12460.0	2250.0	0.0	0.0	0.0	0.0	0.0
AA0D0057	4500S, WING 1, LAB UPGRADES & RENOVATION	0.0	0.0	0.0	0.0	2000.0	12000.0	3000.0	0.0	0.0	0.0
AA0D0095	4500N, WING 3, LAB UPGRADES & RENOVATION	0.0	0.0	0.0	0.0	0.0	1750.0	14000.0	3000.0	0.0	0.0
AA0D0096	4500N, WING 2, LAB UPGRADES & RENOVATION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1900.0	15000.0	3000.0
AA0D0098	4500S, WING 2, LAB UPGRADES & RENOVATION	0.0	0.0	0.0	0.0	0.0	0.0	2100.0	12500.0	3400.0	0.0
AA0D0102	4500N, WING 1, LAB UPGRADES & RENOVATION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2200.0
AA0D0103	4500S, WING 3, LAB UPGRADES & RENOVATION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2200.0	13000.0
AA0D0104	4500S, WING 4, LAB UPGRADES & RENOVATION	0.0	0.0	0.0	2450.0	11450.0	4300.0	0.0	0.0	0.0	0.0
A99D0018	FIRE PROTECTION SYSTEMS UPGRADE (LI)	3120.0	2216.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A99D0017	LABORATORY FACILITIES HVAC UPGRADE (LI)	3000.0	3600.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA0D0094	PRIMARY SUBSTATION UPGRADES, ORNL (LI)	0.0	0.0	740.0	5975.0	525.0	0.0	0.0	0.0	0.0	0.0
AA0D0017	MANIPULATOR REPAIR FACILITY (LI)	0.0	0.0	0.0	1500.0	8500.0	2000.0	0.0	0.0	0.0	0.0
A98D0007	LABORATORY FAC VENT SYS UPGR-PHASE 1 (LI	0.0	0.0	0.0	1000.0	2500.0	4000.0	0.0	0.0	0.0	0.0
AA0D0055	LABORATORY FAC VENT SYS UPGR-PHASE 2 (LI	0.0	0.0	0.0	0.0	0.0	1000.0	3500.0	4000.0	0.0	0.0
C97D0061	POTABLE WATER SYSTEM UPGRADE I (LI)	0.0	0.0	0.0	1000.0	4000.0	2000.0	0.0	0.0	0.0	0.0
C97D0062	POTABLE WATER SYSTEM UPGRADE II (LI)	0.0	0.0	0.0	0.0	0.0	1000.0	4000.0	2000.0	0.0	0.0
Total		7620.0	10816.0	12230.0	24385.0	31225.0	28050.0	26600.0	23400.0	20600.0	18200.0

Table N.2
Landlord GPP List
Date: August 5, 2002
($ x 1000)

ADS #	Title	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
AA2D0052	PROCESS WASTE DRAIN CONTAMINANT DISCHARG	0.0	500.0	1500.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0113	EAST AND WEST PORTALS	2600.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C97D0071	FIRE PROTECTION SYSTEMS UPGRADE-GPP (TEC)	32.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA0D0058	EAST CAMPUS ELECTRICAL SYSTEMS UPGRADE (	295.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA1D0006	BUILDING 1061 MODIFICATION (TEC=$203K)	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA0D0072	7600 AREA HIGHBAY BUILDING-DESIGN ONLY(T	0.0	1100.0	3700.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A00D0043	1503 GREENHOUSE RENOVATION UPGRADE	0.0	0.0	280.0	1400.0	0.0	0.0	0.0	0.0	0.0	0.0
A99D0098	BUILDING 7602 HIGH BAY UPGRADE (TEC=$850K	325.0	0.0	325.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA1D0037	6026 GRAVEL LOT EXTENSION/PAVING (TEC=$1	535.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA1D0042	MISCELLANEOUS AREA PARKING LOTS (TEC=$19	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA1D0047	6026 NORTH PARKING LOTS (TEC=$467K)	412.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA0D0063	ADVANCED MATERIALS CHARACTERIZATN LAB (T	1700.0	2540.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA1D0051	EAST CAMPUS TELECOMMUNICATIONS UPGRADE(T	100.0	1700.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA1D0058	3500E FLEXIBLE LABORATORY SHELL UPGRA (T	0.0	0.0	0.0	300.0	800.0	700.0	0.0	0.0	0.0	0.0
A01D0059	3500E FLEX-LAB1 (TEC=$600K)	0.0	0.0	0.0	0.0	100.0	500.0	0.0	0.0	0.0	0.0
A01D0060	3500E FLEX-LAB2 (TEC=$600K)	0.0	0.0	0.0	0.0	0.0	100.0	500.0	0.0	0.0	0.0
A01D0061	3500E FLEX-LAB3 (TEC=$600K)	0.0	0.0	0.0	0.0	0.0	0.0	100.0	500.0	0.0	0.0
A01D0062	3500E FLEX-LAB4 (TEC=$600K)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	500.0	0.0
A99D0020	LAB EXPANSION-NANOSCIENCE METRLGY/INST(T	900.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C97D0054	VENTILATION SYSTEMS, DUCTWORK, & FUME HO	0.0	0.0	0.0	1000.0	1000.0	1500.0	2000.0	2000.0	3000.0	1000.0
AA0D0077	CENTRAL CAMPUS RESEARCH BUILDING	0.0	0.0	0.0	2500.0	2000.0	0.0	0.0	0.0	0.0	0.0
A00D0032	REPLACE HOOD/SECONDARY CONFINEMENT EXH.	0.0	0.0	0.0	1000.0	1000.0	0.0	0.0	0.0	0.0	0.0
A98D0016	4511 COOLING TOWER REPLACEMENT (TEC=$140	0.0	0.0	0.0	0.0	200.0	1200.0	0.0	0.0	0.0	0.0
A01D0020	DOSIMETRY LABORATORY	0.0	0.0	0.0	0.0	1500.0	2500.0	0.0	0.0	0.0	0.0
C97D0089	MAINTENANCE SHOP ADDITION 4509	0.0	0.0	0.0	0.0	0.0	200.0	1000.0	0.0	0.0	0.0
A00D0017	BETHEL VALLEY ROAD TRAFFIC CALMING MEASU	0.0	0.0	0.0	0.0	0.0	500.0	900.0	0.0	0.0	0.0
C98D0127	UPGRADE/REPLACE HEPA EXHAUST SYS., 4501	0.0	0.0	0.0	0.0	0.0	0.0	1750.0	0.0	0.0	0.0
A02D0010	INSTALL NEW VESSEL OFF-GAS SCRUBBER SYST	0.0	0.0	0.0	0.0	0.0	0.0	1150.0	3650.0	0.0	0.0
AA2D0018	REPLACE TSF/CROET WATER SERVICE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	200.0	1000.0	0.0
AA0D0080	6010/6025 RENOVATION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	200.0	900.0	0.0
A01D0036	UPGRADE MOTOR CONTROL CENTERS/SWITCHGEAR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	500.0	600.0	0.0
A01D0056	NEW FIRE HEADQUARTERS FACILITY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1000.0	2000.0
A98D0010	WATER SYSTEM UPGRADES, 7600 AREA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	200.0	1000.0
S97D0020	RESTORE NATURAL GAS DISTRIBUTION SYSTEM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	800.0	1000.0
S97D0058	TRANSPORTATION AND PACKAGING FACILITY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	500.0	2600.0	0.0
S97D0023	EXTEND WATER MAIN - 7000 AREA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1000.0	0.0	0.0
AA0D0064	EAST CAMPUS SERVICE BUILDING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1500.0	2900.0
S97D0002	ADDITION TO BUILDING 6012	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	300.0
AA0D0043	7900 AREA OFFICE BUILDING I	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	400.0
C97D0057	UPGRADE CONDENSATE REMOVAL, ORNL STEAM D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1100.0
A99D0154	GPP MANAGEMENT RESERVE	102.0	360.0	595.0	300.0	600.0	600.0	600.0	700.0	1100.0	1100.0
Total		7029.0	6200.0	6400.0	6500.0	7200.0	7800.0	8000.0	9350.0	13200.0	10800.0

Table N.3
Institutional GPP List
Date: August 5, 2002
($ x 1000)

ADS #	Title	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
AA2D0108	UPGRADE SEWAGE COLLECTION, EAST CAMPUS (	25.0	200.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0097	EAST CAMPUS UTILITY MODIFICATIONS (TEC=$	100.0	500.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0114	FIRE PROTECTION SYSTEMS UPGRADE-IGPP (TE	0.0	0.0	0.0	400.0	0.0	0.0	0.0	0.0	0.0	0.0
A01D0019	REBUILD STEAM STAT & SUPPLY PIPING, 7920	75.0	675.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A02D0003	REBUILD STEAM STATIONS, 7930 (TEC=$750)	0.0	0.0	150.0	600.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0095	ORNL WAYFINDING SIGNS (TEC=$625K)	250.0	125.0	250.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA1D0048	5TH STREET/SOUTHSIDE AVE. PARKING LOT (T	295.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA1D0049	5TH STREET ENTRANCE (TEC=$722K)	260.0	0.0	0.0	0.0	500.0	0.0	0.0	0.0	0.0	0.0
AA1D0050	7000 AREA PARKING LOT EXPANSION (TEC=$11	110.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0055	SOUTHSIDE PARKING LOTS (TEC=$80K)	80.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0056	6000 AREA PARKING LOTS (TEC=$150K)	0.0	0.0	150.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0098	ROOFING REPLACEMENT, BUILDING 6007 (TEC=	130.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0096	EAST CAMPUS STORM DRAIN MODIFICATIONS (T	50.0	300.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA0D0065	EAST CAMPUS INFRASTRUCTURE IMPROVEMTS (T	35.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0
AA1D0056	3513\3524 SIOU PARKING LOT (TEC=$850K)	0.0	0.0	850.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA1D0058	SWSA 2 PARKING LOT (TEC=$350K)	0.0	0.0	0.0	0.0	350.0	0.0	0.0	0.0	0.0	0.0
AA2D0054	EAST CAMPUS NATURAL GAS LINE (TEC=$525K)	100.0	425.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0059	QUADRANGLE COMMON AREA (TEC=$3100K)	0.0	170.0	1000.0	1930.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0111	CENTRAL AVENUE EXTENSION (TEC=$1225K)	100.0	400.0	725.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0112	EAST CAMPUS ENTRY AND PARKING AREA (TEC=	0.0	150.0	1500.0	350.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0107	FACILITY UPGRADES, BUILDING 4512 (TEC=$3	100.0	250.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C97D0104	ROAD AND PARKING LOT PAVING - ORNL (TEC=	400.0	100.0	400.0	100.0	400.0	400.0	400.0	0.0	0.0	0.0
AA2D0053	5510A RENOVATION - METROLOGY SERV & MEAS	100.0	150.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0064	BUILDING 1060 STANDBY ELECTRICAL POWER S	0.0	125.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A02D0020	UPGRADE BLDG 5510 HVAC & UTILITIES ISOTO	0.0	0.0	215.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A01D0004	6000 AREA COOLING TOWER REPLACEMENT (TEC	0.0	0.0	0.0	200.0	800.0	0.0	0.0	0.0	0.0	0.0
A99D0027	FLOW MONITORING STATIONS FOR LOW-FLOW VE	0.0	0.0	0.0	155.0	0.0	0.0	0.0	0.0	0.0	0.0
A01D0010	INSTALL SYSTEM TO COLLECT LLLW, HOTCELLS &	0.0	0.0	0.0	0.0	500.0	500.0	0.0	0.0	0.0	0.0
A98D0009	WATER SYSTEM UPGRADES, 1000 AREA	0.0	0.0	0.0	0.0	500.0	0.0	0.0	0.0	0.0	0.0
C98D0145	REPLACE EAST END WATER SOFTENERS - B 251	0.0	0.0	0.0	0.0	0.0	800.0	0.0	0.0	0.0	0.0
AA2D0041	UPGRADE PA SYSTEM AT 7900 SITE	0.0	0.0	0.0	0.0	0.0	0.0	250.0	0.0	0.0	0.0
S97D0051	HAVAC UPGRADES - GPP - SUPPLEMENTAL	0.0	0.0	0.0	500.0	500.0	900.0	500.0	600.0	600.0	600.0
A00D0027	ELECTRICAL SERVICE UPGRADE - BUILDING 76	0.0	0.0	0.0	0.0	0.0	115.0	0.0	0.0	0.0	0.0
C97D0069	UPGRADE ELECTRICAL SYSTEMS, 3019, 3025	0.0	0.0	0.0	0.0	475.0	0.0	0.0	500.0	0.0	0.0
C97D0070	UPGRADE ELECTRICAL SYSTEMS, 6000 AND 700	0.0	0.0	0.0	0.0	0.0	0.0	0.0	400.0	1000.0	0.0
AA0D0068	WEST CAMPUS INFRASTRUCTURE IMPROVEMENTS	0.0	0.0	0.0	0.0	200.0	300.0	1000.0	0.0	0.0	0.0
AA0D0076	RENOVATION OF 4515 (HTML)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	900.0	0.0	0.0
S97D0032	WEST END STEAM UPGRADE COMPLETION	0.0	0.0	0.0	0.0	0.0	0.0	250.0	0.0	0.0	0.0
A02D0008	INSTALL/UPGRADE SAFETY SHOWERS EYEWASHES	0.0	0.0	0.0	0.0	0.0	0.0	150.0	450.0	0.0	0.0
A02D0011	INSTALL/UPGRADE SAFETY SHOWERS EYEWASHES	0.0	0.0	0.0	0.0	0.0	0.0	150.0	450.0	0.0	0.0
AA2D0106	BLDG 3017 TO 500 X-RAY VAULT RELOCATION	0.0	0.0	0.0	300.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0013	IGPP MANAGEMENT RESERVE	40.0	300.0	300.0	565.0	500.0	500.0	500.0	500.0	500.0	500.0
Total		2250.0	3870.0	5540.0	5200.0	4825.0	3515.0	3200.0	3800.0	2100.0	1100.0

Table N.4
Landlord GPE List
Date: August 5, 2002
($ x 1000)

ADS No.	Title	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
A02D0019	REBUILD COMPONENTS ROBBINS-MYERS 10-T BR	0.0	350.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0047	REPLACE BUILDING 3525 AIR HANDLERS (2 EA	0.0	0.0	350.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA1D0029	REPLACE HEPA FILTERS-CAT 2 7920/7930 (T	380.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0099	REPLACE TERTIARY FILTER- SEWAGE TREATME	0.0	125.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA0D0084	ACCESS CONTROLS-OPEN CAMPUS IMPROVEMTS(T	500.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0092	ENGINEERING TECHNOLOGY FACILITY (ETF) CL	100.0	650.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0003	LDRD SCANNING PROBE ELECTROCHEMCL MICROS	56.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C98D0182	LDRD GENERAL PURPOSE EQUIPMENT RESERVE (	29.0	110.0	110.0	110.0	110.0	120.0	120.0	140.0	140.0	170.0
A01D0018	SAP SERVER UPGRADE PROGRAM (TEC=$1860K)	260.0	350.0	400.0	400.0	400.0	0.0	400.0	0.0	400.0	0.0
AA2D0006	4500N J233 CONF RM VIDEOCONFERENCING HAR	32.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0019	REPLACEMENT GENERATOR AT BUILDING 5505 (	35.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A98D0091	HIGH RESOLUTION MASS SPECTROMETER	0.0	0.0	825.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C98D0142	CONVERT STEAM PLANT BOILERS TO NATURAL G	0.0	0.0	0.0	600.0	0.0	600.0	0.0	600.0	0.0	600.0
S97D0056	BOILER#5 CONTROLS UPGRADE, STEAM PLANT(	0.0	0.0	0.0	125.0	0.0	0.0	0.0	0.0	0.0	0.0
A99D0129	33-MHZ TO 3-GHZTIMING GENERATOR	0.0	0.0	0.0	75.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0050	SINGLE-PASS COOLING EQUIPMENT REPLACEMEN	0.0	0.0	0.0	490.0	500.0	600.0	700.0	700.0	700.0	700.0
A00D0035	BACKUP TAPE ROBOT DEVICE	0.0	0.0	0.0	0.0	160.0	0.0	0.0	0.0	0.0	0.0
A01D0014	ORNL COMPUTER NETWORK UPGRADES	0.0	0.0	0.0	0.0	150.0	0.0	0.0	0.0	0.0	0.0
A99D0097	SPINCOATER, DEVELOPER AND INSPECTION STA	0.0	0.0	0.0	0.0	455.0	0.0	0.0	0.0	0.0	0.0
A99D0099	PHOTOMASK ALIGNER AND EXPOSURE SYSTEM (T	0.0	0.0	0.0	0.0	0.0	450.0	275.0	0.0	0.0	0.0
A99D0100	TUBE FURNACES AND PROCESS GAS HANDLING S	0.0	0.0	0.0	0.0	0.0	0.0	0.0	800.0	0.0	0.0
A02D0004	REPLACE DEGRADED COG HEPA FILTERS IN BLD	0.0	0.0	0.0	0.0	0.0	0.0	400.0	0.0	0.0	0.0
A01D0066	WILDLAND FIRE CONTROL 4X4 PICK-UP TRUCKS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	70.0	0.0	0.0
AA0D0036	CELL 1 WINDOW REPLACEMENT, BLDG 3025E	0.0	0.0	0.0	0.0	0.0	0.0	0.0	225.0	0.0	0.0
A00D0040	DATA NETWORK LAYER 2 UPGRADES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	750.0	750.0	0.0
AA2D0014	SITE ACCESS CONTROL UPGRADE (INTERFACE W	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
C98D0051	FLUKE 5720A TESTER (TEC=$62K)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.0	0.0
AA2D0093	ELECTRONIC DISCHARGE MACHINE (EDM)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	305.0	0.0
A00D0003	NEW EXTERNAL WEB SERVER (INFOSRV1)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	78.0	0.0
A01D0011	SAP OPERATIONAL ANALYSIS SYSTEM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	75.0	0.0
A98D0132	INSTALL BACKDRAFT DAMPERS, BUILDING 7920	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	1000.0
AA2D0078	4501 - EXHAUST FAN 56 PLENUM HOUSING REP	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0
A01D0031	REPLACE CRANES/HOISTING DEVICES IN CTD'S	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	500.0
AA1D0022	GREEN IS CLEAN PROGRAM FOR REDUCTION OF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	250.0	250.0	0.0
A98D0110	UPGRADE EAST END FEEDWATER SYSTEM B-2519	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	510.0	0.0
AA1D0019	COMPUTER NUMERICAL CONTROL WATER CUTTING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	525.0
C97D0125	CFC PHASEOUT- CLEAN AIR ACT COMPLIANCE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	800.0	800.0	0.0
C98D0179	REPLACE STEAM PLANT ECONOMIZERS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	650.0	650.0	0.0
A02D0015	REPLACEMENT GERMANIUM DETECTORS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	290.0	0.0
C97D0083	HVAC UPGRADES- GPE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	500.0	500.0
S97D0013	NEW 4000 SCFM AIR DRYER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	760.0	0.0
A98D0103	TRACK BRUSH CUTTER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	200.0	0.0

Table N.4 (cont'd)

ADS No.	Title	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
A98D0120	SOLID STATE STARTER FOR THE #3 AIR COMPR	0.0	0.0	0.0	0.0	0.0	0.0		0.0	151.0	0.0
A99D0035	DOSIMETRY SYSTEM UPGRADE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	200.0
AA1D0023	SEWAGE TREATMENT PLANT DENITRIFICATION S	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	600.0
C98D0121	REPLACE FLEET VEHICLES (GPE)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	300.0	300.0	300.0
A01D0002	REPLACE 1991 AMBULANCE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	130.0	0.0	0.0
A01D0013	UNIX SERVER FOR BUSINESS CONTINUITY PLAN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	78.0
A01D0039	FLUKE MODEL 792A AC/DC TRANSFER STANDRD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.0
A98D0101	BACK HOE, MODEL 310D JOHN DEERE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	77.0
P98D0249	REPLACE 1981 FIRE TRUCK	0.0	0.0	0.0	0.0	0.0	0.0	0.0	510.0	0.0	0.0
A99D0131	MICROWAVE SPECTRUM ANALYZER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	94.0
AA0D0039	CELL 6 WINDOW UPGRADE, BLDG 3025E	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	180.0
C98D0005	DISTILLED WATER MAKERS, 4500N AND 4500S	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	135.0
C98D0052	RETROFIT PACKAGES FOR LEBLOND LATHES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	104.0
C98D0101	MICROWAVE SIGNAL GENERATOR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	55.0
A98D0116	TRANSFORMER FOR 2632 ELECTRICAL SUBSTATI	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	135.0
A98D0117	TRANSFORMER FOR 3000 ELECTRICAL SUBSTATI	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	135.0
A00D0037	REPLACEMENT FOR SWS1 COMPUTER SYSTEM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.0
A00D0041	SUN Al000 STORAGE ARRAY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.0
A00D0042	NETAPP F720	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	74.0
A01D0015	NETAPP F85 FILER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0
A02D0001	REPLACE LERCVENTILATION SYSTEM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	60.0	0.0
A99D0104	GIGABIT ETHERNET PROTOCOL ANALYZER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0
AA0D0002	LSS FIBER NETWORK FOR LERC DATA ACQUISIT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	128.0
AA2D0020	REPLACEMENT OF GC/MS SYSTEM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	136.0
AA2D0021	AA SPECTROMETER WITH GRAPHITE FURNACE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
A02D0014	1504 DECHLORINATED WATER SYSTEM UV UPGRA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	54.0
A99D0135	REPLACE FIRE PROT. RECORDKEEPING SYSTEM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0
A02D0022	EXCHANGE SAN STORAGE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	151.0
AA2D0061	ORNLWIDE-AREA RADIO SYSTEM	0.0	900.0	1020.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0109	GERBER EDGE 2 SIGN PRINTER	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA0D0012	GPE MANAGEMENT RESERVE	21.0	39.0	115.0	100.0	125.0	230.0	55.0	115.0	150.0	204.0
Total		1413.0	2549.0	2820.0	1900.0	1900.0	2000.0	2000.0	6140.0	7231.0	7179.0

Table N.5
Programmatic Line Item List
Date: August 5, 2002
($ x 1000)

ADS #	Title	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
S97D0043	LABORATORY - COMPARATIVE 7 FUNCTIONAL GE	11405.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA1D0002	CENTER FOR NANOPHASE MATERIALS SCIENCES	1500.0	25000.0	20000.0	17250.0	0.0	0.0	0.0	0.0	0.0	0.0
A99D0146	HFIR-ACCELERATOR/REACTOR IMPROVEMENT MODI	400.0	200.0	1000.0	1000.0	4800.0	8400.0	8400.0	1000.0	1000.0	1000.0
AA1D0041	ENERGY RELIABILITY AND EFFICIENCY LABORA	0.0	0.0	1500.0	14430.0	0.0	0.0	0.0	0.0	0.0	0.0
AA0D0050	SANS GUIDE HALL, HFIR (AIP) (TEC=$4300K)	3300.0	800.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A98D0087	CENTER FOR SYSTEMS BIOLOGY (LI)	0.0	0.0	0.0	0.0	0.0	2000.0	14000.0	4000.0	0.0	0.0
A99D0043	ACCELERATOR UPGRADE, HRIBF (AIP)	400.0	400.0	2500.0	2500.0	2500.0	2500.0	400.0	400.0	400.0	400.0
AA2D0115	PROTEOMICS AND PROTEIN COMPLEX ANALYSIS	0.0	0.0	0.0	5000.0	20000.0	70000.0	30000.0	25000.0	0.0	0.0
S97D0046	SPALLATION NEUTRON SOURCE (LI)	276300.0	210571.0	124600.0	79800.0	41100.0	0.0	0.0	0.0	0.0	0.0
Total		293305.0	236971.0	149600.0	119980.0	68400.0	82900.0	52800.0	30400.0	1400.0	1400.0

Table N.6
Programmatic GPP List
Date: August 5, 2002
($ x 1000)

ADS No.	Title	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
AA2D0004	BUILDING 1059 MODIFICATION	0.0	0.0	200.0	1000.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0039	REPLACE HFIR STEAM SYS PIPING, INTERNAL	0.0	110.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0009	BETHEL VALLEY ROAD ACCESS CONTROL IMPROV	2600.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA1D0007	HFIR PERMANENT POOL STORAGE TANKS PROJ(T	0.0	1000.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA0D0053	HFIR MAINTENANCE BUILDING	0.0	0.0	300.0	2600.0	0.0	0.0	0.0	0.0	0.0	0.0
AA1D0009	TRANSMITTER RELOCATION- 7600 AREA	0.0	0.0	63.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA1D0010	POWER SUPPLY BUILDING - 7600 AREA	0.0	173.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA0D0082	FED COOLING TOWER SYSTEM	210.0	390.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0034	HFIR PRIMARY HEAT EXCHANGER REPLACEMENT	0.0	0.0	0.0	0.0	2000.0	0.0	0.0	0.0	0.0	0.0
AA2D0035	HFIR POOL HEAT EXCHANGER REPLACEMENT	0.0	0.0	300.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA1D0003	HFIR USER SUPPORT FACILITY	0.0	500.0	4000.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA1D0015	FACILITY PREPARATIONS FOR PU-238 PRODUCT	0.0	3000.0	750.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA1D0059	FED - FOUNDATION FOR COOLING TOWER SYSTE	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A01D0046	HFIR SECONDARY COOLANT SYSTEM LIFE EXTEN	0.0	0.0	1500.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0026	SBHE DUCTWORK IN-SERVICE INSPECTION AND	0.0	0.0	0.0	1000.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0031	HFIR ELECTRICAL CABLING SYSTEM LIFE EXTE	0.0	0.0	0.0	450.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0032	NORMAL/EMERGENCY DIESEL GENERATORS AND S	0.0	0.0	0.0	1300.0	0.0	0.0	0.0	0.0	0.0	0.0
AA0D0078	HFIR HIGHBAY STORAGE	0.0	0.0	0.0	1000.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0030	SBHE FAN SHED AND FILTER PIT HOUSING UPG	0.0	0.0	0.0	0.0	2800.0	0.0	0.0	0.0	0.0	0.0
A01D0037	UPGRADE HOG/GBOG SYSTEM IN BUILDING 3047	0.0	500.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A02D0012	REPLACE/UPGRADE HOT CELL WINDOWS IN BLDG	0.0	0.0	100.0	500.0	100.0	500.0	100.0	500.0	0.0	0.0
AA2D0029	REPLACE 15 HVAC UNITS IN HFIR BUILDING	0.0	400.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA0D0051	INFRASTRUCTURE IMPROVEMENT, HFIR	0.0	0.0	0.0	0.0	625.0	0.0	0.0	0.0	0.0	0.0
AA2D0040	UPGRADE CAMS AND MONITRONS	0.0	0.0	0.0	320.0	0.0	0.0	0.0	0.0	0.0	0.0
A01D0049	MATERIAL HANDLING FACILITY ADDITION	0.0	0.0	0.0	0.0	1800.0	0.0	0.0	0.0	0.0	0.0
A00D0025	RADIOACTIVE LIQUID WASTES COLLECTION SYS	0.0	0.0	0.0	0.0	0.0	0.0	1250.0	0.0	0.0	0.0
A01D0047	IMPLEMENTATION OF FIRE HAZARDS ANALYSIS	0.0	1000.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A02D0021	RELOCATE ISOLATION FLANGE,CPS,LLLW DRAIN	0.0	50.0	250.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A98D0013	BLDG. 7920 EXPANSION FOR MASTER/SLAVE MA	0.0	150.0	1350.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A98D0135	UPGRADE/REPLACE SHIELDED CAVES AAND B,	0.0	0.0	750.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S97D0004	EXT. POWER LINE TO INT. OF WALKER BRANCH	0.0	650.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S97D0057	BUILDING 3144 ADDITION - PROGRAMMATIC	0.0	1500.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total		2810.0	9523.0	9563.0	8170.0	7325.0	500.0	1350.0	500.0	0.0	0.0

Table N.7
Programmatic GPE List
Date: August 5, 2002
($ x 1000)

ADS No.	Title	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
AA1D0063	REPLACE HEPA FILTERS-CAT 2, BLDG 3047	36.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0065	3047 FILTER HOUSE REFURBISHMENT	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A00D0031	UPGRADE/REPLACE HOTCELL/OPER. AREA SUP,	0.0	0.0	750.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0025	SBHE CONFINEMENT CONTROL SYS SAF-REL UPG	135.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0046	STEAM SUPPLY PIPE RELOCATION	0.0	111.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0036	UPGRADE TO SECONDARY COOLANT PAD MONITOR	0.0	45.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0027	REPLACE 50-TON CRANE MOTORS	0.0	55.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0028	REPLACE REACTOR POOL COOLANT PUMPS	0.0	120.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0038	REPLACE EXPOSED INTERIOR DRAIN PIPING	0.0	140.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0023	REPLACEMENT OF CHILLED WATER PUMPS	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AA2D0033	HFIRTRANSFORMER NO. 1	0.0	75.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total		271.0	596.0	750.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0