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DEPARTMENT OF ENERGY ENVIRONMENTAL MANAGEMENT PLAN FOR OAK RIDGE RESERVATION FEBRUARY 29, 1984

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DEPARTMENT OF ENERGY
ENVIRONMENTAL MANAGEMENT
PLAN
FOR
OAK RIDGE RESERVATION

FEBRUARY 29, 1984

PREPARED UNDER THE DIRECTION OF
Mr. Joe La Grone, Manager
Oak Ridge Operations Office
U.S. Department of Energy
Oak Ridge, Tennessee

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FOREWORD

Background

On July 11, 1983, the Subcommittee on Energy, Research and Production and the Subcommittee on Investigations and Oversight convened in Oak Ridge, Tennessee, for a hearing regarding 2.4 million pounds of mercury that was unaccounted for at the Department of Energy's (DOE's) Y-12 Plant. Of this total, 700,000 pounds is thought to have been lost to the environment. One of the recommendations of the Subcommittee was that DOE-Oak Ridge Operations submit a comprehensive environmental program management plan to focus DOE resources toward resolution of all environmental problems at the Oak Ridge Complex in a timely manner. The plan is to delineate funding requirements and scheduled milestones for facility design/construction and initiation of modern waste management practices. Supporting research and development (R&D) activities were also requested. This report has been prepared in response to the Subcommittees' recommendations.

DOE's Oak Ridge Complex consists of facilities primarily at three sites on the DOE Reservation. The Y-12 Plant's primary mission is production of weapons components. Uranium enrichment, as well as R&D work on advanced uranium enrichment technologies, is performed at the Oak Ridge Gaseous Diffusion Plant (ORGDP). The Oak Ridge National Laboratory (ORNL) conducts basic and applied research studies covering a wide range of technical disciplines and is also engaged in the production and separation of radioisotopes for research and medical use. Activities at these three facilities were initiated in the 1940's under wartime priorities aimed at developing an atomic weapon. At the Y-12 Plant, activities continued into the 1950's under a sense of national urgency to develop thermonuclear-

devices during the cold war era. During that period, there was a lack of detailed knowledge of the environmental impact of many of the materials used. Similarly, there were less stringent environmental standards at the state and national level than are currently in effect. During the 1960's with improving technical knowledge, important progress was made in upgrading operations at Oak Ridge, particularly with respect to the disposal of intermediate level radioactive liquid waste. While this improvement continued into the 1970's, its pace in the area of nonradioactive waste management did not match the development of a national commitment to the environment, the establishment of governmental oversight bodies, and the development of more restrictive standards.

Environmental characterization and upgrading have been practiced at the DOE Reservation since the 1960's, but not to the extent required by current standards. The problems DOE currently faces at Oak Ridge fall into two categories. The first category includes those problems associated with upgrading old facilities and/or maintaining current research, production, and industrial practices to comply with today's environmental standards. The Federal government should operate its facilities in accordance with environmentally acceptable standards. While discussions with regulatory agencies continue on the specific application of standards to DOE's unique operations, projects necessary to bring DOE into compliance are reasonably well understood, planned, and funds requested. In this regard, DOE and the USEPA concluded a Memorandum of Understanding by which they agreed to implement at DOE facilities the standards established by EPA pursuant to the Resource Conservation and Recovery Act.

The second category of problems facing DOE involves the identification of corrective actions needed to reduce hazards from discontinued, early practices. These hazards have not been well characterized technically (e.g., original inventories, migration of leachates over time) and the appropriate corrective actions are even less certain. For example, the

exhumation of materials that have been buried for 30 to 40 years might, under some conditions, create a greater hazard to the environment than leaving the materials in place and attempting to reduce groundwater movement through the waste, and instituting a comprehensive monitoring program.

Recent inspections by EPA and the State have emphasized the need to accelerate environmental compliance activities on a more comprehensive basis. The State report on ORGDP, while complimentary of the environmental program, recommended that ORGDP's backlog of sludges accumulated by the operation of environmental systems be reduced. Projects are already underway to accomplish this task. The State reviews for Y-12 and ORNL were critical of both current practices and the impact that earlier practices might have had on the environment. DOE's programs and plans to resolve these concerns along with concerns based on other regulatory requirements and sound management practice, are summarized below.

Current Practices

The Y-12 Plant is located at the headwaters of two creeks: East Fork Poplar Creek (EFPC), which flows to the east, and Bear Creek, which flows to the west. These two streams are the subject of separate State compliance orders. With respect to EFPC, DOE's permit point is being moved from the place where EFPC exits the plant (New Hope Pond) to the individual outfall pipes or treatment systems. This means that process effluents from the plant must be individually treated and released or must be collected and routed to a central point for processing, leaving the primary sources of flow to EFPC from non-contact cooling waters, storm runoff and treated effluent.

Many process effluents are routed to the S-3 ponds for treatment. These ponds do not represent best available treatment and must be closed out in the near future. Accordingly, a Central Pollution Control Facility is being constructed as the basic system for treating Y-12 wastes. Ongoing negotiations with the State indicate that there may be some supplemental subsystems required to allow the facility to achieve a desired level of treatment. An integral part of the new system is a series of large storage tanks where denitrification (nitrate removal) will be effected. The first three of these tanks have already been erected. Until this system is complete, wastes will be transported to ORGDP where an idle facility has been reactivated to process Y-12 waste. Limited pilot testing of this ORGDP facility has been performed, and DOE is now awaiting discharge permits from the EPA to initiate its operation. The S-3 ponds, which have been partially treated, will be finally treated during 1984 and then drained and closed out.

Y-12 has a number of conventional industrial environmental problems that are being addressed. A project is underway to eliminate the most visible of these, fly ash from the steam plant, in 1984-1985. Steam plant wastewater treatment projects are identified to correct the problems associated with coal pile runoff, boiler blowdown, and zeolite regeneration. Hydrogen fluoride (HF) scrubbers will also be installed to reduce excess HF. Operationally, Y-12 will be changing the coolant extensively used in machining operations from perchloroethylene to a propylene glycol—water mixture, which will significantly reduce gaseous emissions of perchloroethylene from the plant.

Many of the problems at ORNL are related to required maintenance on aging systems. Old radioactive spills have contaminated soils near ORNL to

some extent, and inleakage into sewer systems have allowed low-level radioactivity to seep into sewer lines and then be transported to the sewage treatment plant. Projects are now being funded to repair the leaking systems.

Several process treatment systems at the laboratory should be upgraded to current technology levels. Recovery and treatment systems for solvents, oils and plating wastes are being investigated. With respect to conventional systems, both coal pile runoff treatment and the sewage treatment plant need upgrading. Projects are in progress for this upgrading.

A Central Waste Disposal Facility to handle low-level radioactive solid waste is being planned under ORNL's direction. This facility, which will accept wastes from all three plants, will represent a significant improvement over past burial practices. A public scoping meeting to guide the preparation of the environmental impact statement for this facility was recently held.

Previous Practices

The major subject of the congressional hearing was the mercury contamination resulting from the operations of lithium isotope separation systems at Y-12 during 1956-1963. The mercury issue will be discussed in four elements:

1. current sources of new contamination,
2. sediment removal from New Hope Pond,
3. corrective actions in the City of Oak Ridge, and
4. plant worker health impacts.

Mercury, which continues to enter EFPC at the rate of about 2 to 4 oz per day, comes from areas where spills occurred in the 1950s and 1960s and

from one operational building (of the four originally used) that has not been stripped of mercury-contaminated equipment. Rainfall runoff from these areas entrains small quantities of mercury and transports it to EFPC. In addition, wet weather springs in the area pick up some mercury. While this amount is small when compared with previous losses, it causes fish and aquatic life water quality mercury standards to be exceeded. Signs have been posted by the state prohibiting the use of EFPC for fishing, drinking, or swimming. Projects have been planned to strip old mercury contaminated equipment from the remaining building. Coring is underway to identify areas where mercury-contaminated soils are present. While funding estimates are included to remove those soils, the estimates are quite tentative, pending determination of the extent of the areas to be decontaminated and methods to be used.

New Hope Pond was constructed to allow settling of material prior to the stream leaving the Reservation. Due to accumulation of materials, the sediment in New Hope Pond containing mercury, uranium, and other contaminants must be periodically removed. A diversion ditch has been constructed so that EFPC can flow around New Hope Pond during sediment removal operations. Projects have been identified to remove the sediment to a disposal area. The sediment is defined as hazardous waste under the RCRA and a disposal strategy must be developed. This disposal strategy may involve a delisting process which removes the waste from RCRA requirements. Significant uncertainty exists with this waste management strategy since DOE has had limited experience with the delisting process.

Chemical analyses have confirmed the presence of mercury in the sediments and floodplains of EFPC. In addition, fill dirt was taken from the creek during an off-site sewer line installation and placed in various

locations within the City of Oak Ridge. While it is generally agreed that the mercury in the fill dirt does not pose an immediate health hazard, its long-term effects require study. Standards do not exist for soil contamination as they do for water; and therefore, the State has developed interim guidelines on a conservative basis. These interim guidelines will permit DOE and the City, in consultation with the State, to determine on a case-by-case basis if any interim remedial actions should be taken at locations within the City.

An Interagency Task Force composed of members representing the City, the State, EPA, DOE, the Tennessee Valley Authority (TVA), and the U.S. Geological Survey (USGS), has been established to study these problems and determine what corrective actions need to be taken. Since these contaminants have been in place for 20 to 30 years and are relatively stable, DOE and the Task Force are reluctant to disturb the sediments until further studies have been made. The USGS, the Oak Ridge Associated Universities, and TVA (with coordination by ORNL), will be performing detailed studies on soils, surface water, fisheries, and groundwater to support the Task Force in their evaluations. Estimates for project costs cannot be supported until those studies have been performed; however, cleanup of mercury from a creek in Virginia downstream from a chlor-alkali plant was reported to cost about $3 million for 1/3 mile. The costs for mercury cleanup, while uncertain, are expected to be substantial.

Employees who worked in the Y-12 Plant lithium isotope separation operations area in the early years were exposed to mercury vapors, particularly during the 1956-1957 period. Medical records at Y-12 as well as discussions with private physicians in the area have shown no indication of effects of mercury poisoning in these individuals. However, a new

follow-up evaluation, including oversight by an outside Blue Ribbon panel as well as the National Institute of Occupational Safety and Health, has been planned.

The Bear Creek Burial Grounds will continue to be used for disposal of low-level radioactive contaminated wastes until completion of the Central Waste Disposal Facility (CWDF). Current disposal practices have been greatly improved to minimize the possibility of groundwater contamination. However, attention must be focused on areas in Bear Creek Burial Grounds where disposal methods were used in the past that are unacceptable today (e.g., trenches built below the local water table). A study is now underway to establish both the inventory of this burial ground and the degree of migration of contaminants. Oil which is contaminated with polychlorinated biphenyl compounds (PCBs) has seeped out of old burial trenches and moved several hundred yards away to be trapped in ponds specifically built for the purpose of precluding the entry of the contaminated oil to Bear Creek. Again, the estimates included in the report for Bear Creek Burial Grounds are tentative, pending more accurate characterization of the contaminated areas and their overall environmental significance.

The burial grounds used for disposal of ORNL radioactive wastes have been receiving considerable attention since the early 1970s. Remedial actions in the early burial grounds have reduced radioactive effluents. Even larger reductions in radioactive losses to White Oak Creek were achieved by the introduction of the hydrofracture method of radioactive liquid waste disposal. With these improvements, White Oak Creek meets current standards at the Reservation boundary where it discharges into the Clinch River, but further reductions are necessary to meet DOE and State

surface and groundwater quality goals. To further reduce the contamination other discharge or seepage points must be identified and solutions specifically tailored to each discharge point must be developed. Since the most contaminated sites and the largest seepage points were identified and dealt with first, further reductions are becoming more difficult; however, since most of the remaining seepage problem continues to originate in the older burial pits, it is important to resolve the seepage problem before attempting to cleanup or immobilize the sediments from White Oak Creek and White Oak Lake. Sequential scheduling will probably put the cleanup of White Oak Lake well into the future.

Conclusions

Corrective projects are now in progress and others are being planned to deal with environmental problems at Oak Ridge. The entire corrective effort will take years to accomplish and will require hundreds of millions of dollars. It is important to note that the permitting process is a negotiation to ensure that environmental protection is achieved with reasonable cost/benefit returns. Many of the corrective actions are straightforward, while some contain significant uncertainties. Cost estimates for needed environmental projects/activities and supporting R&D are summarized below (in millions of dollars).

1984	1985	1986	1987	1988	Total 84-88	Post 1988
70	100	80	90	110	450	200-300

Currently, there appears to be no technically insoluble problems at the site. While the solutions to some problems may be very difficult, continued support will ensure substantial improvements in the future.

EXECUTIVE SUMMARY

The Environmental Program Management Plan for the Oak Ridge Complex was prepared in response to recommendations made at the Congressional hearing held in Oak Ridge on July 11, 1983, to discuss the extent and impact of mercury and other pollutants from DOE's Oak Ridge facilities. While this is a planning document and not a commitment of funds, this effort will help to focus DOE resources toward resolving environmental problems at Oak Ridge in a timely and cost-effective manner. The plan includes:

1. an environmental planning basis,
2. a brief description of the problems and proposed resolutions for each plant,
3. research and development requirements and funding schedules,
4. funding schedule summaries, and
5. continuing analyses and unresolved issues.

The planning basis provides the foundation for identifying the environmental problems and their potential resolutions. While applicable environmental standards must be met, there is considerable latitude for interpretation of existing regulations and projection of future requirements. This latitude can have a significant impact on funding and scheduling. In general, it has been assumed that:

1. existing regulations provide a reasonable basis for formulating environmental plans, particularly with respect to current practices at the plants;

2. proposed EPA regulations that further reduce airborne radionuclide emissions to the general public will be finalized (compliance could cost $75 million for the Oak Ridge Complex); and
3. present radioactive waste facilities (e.g., hydrofracture and ILW system) will be environmentally acceptable through 1990.

Using the established planning basis, the environmental problems and proposed resolutions were identified by category. The categories used were (1) radioactive waste, (2) hazardous waste, (3) co-contaminated waste (hazardous and radioactive contaminated), (4) conventional waste, (5) monitoring, and (6) remedial actions or decommissioning. The first five of these deal with current waste management practices, while the sixth is related to past practices. In general, resolutions to environmental problems associated with current waste management practices can be planned and scheduled. Problems associated with past waste management practices, on the other hand, are more difficult to define and resolve, are dependent on extensive field testing and monitoring to determine bounds, and may require research, development, and demonstration (RD&D) to identify appropriate solutions.

Funding requests for problems related to co-contaminated waste, conventional waste, and monitoring occur primarily in the 1984 to 1986 time frame. The bulk of the requested funding in later years is related to radioactive waste and remedial action problems. Detailed breakdowns are presented in Sect. 5.

The minimum funding required from 1984 through 1988 is about $500 million and is broken down by plant in Table 1. Some activities such as those associated with CERCLA and other remedial actions cannot be defined

for inclusion in Table 1. In these cases only scoping studies have been costed. Additional funds will be needed when activities are defined.

Table 1. Total Funding.

Plant	Budget authority (millions of dollars) 1984	1985	1986	1987	1988		Total Funding
Y-12	39	48	46	52	38		220
ORNL	14	20	30	39	60		160
ORGDP	18	32	6	1	12		70
TOTAL	70	100	80	90	110		
						TOTAL	≈ 450

Environmental activities funding can also be broken down as follows:

1. funded environmental activities ($ 75 as detailed in Table 2, Sect. 5)
2. unfunded environmental activities ($320 as detailed in Table 3, Sect. 5)
3. additionally needed RD&D (funded and unfunded) ($ 55 as detailed in Table 4, Sect. 5)

About $320 million of this total (1984 through 1988) will be earmarked for problems associated with current waste management practices. Such problems could be resolved by 1990 if funding is provided and the environmental planning basis remains intact. About $130 million (1984 through 1988) is needed to define problems associated with past waste management practices and to initiate remedial actions (see Fig. 3, Sect. 5). It is anticipated that funds of $200 million to $300 million will be required beyond 1988 to implement solutions for the problems associated with past waste management practices. Large expenditures for

the replacement of the ORNL hydrofracture system may become necessary after 1988 if this type of geologic disposal is not permitted by State regulation.

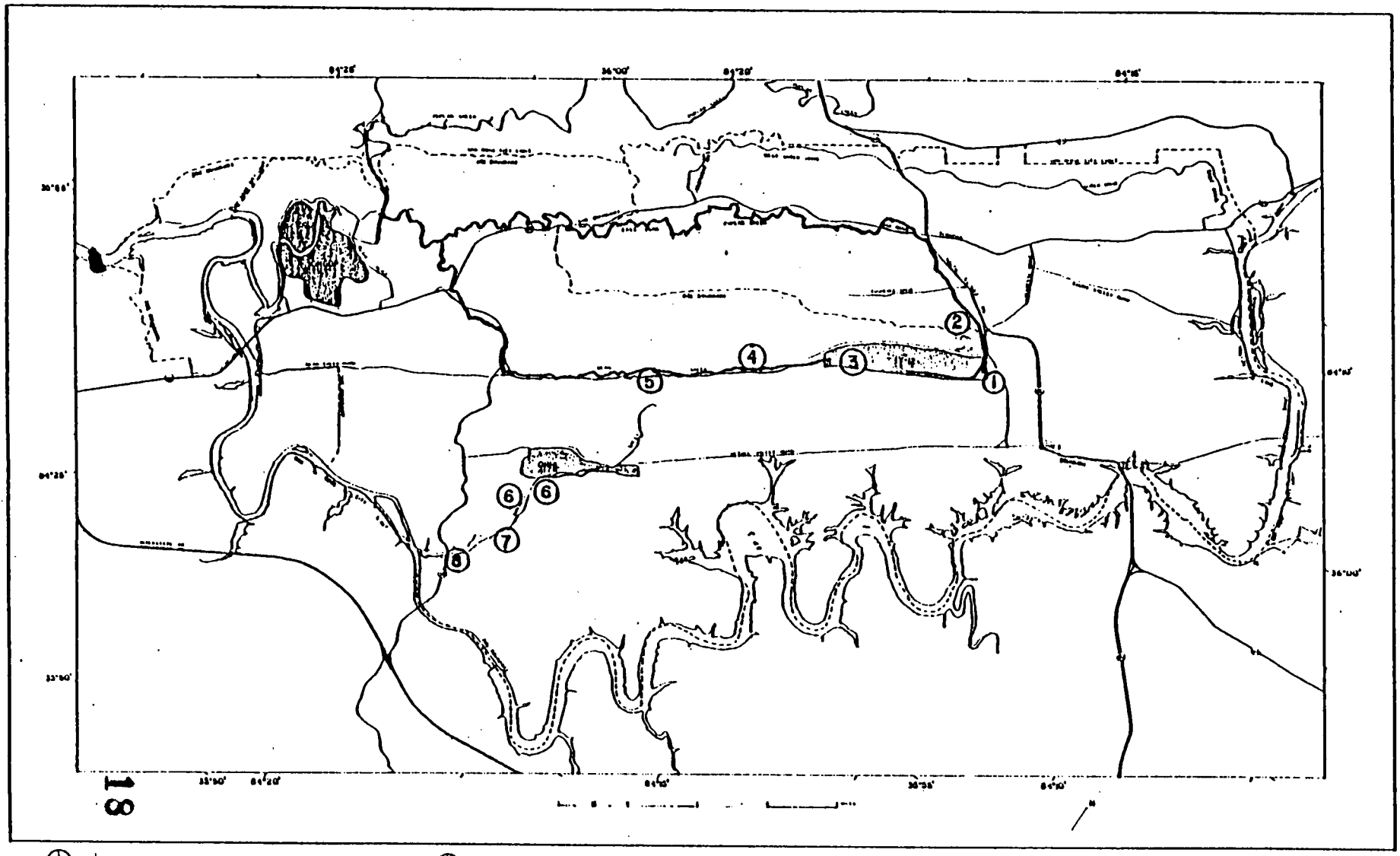
The RD&D activities are related to both current and past practices. Those associated with current practices will be focused on development and demonstration to resolve the problems associated with current practices, while additional research will be required to resolve those associated with past practices. Remedial action and decommissioning are not routine but must be considered on a case-by-case basis.

Unresolved issues and continuing analyses are primarily related to remedial action concerns, which will require considerable study and may cost hundreds of millions of dollars to remedy. At ORNL, these concerns are related to the radioactive burial grounds, White Oak Creek/Lake sediments and floodplains, and subsurface soils around pipeline leaks. Similar problems at Y-12 are related to off-site cleanup of mercury along EFPC, on-site mercury cleanup at lithium isotope separation areas, and remedial actions required in Bear Creek Valley.

1. INTRODUCTION

Activities at the Y-12 Plant (Y-12), Oak Ridge National Laboratory (ORNL), and Oak Ridge Gaseous Diffusion Plant (ORGDP) date from the 1940s and 1950s. Many radiochemical processes developed at Y-12 and ORNL during these early years were carried out with a great sense of urgency and without full understanding of the potential for environmental damage. Also there was a time when there were minimal, or no, standards or regulations for many activities. Production of weapons material, stable isotopes, and enriched uranium, as well as research and development in radiochemical processing, enrichment, physical sciences, life sciences, materials and a host of other areas, continues at these facilities. Waste disposal practices from the earlier work (while consistent with the practices of the time) have resulted in the need for a number of remedial actions to ameliorate the current and long-range impacts on the environment, while the ongoing activities produce wastes for which treatment facilities are required to meet current regulations. Figure 1 shows the location of the three facilities in relation to primary streams and important waste disposal facilities within the Oak Ridge Complex.

The climate with respect to environmental issues has changed significantly over the past 15 years. The National Environmental Policy Act (NEPA) was one of the first of the contemporary environmental laws passed by the U.S. Congress. The Clean Air Act (CAA), the Clean Water Act (CWA), the Toxic Substances Control Act (TSCA), the Resource Conservation and Recovery Act (RCRA), the Safe Drinking Water Act (SDWA), and the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) and their associated standards now provide a better defined basis for environmental planning which did not exist during the first thirty years of facility operation. The Environmental Protection Agency



1. NEW HOPE POND
2. EAST FORK POPLAR CREEK
3. S-3 PONDS
4. BEAR CREEK BURIAL GROUNDS
5. BEAR CREEK
6. ORNL SWSAS
7. WHITE OAK CREEK
8. WHITE OAK LAKE

Figure 1. Oak Ridge Reservation map

(EPA) and the Tennessee Department of Health and Environment (TDHE) have responsibility to oversee compliance with these laws and the standards they establish. For example, the National Pollutant Discharge Elimination System (NPDES) permit program for Federal facilities is anticipated to be delegated completely to the State. This program determines monitoring sites, methods and sampling, effluent limitations, and analytical needs to ensure compliance with the Clean Water Act. In addition, guidelines and regulations have been developed by the Occupational Safety and Health Administration (OSHA), the Department of Transportation (DOT), and the Nuclear Regulatory Commission (NRC) relative to worker protection, material transport, and disposition of radioactive wastes, respectively. Special nuclear materials are regulated by the Atomic Energy Act (AEA).

Regulatory goals have been established for waste management. The CWA will require treatment of waste streams to meet best available technology (BAT). DOE has adopted a philosophy to limit radiological doses to a level as low as reasonably achievable (ALARA). These are the guiding principles in planning for the correction of problems at the Oak Ridge Complex.

The Environmental Program Management Plan for the Oak Ridge Complex contains a discussion of environmental problems and the activities planned to solve the problems; and a summary of necessary research and development costs and schedules. Environmental activities will be funded from either expense-funded (exp) or capital-funded budgets as appropriate. Capital funding can be obtained as general plant project (GPP) funding, general plant equipment (GPE) funding, capital equipment (CE) funding, or line item (LI) funding. Environmental activities through 1984 are generally funded

except for a supplemental line item in 1984 for Y-12. The funding schedules for activities proposed in 1985 and 1986 are being defined, and planning efforts are continuing. Funding schedules for environmental activities beyond 1986 represent the best available information but are highly uncertain at best.

Research and development needs during this period are considerable. Improved data on sludges and flows, as well as chemical and physical descriptions of the various ponds and streams, must be developed for project planning. It is desirable to examine many of these problems in an integrated fashion so that they can be corrected promptly, taking into consideration the long-term needs of the facilities, the operability and operating costs of the improvements, and the total costs of installed equipment and remedial actions.

Several actual and potential environmental problems have been identified in the Oak Ridge Complex which will be very expensive to remedy and will require considerable study to resolve. These are addressed in Sect 6.

2. ENVIRONMENTAL PLANNING BASIS

A planning basis had to be established in order to prepare the Environmental Program Management Plan. The three DOE plants at Oak Ridge - Y-12, ORNL, and ORGDP - will be covered in the Plan. Federal and State environmental laws, and DOE orders provide a broad basis for this effort, and the DOE facilities will comply with DOT regulations for transportation of wastes and with OSHA requirements for worker protection. DOE will work with the TDHE and the EPA in establishing acceptable solutions to environmental concerns and problems and in implementing necessary actions. Assumptions made for this planning base are related to the management of a wide range of waste types: radioactive, hazardous, co-contaminated (hazardous and radioactive), and conventional.

DOE Orders and guidelines will be followed in conducting radioactive waste management activities. This plan recognizes pending EPA regulations under the CAA to limit airborne radionuclide emissions to the general public to 10 mrem/year whole body and 30 mrem/year critical organ (proposed 40 CFR 61, Volume 48) even though it is not clear that these values will actually appear in the final regulation.

Hazardous waste not contaminated with radioactive materials will be handled consistent with the Memorandum of Understanding entered into between DOE and EPA on February 22, 1984 (copy attached).

Hazardous wastes that are contaminated with radioactivity, co-contaminated waste, will be handled as required, depending on the amount of radioactivity present. The general strategy adopted for handling co-contaminated waste is to first render the material nonhazardous, then delist, and handle it as a radioactive waste. Incineration and concrete fixation treatment processes are being designed to render such material nonhazardous. It is assumed that wastes can be delisted on a case-by-case basis with technical agreement from the TDHE within a 6-month period. For cleanup of mercury at Y-12, mercury concentrations in liquid discharges are assumed to be reduced below the 2 ppb drinking water standard at a point where the stream leaves the plant. It is not known if the aquatic life stream guide of 0.05 ppb can be achieved using currently available technology. The TDHE will be informed of plans associated with hazardous waste management.

The CAA and CWA are the driving forces for handling conventional waste. DOE will obtain both air and NPDES permits. It is assumed that industrial wastewater standards which provide BAT will be applied.

Where possible, central waste treatment and disposal facilities will be used by all three plants. Examples of such facilities include the sanitary landfill, the low-level radioactive waste disposal facility, the TSCA incinerator, and the sludge fixation facility.

3. REQUIRED ENVIRONMENTAL ACTIONS

3.1 Y-12 PLANT

The Oak Ridge Y-12 plant has four primary responsibilities:

1. production of nuclear weapons components;
2. fabrication in support of DOE's weapon design agencies;
3. support for other UCC-ND installations (several major Oak Ridge National Laboratory programs are physically located at the Y-12 site);
4. processing of source and special nuclear materials.

Major activities at Y-12 include chemical processing of lithium and uranium compounds; precision fabrication of components from lithium, uranium, and many other materials; the assembly of these components into major subassemblies for nuclear weapons; and the disassembly of components returned from the stockpile. As a result, the plant has numerous, complex waste and effluent streams.

The Y-12 plant site (Figure 1) consists of an inner industrial complex covering about 600 acres surrounded by a buffer area of approximately 4260 acres. The plant facilities comprise 233 principle buildings, including large machine shops, chemical processing buildings, laboratories, maintenance buildings, changehouses, and numerous plant support facilities. The majority of these facilities date from the late 1940s and early 1950s. Over the years, most of them have been remodeled and reworked numerous times in response to changing plant programs and requirements.

Like the other Oak Ridge facilities, Y-12 has felt the effects of the rapidly changing regulatory climate (Sect. 1). However, the enhanced security and national urgency surrounding the weapons production work at Y-12, coupled with lean defense appropriations have tended to lower the

priority for responding to the increased level of regulation. Even under these conditions, approximately $44 million in capital funds have been expended since 1970 on environmental management-related projects at Y-12.

Over the past few years, significant changes in the interpretation of existing environmental regulations have had a profound impact on Y-12's environmental management plans. Until 1977, total responsibility for enforcing the CWA at federal facilities such as Y-12 rested with EPA. Under the EPA, Y-12 had one NPDES permit with four outfalls: one at the outfall of New Hope Pond (Fig. 1), one at a point 5 miles west of the main plant site on Bear Creek (at Highway 95), one at the outfall of Rogers Quarry, and one at the outfall of Kerr Hollow Quarry. The Y-12 Plant has consistently met the effluent limitations specified by the NPDES permits.

However, in 1977 the Federal Water Pollution Control Act was amended allowing the states to establish their own State water quality criteria. By law, these criteria took precedence over any EPA-issued NPDES permits. The TDHE considers that all waters which arise in the State are waters of the State even though they may flow through private or federally owned property. Therefore, not only the original NPDES outfalls, but all on-site streams must now meet State water quality criteria.

This stricter interpretation led in May 1983 to the signing of a Memorandum of Understanding (MOU) by DOE, EPA, and TDHE concerning numerous areas where Y-12 was deemed to need water effluent quality upgrading. In September 1983 the Commissioner of the TDHE issued a Complaint and Order relative to pollution of the East Fork Poplar Creek watershed (EFPC), and a Complaint and Order concerning the Bear Creek watershed was issued in December 1983.

In order to meet its environmental management obligations, Y-12 must quickly make significant changes in facilities, processes, and procedures. The projects planned and funding required over the next 5 years have been divided into six categories: (1) radioactive waste, (2) hazardous waste, (3) co-contaminated waste, (4) conventional waste, (5) monitoring, and (6) remedial action and decommissioning. Some projects do not fit cleanly into one category, but in these cases the project is included under the category that fits it best. Detailed information on project scope and justification is contained in Appendix A.

3.1.1 Radioactive Waste

Y-12's major activities of fabrication of components from uranium and uranium alloys, as well as the assembly and disassembly of weapons components, generate large quantities of radioactive wastes. Low-level radioactive uranium-contaminated wastes represent the largest volume of material currently disposed of in the Bear Creek Burial Grounds. In addition, large quantities of depleted (in ^{235}U) uranium metal, primarily in the form of metal turnings (called "chips"), and uranium oxide material are currently buried at that facility. Under the Tennessee Water Quality Act, continued long term burial of these materials is unacceptable because the water table is close to the surface with the potential for contaminating the groundwater. The low-level uranium-contaminated wastes will ultimately be buried in the Central Waste Disposal Facility (Sect. 3.2.1.1), a proposed 1986 ORNL line item project. After volume reduction in the Waste Material Preparation Facility (83 GPP, $750K), Y-12 generated low-level contaminated materials will be placed in the Central Waste Disposal Facility (CWDF) which is to be opened in late 1985 [Initial Central Waste Disposal Facility Site Development (84-D-124 LI, 1575K)].

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To dispose of the uranium oxide material and uranium and uranium alloy metal, Y-12 is proceeding to design and construct Uranium Chip Oxidizers (84-D-124 LI, $500K) and above-ground, concrete vaults in which to store all uranium metal (except chips and powders) and uranium oxide [Uranium Oxide Storage Vaults (83,86,88 GPP, $1050K; 84-D-124 LI, $350K)].

Two other storage areas for uranium and uranium-contaminated metals require modifications. Uranium scrap from disassembled components as well as uranium scrap accumulated from the machining and metal preparation operations are stored inside fenced areas near Buildings 9720-5 and 9720-13. Also, various scrap metals contaminated with uranium are being stored in the salvage yard at the west end of the plant until arrangements can be made for smelting them. Modifications to both of these areas are needed to minimize the possibility of low-level radioactive contamination reaching surface and groundwaters. Engineering assessments are to be conducted during 1984 to determine the required modifications, schedules, and funding [Engineering Assessment of Modifications to 9720 Warehouse Storage Area (84 exp, $50K), Engineering Assessment of Modifications to Salvage Yard Scrap Metal Area (84 exp, $50K)]. Studies are underway in conjunction with ORGDP to identify mechanisms for disposal or recycling of this scrap [Contaminated Scrap Disposition].

The Source Control and Treatment project (82-D-107 LI, $4000K) which is planned to improve the control of airborne radionuclide emissions, addresses only the most critical of Y-12's known radionuclide emission sources. A Stack Emission Control project (86-OR-GB-1 LI, $30,000K) would provide funding to install BAT on all major sources. Both of these projects are in keeping with DOE's ALARA program for control of exposure to ionizing radiation. In addition, the EPA has recently proposed to

promulgate extremely stringent limits for off-site radiological dose (under CAA) as well as BAT on all radionuclide sources, which would make the Stack Emission Control project essential if Y-12 is to be in compliance.

3.1.2 Hazardous Waste

DOE Order 5480.2, "Hazardous and Radioactive Mixed Waste Management" (published December 13, 1982) established hazardous waste management procedures for facilities operated under authority of the AEA, as amended. The complex nature of Y-12's operations is reflected in the fact that about 150 waste streams are currently considered hazardous under 5480.2. Y-12 also has 26 currently active hazardous waste treatment, storage, or disposal facilities that must meet very stringent requirements under 5480.2 which require that DOE facilities be controlled under a program as rigorous as RCRAs.

Approximately 200 yd^3 of potential RCRA hazardous wastes and/or RCRA wastes co-contaminated with uranium must be disposed of from Y-12 on an annual basis. Historically, most of these materials have been buried in the Bear Creek Burial Grounds. However, this practice has been halted because of concern about groundwater contamination.

Beginning in February 1984, Y-12 will ship certain nonradioactive hazardous wastes to commercial storage and/or treatment facilities on a quarterly basis or as generation rates require. These wastes will have been staged through an existing warehouse modified to accept RCRA wastes [Modifications to Building 9720-9 (84 exp, $200K)]. Various liquid hazardous wastes, such as acids and bases, will be treated in wastewater treatment facilities to render them nonhazardous.

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Waste oil and coolants were at one time disposed of in the Bear Creek Burial Grounds and Oil Landfarm. This material is currently being sold or

stored with minimal processing. Plans are underway to provide some processing capability by upgrading and expanding Y-12 oil/water/solvent separation and distillation capabilities via the Waste Oil/Solvent Separation and Storage Facility (84-D-124 LI, $800K) and Waste Coolant Processing Facility (83 GPP, $845K). The emphasis is on improved storage and increasing salability. However, much of this material will ultimately be disposed of in the TSCA incinerator to be built at ORGDP under the Compliance with Toxic Substances Control Act line item (Sect. 3.3.3).

For many years, several Y-12 process waste streams have been directed into EFPC. However, compliance with the Tennessee Water Quality Act makes this practice unacceptable. A Plating Waste Treatment Facility (84-D-124 LI, $750K) would provide a package treatment system to remove trace amounts of metals, cyanides, and organics from 8.7 million gal of plating shop rinse water per year. An East End Waste Treatment Facility (84-D-124 LI, $200K) will treat 1.5 million gal of water/paint from the plant's paint shops, as well as 52,000 gal of water containing detergent, oil, and dirt, on an annual basis.

Funding is needed for numerous modifications to existing facilities/procedures to meet the requirements of DOE 5480.2,. The RCRA Compliance Program (84,85 exp, $2500K) provides funding for evaluating plant systems, formalizing procedures and training workers. Revisions to Interim Storage Areas (84,85 exp, $200K) will involve diking and other physical improvements. Special Coolant Biodegradation Reactor Analyses (84 exp, 10K), Acetonitrile (ACN) Incinerator Analyses (85 exp, $25K), and Machine Coolant Storage Tank Analyses (84 exp, $10K) are also required. Modifications to Two Oil Retention Ponds (85,86 GPP, $1500K), located in

the Bear Creek Burial Grounds, must be further evaluated but may include fencing, pond liners, and spill prevention techniques.

Acetonitrile (ACN) is stored in 55-gal drums until it is burned in a dedicated incinerator. Modifications to ACN Drum Yard (85 GPP, $500K) will include a concrete pad and dike for the storage yard. Minor Modifications to Building 9404-7 PCB Storage Area (84 exp, $20K) are necessary to increase the height of the dike around the building to comply with current requirements for PCB storage.

PCB-Contaminated Oil Storage Capacity (85 GPP, $60K) must be increased to phase out one 20,000 gal and one 10,000 gal underground storage tank. Underground storage of hazardous materials is likely to be precluded in the future by the State.

Modifications to Salvage Yard Oil/Solvent Drum Storage Area (84 exp, $25K) must include expanding the diked area in the salvage yard and replacing damaged or leaking drums which hold material awaiting future disposition. Improved storage tanks previously procured (82,83 exp) have made possible the elimination of many of the drums in the salvage yard area.

A detailed study must be made to define specific requirements for what will be included in Modifications to Chestnut Ridge Security Pits (85, 86, 87 GPP, $1700K). Extensive modifications are required if all requirements of DOE 5480.2 are to be met.

Replacement of PCB Transformers (84-D-124 LI, $5000K), in environmentally vulnerable locations, with non-PCB equipment is required for continued compliance with TSCA. Other PCB transformers will be replaced in subsequent years Multisite Electrical Systems Upgrade (86-OR-GB-13 LI, $5000).

The plant's Spill Prevention Program (83, 85-87 GPP, $1550K; 84-D-124 LI $550K) will provide diking and other special control features at hazardous liquid transfer points, around hazardous material storage tanks, and at other high-risk locations. Efforts are continuing to Repair Existing Dikes (84 exp, $240K) in order to assure that they meet the requirements of the Spill Prevention Program.

3.1.3 Co-contaminated Waste

The S-3 Ponds located at the far west end of the Y-12 Plant have been collecting hazardous and low-level radioactive co-contaminated liquid wastes from the plant for about 32 years. As of August 1983, the total annual quantity of liquid wastes entering the four interconnected ponds was estimated to be approximately 2.7 million gal.

The S-3 Ponds are a source of contamination through groundwater to Bear Creek and East Fork Poplar Creek. Y-12 has been characterizing the chemical composition of these ponds since 1962. The long-standing interest in the ponds and their contents led Y-12 to recognize the need to discontinue their use and to plan installation of a pollution control facility for treatment of the waste solutions being disposed in them. In 1975, a plan and a cost estimate for closing out the ponds were prepared that recognized the need for a development program and the necessity for continual operation until an alternative treatment method was implemented. In 1977 the need for a waste solution processing facility was identified in a 1980 capital project budget submission and planning and engineering design funds were received in 1979. The current plans to close out the S-3 Ponds are addressed in Sect. 3.1.6.

Before use of the ponds can be discontinued, alternative treatment methods must be provided for the waste streams that have historically been

discharged to the ponds. The interim plan is to collect these waste solutions at Y-12 and transport them via tank trailers and approved transport containers to ORGDP for treatment [Processing Y-12 Wastes at ORGDP (84-86 exp, $4100)]. The neutralized solutions with high nitrate concentrations will be returned to Y-12 for storage and ultimate treatment in the West Tank Farm Storage (83,84 CE, $3330K) and West Tank Farm Treatment Facility (84-D-124 LI, $1050K). Solutions that do not have high nitrate concentration will be discharged from ORGDP after treatment through NPDES discharge points. Arrangements will be made for commercial disposal of those waste streams now going to the S-3 ponds that do not have uranium contamination and are not amenable to treatment at ORGDP.

The long-term plan for handling S-3 Pond wastes consists of collecting and transporting of nitrate wastes to the West Tank Farm Treatment Facility and nonnitrate wastes to a new Central Pollution Control Facility (81-D-120 LI, $6800K). An Expansion of West Tank Farm (85,86 CE, $4000K) may be required in future years.

As explained in Sect. 3.1.2, large quantities of solid RCRA hazardous wastes co-contaminated with uranium have historically been disposed of in the Bear Creek Burial Grounds. Since this area is no longer to be used, it is planned to store these co-contaminated solid wastes in a temporary warehouse (Building 9720-9) until the design and construction of the RCRA and Co-Contaminated Liquid and Solid Waste Storage Facility (84-D-124 LI, $800K) is completed. Further Expansion of RCRA and Co-contaminated Liquid and Solid Waste Storage Facility (TBD) will be required to add storage capacity and/or provide treatment for these wastes. Many of the stored wastes will be candidates for fixation in concrete, which will be an available technology at ORGDP as early as 1984 using a temporary batch

plant, and/or destruction in the ORGDP incinerator, which is scheduled for startup in mid-1987 (see Sect. 3.3.3).

3.1.4 Conventional Waste

The need for a technique to equalize the pH of the liquid effluent from Y-12 was recognized in the early 1960s. In 1963, a 5 acre pond was constructed at the east end of the plant at a cost of $193,500. The pond, named New Hope after an old community in the area, has proportional sampling systems at both the inlet and the outlet. The pH is recorded continuously and is telemetered into the Plant Emergency Control Center where pH changes can be observed. Also, the flow rate of the effluent is continuously measured and recorded.

The design of the pond includes a special water distribution system to enhance mixing within the pond. In the early 1970s, an oil skimmer was added to remove surface accumulation of oil and debris. Later, a water gate was installed at the outlet to allow the effluent to be retained for ten to twelve hours in the event of a large chemical or oil release. Once contained, such a spill could be treated before being released.

The primary functions of the pond today are pH adjustment (through flow equalization) and settling of insoluble materials, such as sediment which may be contaminated with uranium and mercury. In 1973, the pond sediment was removed and transferred to a dry basin on top of Chestnut Ridge, south of the pond. Recent evaluations of pond capacity have indicated continued sedimentation and a need for another New Hope Pond Sediment Removal project (84,85 exp, $150K). Currently, a New Hope Pond Bypass (83 GPP, $410K) is being constructed around the pond to allow for isolation during the next cleaning operation. This bypass will also allow

the pond to be isolated for longer periods of time in the event of an accidental spill as described above.

Essentially all liquid process waste streams from Y-12 facilities/operations must be diverted from direct discharge to EFPC to an acceptable treatment system prior to release in order to meet the Tennessee Water Quality Act. A major step has already been made in this area. The Y-12 laundry, which was a major contributor to EFPC, has been shut down, and Y-12 laundering is now being handled by the ORGDP Laundry. For other EFPC effluents, A Source Collection and Treatment Facilities project (84-D-124 LI, $7725K) will provide collection tanks with curbs, pumps, piping, and truck loading stations to allow for each of the wastes to be transported to the appropriate central treatment facility.

Approximately 4 million gal per year of acidic runoff results from rainfall contacting and percolating through the Y-12 Plant coal yard, located next to the steam plant. The runoff has a pH range of 2 to 3 and contains suspended coal fines and metal contaminants (iron, manganese, arsenic, and others) and is subsequently discharged to the EFPC. About 20 million gal of ion-exchange regeneration acid having a pH range of 1.5 to 4.5 and 20 million gal of boiler blowdown typically at an elevated temperature and having a pH of about 11 are also released to the creek annually. The Steam Plant Wastewater Treatment Facility (84-D-124 LI, $4000K) provides for the treatment of these acid and caustic discharges. The treated effluent will be a permitted outfall to the EFPC.

Several improvements are required in Y-12's management of its air emissions. The most notable of Y-12's problems in this area involves the particulates (fly ash) from the steam plant. On April 14, 1982, DOE signed a Federal Facilities Compliance Agreement with the EPA which placed the

Y-12 Steam Plant on a schedule to obtain compliance with the CAA and the State Implementation Plan for Tennessee. The Steam Plant Improvement (78-17-D LI, $13,500K) project includes the installation of fabric filters (baghouses) to effect the control of particulates.

The principal volatile organic compound emitted by Y-12 is perchloroethylene (tetrachloroethylene). In most industries, it is usually used as a solvent in degreasers, but the primary use in Y-12 is as a machine coolant in the M-Wing Shop. Additional and replacement machines have increased perchloroethylene emissions above State regulated limits. Also, perchloroethylene is considered a health hazard and a possible carcinogen, making its replacement as a standard process material highly desirable. The M-Wing Coolant Changeout project (81-D-115 LI, $3800K) will replace the machine coolant with a propylene glycol-water mixture.

Another Y-12 air emission of concern is hydrogen fluoride (HF). Hydrogen fluoride emissions arise almost exclusively from the chemical processing operations in Buildings 9212 and 9206. Recent and projected increases in production will significantly increase these emissions, possibly to levels above State of Tennessee control limits. Process controls to minimize the necessity for use of excess HF in the chemical operation are being installed. In addition, an HF Scrubbers (81-D-120 LI, $1000K) project should essentially eliminate these operations as air pollution sources.

An overall inventory and evaluation of Y-12's stack effluents is underway [Stack Characterization (84 exp, $85K)] and will serve as a basis for a more comprehensive, long-range air emissions management plan. A Drainage System Verification (84 exp, $250K) project is continuing in 1984

to assure that all effluents from the Y-12 drainage system are well understood and documented.

In the area of conventional solid waste, Y-12's Sanitary Landfill 2 was permitted by the State and became operational in April 1983. The facility serves ORGDP, ORNL, and other DOE prime contractors in Oak Ridge in addition to the Y-12 Plant. A permit modification, which is expected to be finalized soon, allows the disposal of asbestos, aerosol cans, beryllium oxide, and glass as well as combustibles and decomposable materials in this landfill. Because of the high potential for inadvertently mixing uranium-contaminated materials with sanitary wastes, a Trash and Scrap Monitoring Facility (84-D-124 LI, $150K) is to be built. This project will provide radiation detectors to ensure that no radioactive wastes are placed in Sanitary Landfill 2.

3.1.5 Monitoring

Environmental monitoring requirements at Y-12 have increased at an astounding rate. Studies are needed to evaluate existing situations to determine what remedial actions may be required and to meet monitoring requirements in the various environmental management laws and regulations. To evaluate the extent of contamination of surface and groundwaters that has resulted from disposal practices in the Bear Creek watershed, extensive Bear Creek Burial Grounds Groundwater Evaluation (84-88 exp, $500K) studies are underway. Characterization of Liquid Wastes (84-86 exp, $1000K) that are currently flowing into EFPC is required to determine which effluents must be treated.

Additional NPDES Monitoring/Sampling Stations (84-D-124 LI, $1300K) will be required because of expected changes in Y-12's NPDES permit(s) in 1984. The actual number and type of NPDES monitoring stations required

will not be known until EPA has issued the permits, but the best current estimate is that at least nine new stations will be specified.

Compliance with DOE Order 5480.2 for hazardous and co-contaminated waste management requires more new analyses and monitoring systems, including RCRA Waste Analysis Plan Development (84-85 exp, $200K) and RCRA Groundwater Monitoring and Protection (84-85 exp, $330K).

Two Meteorological Towers (84 GPP, $200K) are to be installed on the Y-12 site to improve air emission management. Site-specific meteorological data are required as a prerequisite for computer modeling studies and for predicting the behavior of various air emissions as well as to define the effectiveness of new controls. Improved equipment and procedures will greatly contribute to the quality of Y-12's air monitoring data. An engineering evaluation currently underway [Stack Monitoring Evaluation (84 exp, $100K)] will define which of Y-12's stacks and stack monitoring equipment will need to be modified [Stack Monitoring Upgrade (87 LI, $5000K).

The tremendous increase in monitoring requirements has led to a tenfold increase in the workload for the Y-12 Analytical Laboratory. This demand cannot be met even by using outside laboratories and by working 21 shifts per week at the Y-12 Analytical Laboratory. The solution to this concern is to Refurbish and Expand the Plant Lab (84-D-124 LI, $850K; 84 exp, $500K; 85 exp, $500K) to provide space for additional lab personnel and equipment.

3.1.6 Remedial Action and Decommissioning

Y-12 is in the process of closing down operation of several major waste management facilities. The need for the Closeout of the S-3 Ponds (84-86 exp, $6000K) was discussed under Sect. 3.1.3. Considerable expense

and capital equipment funds have already been spent on the early stages of this project. The closeout plan includes:

1. neutralization of the liquid in the four ponds to precipitate metal hydroxides;
2. biological treatment to reduce the concentrations of nitrate and total organic carbon;
3. separation of the solid and liquid phases by sedimentation;
4. analysis and characterization of the liquid and solid phases;
5. discharge of the treated wastewater;
6. performance of leachability and transport analyses on core samples from the ponds to determine the need for additional earth removal;
7. installation of a rain-excluding cover over the ponds;
8. removal of the wet solids from the ponds for solidification in cement;
9. transfer of the co-contaminated solidified products to an approved disposal site; and
10. filling the ponds using the demolished pond walls and fill earth that has been checked for hazardous constituents, capping the fill with impervious clay and covering with topsoil for seeding with grass.

The closeout is expected to be complete by January 1987.

Rehabilitation of Bear Creek (87 LI, $20,000K) will involve yet-to-be determined actions for mitigating concerns related to the contaminated (primarily by aluminum and uranium) sediments of the creek, contaminated groundwater, and contaminated soils. Special treatment may be required for these soils and sediments if they are classified as co-contaminated hazardous waste. The outcome of the Disposal Area Remedial Actions project (see next paragraph) will affect the schedule for Rehabilitation of Bear Creek.

Operations in the Bear Creek Burial Grounds are to be ceased because of groundwater contamination problems there (Sect. 3.1.1). Studies to determine Burial Grounds Inventory (84 exp, $150K) are underway as well as Burial Grounds Remedial Action Studies (84 exp, $1200K). A plan for closure and remedial action in the Bear Creek Watershed area to restore water quality is to be submitted to the EPA and TDHE by July 1, 1984. Specifics of the required Disposal Area Remedial Actions (84-D-124 LI, $12,000K) will not be known until that time. Early work on Oil Landform Remedial Action (84 exp, $200K) is already underway.

Classified material was buried in 1965 and 1966 under the site of the current Y-12 coal pile. There is concern over the possibility that because of the acidic nature of rainwater leaching through the coal, the buried material is being dissolved, leading to contamination of EFPC and the groundwater. A program is underway to evaluate the groundwater cycle and to determine a method for removing all previously buried material and relocating it to an appropriate site [Excavation of Coal Pile Burial Pit (84 exp, $250K)]. The excavation is planned to be completed prior to buildup of the coal inventory in September 1984.

Lithium isotope separation processes operated in the late 1950s and early 1960s resulted in extensive losses of mercury within the Y-12 Plant; some of this mercury was lost to the environment outside of the plant by way of EFPC. Today, some of the residual mercury contained in old process buildings and grounds of the plant is escaping to EFPC. This results in a continuous violation of the Tennessee Stream Guide for mercury (0.05 ppb). Current concentrations in EFPC average 3 to 4 ppb (the drinking water standard for mercury is 2 ppb). Available data support the judgment that there is no immediate or foreseeable risk to the health of the public as a

result of the past or current residual mercury discharges other than an unlikely possibility of harm that would result if a person were to ingest a large number of fish containing mercury at concentrations higher than 1 ppm from the EFPC on a continuing basis. Even this low-probability situation will be diminished as the secondary mercury sources are identified and eliminated. The public health risk from the use of mercury-contaminated soils and sediments needs further analysis; however, there is presently no known public health problem that has resulted from their use.

Investigations are underway to identify the existing sources of mercury in the Y-12 Plant that are contaminating EFPC [Mercury Source Identification and Remedial Action Planning (84-88 exp, $800K)]. Some cleanup activity has been and will be performed using expense funds [Mercury Cleanup (84-88 exp, $2700K)]. However, the fact that some of the secondary sources are area rather than point sources, makes facilities for Reduction of Mercury in Plant Effluents (85-D-121 LI, $15,000K) necessary. Specific Treatment of Mercury-Contaminated Water (84 exp, $1000K) that has collected as a result of pipes bursting in one of the former lithium facilities has been necessary during 1983 and 1984.

One of the old lithium isotope separation process buildings and a small support building must be stripped and decontaminated [Decommissioning of Lithium Isotope Facilities (84 exp, $500K; 84-D-124 LI, $12,000K)], otherwise, they will continue to contribute to the unacceptable concentration of mercury in EFPC. All active production and support operations currently located in the process building must be relocated [Relocation of Production and Support Facilities, (84-D-124 LI, $6400K)] to ensure the health and safety of the building occupants during removal of the process equipment and asbestos-bearing insulation.

In 1974, about 10 years after the lithium isotope separation production operations were shut down, a study of a small group of Y-12 mercury workers was conducted to determine whether any of the members of this group had observable symptoms of chronic mercury poisoning or other effects of their exposure to mercury. No such symptoms were found. A follow-up Mercury Health Study (84-88 exp, $1500K) directed toward the same objective has been initiated. This study will be performed in cooperation with the National Institute of Occupational Safety and Health (NIOSH).

A wide variety of Special Off-Site Studies (84-88 exp, $850K) related to the Y-12 mercury situation are ongoing. In addition to these activities are Off-Site Environmental Evaluations (84-88 exp, $3750K) associated with the DOE, EPA, TVA, TDHE, and U.S. Geological Survey Interagency Task Force. This task force is charged with investigating contamination (mercury, uranium, thorium, plutonium, beryllium, and PCB) of the sediment in the Tennessee and Clinch Rivers and their tributaries downstream of Oak Ridge. Four areas of pollution are being studied: surface water, soils and sediments, groundwater, and fisheries. The requirement for Rehabiliation of East Fork Poplar Creek (87 LI, $20,000K) will be determined from these studies.

All DOE facilities are subject to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) jurisdiction. DOE Headquarters is working to develop a CERCLA assurance program, and an interim guidance has been issued. This guidance states that actions undertaken by DOE in response to CERCLA should be designed to meet EPA requirements.

CERCLA applies to inactive waste sites that contain hazardous wastes specifically listed by EPA, that have characteristics generally identified

under the RCRA, or that are described in DOE Order 5480.2, "Hazardous and Radioactive Mixed Waste Management". Under CERCLA, remedial action or removal is required on release or threat of release of a hazardous substance which may present a substantial danger to public health or welfare.

In addition to the many sites in the Bear Creek Burial Grounds area and the Coal Pile Pit, the following inactive waste sites have been identified for the Y-12 Plant:

Site	Size (acres)
- Security pit NW of 9204-4	1
- Effluent pit near 81-22 (S-2)	0.33
- Pit west of 9404-1	0.1
- Field north of 9712 (garage)	2

CERCLA Site Evaluation Studies (85,86 exp, $575K) must be made of each of these sites to determine what, if any, remedial actions must be taken. At this time, it is not possible to predict the funding levels that may be required for such actions.

3.2 OAK RIDGE NATIONAL LABORATORY

ORNL is a multidisciplinary research laboratory with roles in the development of long-term, high-risk, high-payoff technology and stewardship of large and expensive research facilities. Research and development is conducted for DOE and other agencies. ORNL has resources for studying heavy-ion nuclear reactions; transuranic element processing, production, and research facilities; facilities for stable isotopes production; and a laboratory for producing and studying surface modifications of solids.

ORNL supports energy-base technologies, basic research in physical and life sciences, work for other federal agencies and technology transfer to the private sector.

The TDHE and EPA conducted a Compliance Evaluation Inspection of ORNL on August 23, 1983, and a Notice of Noncompliance was issued by TDHE on October 26, 1983. About $55 million has been spent at ORNL in recent years to correct or mitigate environmental problems. Environmental activities are planned at ORNL to address concerns related to radioactive waste, hazardous waste, mixed or co-contaminated waste, conventional waste, monitoring, and remedial action and decommissioning. Projects proposed after 1984 are likely to change as a result of continuing development and engineering studies. Detailed information on project scope and justification is contained in Appendix A.

3.2.1 Radioactive Waste

ORNL has been a leader in the processing of radioactive substances since its establishment. Activities in this area include process research and development; fuel cycle studies; isotope preparation, enrichment, and purification; and radwaste processing and disposal studies. Inherent to this ongoing effort is the production of low-level solid and liquid radioactive wastes. These wastes are routinely collected, processed, and disposed of in facilities at the Laboratory. Some features and components of these systems need to be replaced, repaired, or modified in order to alleviate environmental concerns.

3.2.1.1 Low-level Solid Waste

One acceptable method for disposing of solid low-level waste is shallow-land burial. However, several environmental concerns, including

migration of radionuclides via groundwater flows, must be considered when employing this method. Problems have been experienced with some of ORNL's older, now inactive, burial grounds, and corrective measures have been taken or are planned (Sect. 3.2.6). Considerable knowledge has since been obtained, and standards and guidelines are currently available to allow the design of burial grounds with very high confidence in their capability for containing the wastes.

Existing burial space at ORNL is anticipated to be exhausted by 1990; therefore, projects are underway to address the Laboratory's needs by reducing the rate of generation as well as by preparing additional burial space. The Anaerobic Digestor System (84 GPP, $665K) will reduce volume by the digestion of contaminated cellulosic and animal wastes from ORNL's research activities.

The Central Waste Disposal Facility (84 CE, $200K; ORNL-86-AR-2 LI, $7500K) is proposed to serve the disposal needs of ORNL, Y-12, and ORGDP for the long term. This shallow-land burial facility is being designed with state-of-the-art technology to conform to the best practices and latest applicable regulations. It will receive the standard low-level wastes produced by all three facilities, such as cleaning materials, construction debris, etc., and wastes fixed in grout. Extensive field work, which has been underway for 2 years, is continuing to fully characterize this disposal site and to allow its qualification. This work is being conducted pursuant to the guidelines of the NEPA. An additional disposal area, Initial Development, SWSA #7 (87 GPP, $900K), has also been proposed for engineered storage of radioactive waste.

Additional facilities planned include a Remote Handled TRU Waste Facility (84 GPP, $100K) and the Shielded TRU Waste Storage (85 GPP,

$200K). The former is for packaging of high beta-gamma activity waste contaminated with more than 100 nanocuries of transuranics (TRU) per gram, and the latter is an expansion of existing storage capacity.

3.2.1.2 Liquid Waste System

The two systems for collection, treatment, and disposal of low-level (process) and intermediate-level liquid (ILW) wastes continue to operate effectively. Recent improvements to the processing and disposal facilities have corrected some major system deficiencies. The most serious remaining concern is leakage (or potential leakage) from the collection system, parts of which have exceeded their design life. Another concern is the continued use of unlined ponds and surge basins, which should be replaced or decommissioned. Other long-term needs are related to improvements in ILW evaporator operation, interaction of storm drain and sanitary sewer systems with radioactive waste systems, use of ILW collection tanks, and a backup for the hydrofracture disposal of liquid wastes.

Projects for controlling leakage and improving operation; at the process waste system include the currently funded Process Waste Treatment Plant Improvements (84 GPP, $60K) and the proposed project for Upgrade LLW Transfer and Processing System (88 LI, $10,000K). Replacement of portions of the ILW system has been proposed in the Replace of ILW System, Phase I (88 LI, $40,000K) project. Additional replacement will be required in Replace ILW System, Phase II (after 1988). In the interim a phased approach is being used to upgrade the older portions of the ILW collection system. The Central ILW Collection System (83 GPP, $900K) and the ILW Drain Line, Building 3517 (84 GPP, $400K) improvements have been funded. Three additional projects are planned to replace ILW lines-Isotope Area ILW Lines (86 GPP, $900K), TRU/TURF ILW Lines (85 GPP, $950K), and HFIR ILW

Lines (86 GPP, $950K). Other projects planned are Rehabilitation of Contaminated Sanitary Sewers (85 GPP, $600K) to minimize inleakage of radioactivity to the sanitary sewer system, HFIR Ponds Replacement (88 GPP, $950K) to replace the existing unlined ponds or diked storage, and Backup for Hydrofracture Disposal (after 1988) to provide an alternative facility for disposal of ILW concentrate.

3.2.1.3 Radioactive Gaseous Emissions

EPA has proposed regulations to limit annual radionuclide doses to 10 mrem/year whole body and 30 mrem/year critical organ at the site boundary. Though ORNL complies with these proposed regulations, requirements have also been discussed which would mandate BAT treatment systems. If such requirements are mandated, Stack Emissions Control and Treatment (88 LI, $45,000K) will be needed.

3.2.2 Hazardous Waste

In response to implementation of the RCRA, ORNL has developed a hazardous material handling system. Existing facilities at ORNL pose safety problems and have very limited capability for the treatment and disposal of hazardous waste.

The current storage facility for hazardous waste suffers from inadequate fire protection and potential safety problems related to its close proximity to a mothballed reactor scheduled for decontamination and decommissioning. The building is too small to ensure adequate separation of incompatible chemicals. The Hazardous Waste Storage Facility (82 GPP, $225K) was funded to provide additional space and adequate fire protection; however, this project remains in a hold status, pending approval of a requested RCRA construction permit by EPA. The Chemical Waste Storage

Facility (84 GPP, $350K) is funded to provide specifically designed storage space for all types of ORNL waste chemicals by their compatibility class. The Improvements to Hazardous Waste Management Area (85 GPP, $200K) is proposed to provide support facilities dictated by OSHA considerations for personnel working in ORNL's hazardous waste management area.

In addition to adequate storage facilities, projects have been proposed to extract valuable constituents from the wastes or to render them nonhazardous. The Material Recovery Facility (85 GPP, $370K), Recovery Operations - Solvents (86 GPP, $100K), Recovery Operations - Plating Shop Solutions, (85 GPP, $100K) and Recovery Operations - Oil (86 GPP, $100K) projects are proposed to provide a recovery operations building and equipment to recycle waste solvents and oils and detoxify plating solutions. Other proposed handling and treatment facilities are located at ORNL facilities at the Y-12 Plant. These include the Isotope Separations Facility Wastewater Collection System (85 GPP, $100K) to adjust the pH and remove solids from concentrated nitric acid wastes and the Hazardous Waste Staging Area (85 GPP, $300K), which will serve as a facility for packing, sampling, and storing hazardous waste. Transformers containing PCBs in ORNL facilities at the Y-12 Plant will have improved containment under the proposed Improvements to PCB Transformer Dikes (84 exp, $140K). In addition Replacement of PCB Transformers Ph I, II, III (86-88 GPP, $2100K) is planned to replace transformers that pose an unacceptable environmental threat because of their location or condition.

Two new hazardous waste disposal facilities have been proposed for the Oak Ridge Complex. The Explosive/Shock Sensitive Chemical Disposal Facility (86 GPP, $100K) will allow explosives and shock sensitive materials to be detonated safely. The Gas Cylinder Disposal Facility (86

GPP, $200K) will permit damaged gas cylinders to be safely vented to the atmosphere through appropriate emission control equipment.

Asbestos was used as an insulation material in ORNL buildings constructed from the 1940s through the 1970s. Asbestos Replacement (86-89 exp, $4500K) is planned to remove asbestos material where it has deteriorated or where it poses a potential environmental insult.

3.2.3 Co-contaminated Waste

Wastes contaminated with both radioactive and hazardous materials are segregated and handled separately from hazardous waste to prevent inadvertent mixing. Co-contaminated waste is currently stored in various areas at ORNL. Several projects have been funded or are proposed to maintain separate handling. A temporary location for storing drums of co-contaminated waste has been funded under Temporary Co-contaminated Waste Pad (84 GPP, $17K), and Long Term Hazardous Waste Storage Facility (85 GPP, $300K) has been proposed to construct a facility dedicated to the storage of this waste. The Spill Prevention and Countermeasures Ph I, II, III project (86-88 GPP, $2700K) is planned to upgrade existing spill containment systems at ORNL. Truck Transfer Station Diking (85 exp., $200K) will also be provided.

A Scintillation Vial Crusher (84 GPE, $40K) has been funded to separate the vials from their contents, allowing vials to be disposed of as solid radioactive waste and the solutions to be stored for future incineration. Portable Cement Batch Plant (85 GPP, $500K) has been proposed for fixation of co-contaminated sludges in a grout matrix.

3.2.4 Conventional Waste

Conventional waste concerns are related to meeting NPDES permit and solid waste disposal requirements. Inadequate treatment of ORNL's waste streams has led to problems in meeting requirements set by the TDHE and EPA. The Notice of Noncompliance states that present NPDES permits for ORNL are not written to adequately cover all discharges. New permits will place limitations on discharges rather than on streams and will include limitations for all pollutants.

The inadequate treatment of ORNL's sewage has led to numerous NPDES noncompliances. Improvements to Existing Sewage Treatment Systems (84-E-104 LI, $1200K) has been funded to upgrade sewage treatment to meet BAT. Corrections to ORNL - Inflow/Infiltration (84 GPP, $200K) has been funded to reduce the hydraulic loading to the sewage treatment plant and allow treatment of more concentrated waste. The Improvement to Sewage System - HFIR/TRU (85 GPP, $250K) will allow rehabilitation of the sewage collection system in the HFIR/TRU area. The radioactive contamination in the sewage collection system is addressed in Sect. 3.2.1.2. The Filter System ORNL Sewage Treatment Plant (85 GPP, $300K) project has been proposed to provide tertiary filtration for additional reduction of suspended solids and biochemical oxygen demand (BOD). This project may not be required if performance improvements at the upgraded sewage treatment plant are adequate.

Steam plant effluents of concern are those associated with coal yard runoff and the ash hopper system. Coal Yard Runoff Treatment System Improvements (84 GPP, $700K) has been funded to provide treatment facilities for neutralization, clarification, and sludge handling. The proposed facilities will allow ORNL to meet discharge requirements more

consistently. The Ash Hopper Solids Handling System (83 GPE, $50K) will remove solids from the air washer wastewater generated by the steam plant.

Other collection and treatment systems have been proposed to meet regulatory requirements. Some streams from processes and laboratories contain nonradiological pollutants including organics, acids, and bases which are discharged without treatment to White Oak Creek (WOC). The Nonradiological Wastewater Treatment System (87 LI, $16,000K) is proposed to provide treatment to meet BAT guidelines. This project assumes approval of funding for decommissioning the 3513 pond (Sect. 3.2.6) and must be integrated with the plans for upgrading the LLW transfer and processing system (Sect 3.2.1). Treatment System, 1500 Area (84 exp, $60K) and 2000 Area Process Drain Isolation (84 exp, $60K) have been funded to route effluents from environmental research laboratories to a central collection point. Volume Reduction Modifications; Process Waste Treatment Plant (85 GPP, $300K) will segregate and divert nonradioactive streams from the Process Waste Treatment Plant.

Some process waste streams from ORNL facilities at the Y-12 site are discharged to EFPC without treatment. Process wastewater from ORNL's Biology complex is generated from laboratories and cage washers/sterilizers. This wastewater is mixed with storm drainage before being discharged to the EFPC. The Biology Area Wastewater Collection System (84 GPP, $600K) has been funded to isolate the process waste system from the storm drainage system and to provide collection tanks for the process wastewater. A follow on project, Biology Area Wastewater Treatment System (86 GPP, $900K) will provide a treatment system to adjust the pH and to remove solids and organics from the process wastes. Another waste stream of concern, the wastewater produced by the regeneration of the

demineralizer system in Building 9201-2, is currently discharged to EFPC without treatment. The Resin Regeneration Collection System Building 9201-2 (85 GPP, $150K) project is proposed to collect this wastewater, adjust its pH, and remove the solids before discharge. Sump water from Buildings 9201-2 and 9204-3 discharge to EFPC without treatment. In the past, oil spills reaching these sumps have led to reportable spills. In the proposed Sump Oil Separation (85 exp, $150K) project, oil separators would be added to the sumps to remove oil from the sumps before discharge. Control of Mercury Discharges, Building 9201-2 (84 exp, $60K) will provide for lining of pipes that have been contaminated with mercury.

Nonhazardous, nonbiodegradable solid wastes have been disposed of in a borrow pit at ORNL. A new area is urgently needed to supply additional disposal capacity. The Industrial Landfill (84 GPP, $200K) will provide a new permitted facility near the hazardous waste management area to dispose of these wastes. Improvements to Health Physics Research Reactor (HPRR) Access Road (86 GPP, $200K) is a proposed project to permit improved access to the new site.

Several potential projects have been identified to meet anticipated State requirements. These are Improved Containment - ORNL Waste Ponds (89 LI, $10,000K) for lining waste ponds at ORNL, CAA/CWA Compliance, Ph I, II, III (86-88 GPP, $2850K) to add treatment where required, and Process/Storm Drain Isolation, Ph I, II (87,88 GPP, $1800K) to isolate process drains for treatment, if required.

3.2.5 Monitoring

ORNL's environmental monitoring system is antiquated and requires upgrading to effectively document the impact that ORNL is having on the surrounding environment. Adequate monitoring can be obtained by

replacement of outdated equipment and installation of monitoring equipment in new locations.

DOE Orders require that ORNL's discharges be monitored so that an inventory of released radioactivity can be maintained and the impact of discharges can be assessed. Several projects have already been completed. The current funded project is Upgrade 7911 Stack Monitoring System (84 GPE, $350K). In this project, sampling probes will be installed, the samples taken will be routed to new analytical instrumentation, and the data will be transmitted to an existing computer. Upgrade 3020 Stack (85 GPE, $250K) is also proposed.

The Environmental Monitoring System Upgrade (ORNL-85-6 LI, $3500K) and the Environmental Monitoring Systems Upgrade, Phase II (ORNL-86-6 LI, $5000K) will replace outdated instrumentation with state-of-the-art monitoring equipment. Major sources of continuing radioactive effluents, including reactors, settling basins, waste trench areas, solid waste storage areas, and isotope production areas, require upgrading to current monitoring technology. Low-Level Waste Sampling and Monitoring Upgrading (85-86 GPP, $1000K) will provide a portion of the upgrade.

New permits issued to ORNL may require additional monitoring equipment. Three projects are proposed to provide additional stations: Water Quality Monitors (84 GPP, $300K), New NPDES Monitors at ORNL (85 GPP, $300K) and New NPDES Monitors at ORNL's Facilities Located at Y-12 (85 GPP, $300K).

The United States Geological Survey (USGS) has made detailed studies of the groundwater system underlying the ORNL Solid Waste Disposal Areas. Many monitoring wells have been installed as a result of these studies, and analysis of the resulting data indicates that additional wells are needed.

Projects have been proposed to install these monitoring wells. These include the Hydrostatic Head Measuring Station, Ph I (84 GPP, $220K), the Hydrostatic Head Measuring Station, Ph II (85 GPP, $550K), and the Hydrostatic Head Measuring Station, Ph III (86 GPP, $700K). Based on additional data from these wells, a Groundwater Monitoring Network, Ph I, II, III (86-88 GPP, $2100K) will be installed.

Monitoring support equipment and facilities have also been proposed. The Environmental and Effluent Data Computer (83 GPE, $198K) has been approved to allow more efficient collection and evaluation of data. The Environmental Monitoring Center (87 GPP, $900K) has been proposed to house personnel and equipment involved in ORNL's environmental management program. Environmental Monitoring Equipment, Ph I, II, III, IV, V, (85-89 GPE, $2500) will provide needed capabilities for monitoring.

3.2.6 Remedial Action and Decommissioning

Contaminated disposal areas and facilities from past research, development and waste management activities at ORNL have been deactivated and remedial actions have been taken. Additional remedial actions are being planned by ORNL to stabilize the remaining radioactivity. Existing ORNL facilities requiring site corrective measures include the low-level solid waste storage areas (SWSAs), liquid low-level waste processing ponds and intermediate-level waste (ILW) pits, ILW transfer lines, radwaste processing and transfer lines, and the WOC floodplain and lake bed.

Several corrective actions in the SWSAs have been completed and new ones are being initiated. These have significantly reduced the release of radionuclides to the environment, but additional work is required to further reduce releases. Engineered Groundwater Barriers, Trench 7 (84 GPP, $400K) has been funded to intercept groundwater up-gradient from

Trench 7 to route it around the trench and reduce radioactive leaching. Additional corrective actions related to Additional Burial Ground Stabilization may be required after 1988. Additional research and development is needed to identify appropriate remedial actions (see Sect. 5). Several low-level waste processing ponds and pits have been identified for replacement (Sect. 3.2.1.2) or remedial action. A project to Solidify the Sludge Pond at SWSA 5 (84 exp, $250K) has been funded and Decommissioning of Pond 3513 (86 GPP, $3000K), and Decommissioning of Ponds - 3524, 3539, 3540 (after 1988) and Contaminated Groundwater Control Measures (86,87 GPP, $1350K) are planned.

Corrective measures for the White Oak Creek floodplain and lake bed are long-range needs. R&D will continue to find ways to limit contamination at the source (e.g. burial grounds). When the sources of contamination have been identified and controlled, a decision will be reached on the additional remedial action which will be required in White Oak Creek. White Oak Lake/Creek Rehabilitation may cost tens of millions of dollars.

The Surplus Facilities Management Program (SFMP) sponsored by DOE provides for the management of DOE surplus radioactively contaminated facilities from the end of their operating lives until final facility disposition. As part of the program, ORNL oversees about 45 individual surplus facilities, ranging from abandoned waste storage tanks to large experimental reactors. Several of these facilities are considered to be of some environmental concern. These include the Metal Recovery Facilities (84-88 exp, $5800K), and Old Hydrofracture Facility. Long-range program plans to provide decommissioning schedule for the facilities are being developed.

3.3 OAK RIDGE GASEOUS DIFFUSION PLANT

ORGDP is primarily dedicated to the production of isotopically enriched uranium-235 for use in the fabrication of nuclear reactor fuel. Under the Toll Enrichment Program, electrical utilities from the United States and other nations ship uranium feed to the gaseous diffusion plant for enrichment. Major research and development activities related to enrichment technologies are performed at ORGDP for the DOE. Advanced isotope separation technologies currently under development include advanced gas centrifuge (AGC) enrichment and atomic vapor laser isotope separation (AVLIS).

ORGDP has evaluated key environmental issues over the years and obtained funding for the most pressing problems. There are a few areas of concern remaining, including several areas of interest identified as a result of the State of Tennessee Compliance Evaluation Inspection on July 13, 1983. These can be categorized as follows: radioactive waste, hazardous waste, co-contaminated waste, conventional waste, monitoring, and remedial action or decommissioning. Detailed information on project scope and justification is contained in Appendix A.

3.3.1 Radioactive Waste

ORGDP produces enriched uranium and operates a uranium recovery facility. Uranium (average assay of 1% U-235 isotope) is routinely handled. Low-level radioactive solid wastes are either buried or stored. Contaminated rubble will be buried at the CWDF (Sect. 3.2.1); contaminated metals will continue to be stored. Some equipment for initial startup of the CWDF is being funded by ORGDP (84 CE, $200K).

Currently, about 25,000 tons of scrap metal slightly contaminated with uranium, ^{99}Tc, and transuranic nuclides are stored at ORGDP. The storage site which is an area within the 100-year floodplain of the Clinch River, is not consistent with DOE regulations. The storage area was sited before the present DOE 100-year floodplain requirement was implemented. The presence of radioactive contamination precludes sale of the scrap to commercial recyclers. The Scrap Metal Management Project (84, 85 exp, $2400K) is funded for segregation, sizing, and storage of scrap in preparation for future smelting. The Scrap Metal Smelting (85, 86 exp, $6000K) project is proposed to remove the scrap metal from ORGDP. Smelting and removal would provide for significant volume reduction and allow relocation of the contaminated material out of the 100-year floodplain. One proposed use of the metal ingots would be as radiation shielding at other DOE facilities.

Two surface impoundments are currently utilized to store nonhazardous/classified/radioactive sludges generated from neutralization and precipitation of metals, coal pile runoff treatment, uranium decontamination, neutralization of solutions, and treatment of airborne effluent scrubber blowdown solutions. There is no evidence of leakage from the ponds, however, the unlined impoundments present a relatively high potential for release of radioactive material and do not meet DOE requirements for ultimate disposal. The Central Sludge Fixation Facility (81-R-506 LI, $8800K) has been funded to handle routinely generated sludges that are currently being discharged into the impoundments as well as sludges currently stored in the two surface impoundments. An interim fixation facility will be operational in 1984, while the total facility is expected to be completed by January 1986. The interim facility will

provide for fixation of sludges generated by the treatment of Y-12 liquid waste at ORGDP (Sect. 3.1.3). In addition, it will handle sludges generated by routine operations at ORGDP, and as capacity permits, treatment of sludges in the impoundments.

The fixed sludges from the two surface impoundments will have to be buried in the classified burial ground. An expansion project Classified Burial Ground Expansion (84 GPP, $650K), has been funded which will provide the capacity for disposal of the classified fixed sludges. Unclassified materials processed through the fixation facility will be disposed of in the CWDF (Sect. 3.2.1.1).

Effluents from the chemical operations building are currently neutralized in an acid brick lined concrete tank and discharged to a holding pond for clarification. The outfall from the holding pond is an NPDES point source. The Central Neutralization Facility (81-R-506 LI, $1380K) and Floor Pan and Cylinder Cleaning Facility (81-R-506 LI, $2290K) projects have been funded to maintain the ALARA philosophy in reducing uranium and technetium concentrations in these effluents and to provide improved wastewater treatment.

Waste oils from the diffusion cascade having high concentrations of uranium at greater than 1% U-235 enrichment are not acceptable as feed to the TSCA incinerator (Sect. 3.3.3) due to criticality concerns. The Oil Decontamination Facility (85 GPP, $250K) has been funded to provide a chemical treatment system for reducing the total uranium concentration to levels that will allow the oil to be sent to the incinerator for ultimate disposal. A pilot-scale facility is now being successfully operated.

3.3.2 Hazardous Waste

Hazardous waste and mixed or co-contaminated waste (hazardous and radioactive contamination) are handled separately. Mixed or co-contaminated waste is discussed in Sect. 3.3.3. Hazardous waste that is not contaminated with radioactive materials is packaged, manifested, and shipped off-site. Ongoing concerns are related to stored lithium hydroxide, dielectric fluids, and asbestos. About 10 million kg of lithium hydroxide, a material that is very basic and moderately soluble in water, is stored in deteriorating fiber drums located in the basement of the K-25 Building. The K-25 Building is equipped with water sprinkler systems. The relatively remote probability of sprinkler activation coupled with the impact of the resulting release of this material is an environmental concern. Studies have been initiated to evaluate feasible actions for lithium hydroxide containment.

More than 950,000 kg of dielectric fluid containing greater than 500 ppm PCB are present in electrical equipment located throughout the ORGDP site. All of the equipment containing concentrated PCB has been provided with adequate secondary containment; however, 22 outside transformers containing mineral oil with greater than 500 ppm PCB have been identified. Without added containment or removal of these transformers, there is a risk of accidental release and subsequent exposure of personnel and/or contamination of the environment. Alternatives for mitigating this problem are being evaluated.

Many ORGDP facilities contain asbestos, and many demolition and renovation jobs involving asbestos are now and will continue to be necessary. In cases where asbestos is encountered, it can be handled

through administrative control; no project will be required. Asbestos waste will be placed in approved existing burial grounds.

Sludges produced by the treatment of cooling water to reduce Cr^{6+} to Cr^{3+} are currently stored in a surface impoundment. The continued discharge of chromium sludges to the pond has made it increasingly difficult to meet NPDES requirements. Therefore, Chromium Sludge Collection (81-R-506 LI, $2230K) facility to collect and dewater the sludges has been funded.

3.3.3 Co-contaminated Waste

Co-contaminated waste consists of radioactively contaminated hazardous/toxic organic wastes. The ORGDP maintains a stored inventory of PCB- contaminated wastes and other waste organic materials that cannot be disposed of at commercial facilities because of radioactive contamination. Additional wastes are generated annually. In order to be responsive to the TSCA, the Compliance with the Toxic Substances Control Act (83-N-402 LI, $31,900K) line item was funded. The project, which will be completed in FY-1987, provides an incinerator designed to dispose of PCBs and toxic organics. Although the disposal date required by TSCA cannot be met, this project will serve as a basis for a variance to allow time for construction. It is anticipated that EPA may promulgate additional regulations governing the management of toxic materials. Therefore, the Compliance with Toxic Substance Control Act, Phase II (88 LI, $6000K) has been proposed to provide an allowance for new facilities to meet additional regulations.

The Central Sludge Fixation Facility as discussed in Sect. 3.3.1 will also be used to treat mixed wastes. It will provide a mechanism for fixing hazardous components in a grout matrix to render them nonhazardous.

Several chemical treatment facilities at ORGDP has been reactivated to treat Y-12 electroplating/metal finishing wastes and chemical wastewaters. Treatment will begin upon receipt of appropriate permits (Sect. 3.1.3).

3.3.4 Conventional Wastes

Currently, the coal pile runoff is neutralized and discharged to a holding pond. The large quantity of sludge generated is filling up the pond. The Coal Pile Runoff Treatment (83 GPP, $240K) project has been funded to provide an alternative treatment system which will eliminate the discharge of coal yard runoff sludge to the holding pond.

Several projects are being considered to address potential long-range concerns. The Compliance with Clean Water Act (88 LI, $8000K) project will provide facilities which may be needed to meet requirements that are promulgated by additional state or federal regulations. This project would allow cleanup of discharges to drinking-water quality, if required.

Two phased projects have been proposed to provide equipment for reducing the releases of hydrocarbons into the atmosphere. During the course of normal operations, significant quantities of these compounds are sometimes discharged to the atmosphere from the plant diffusion cascade. Future regulations may be promulgated to require improvement in the control of these releases. Reduce Coolant Discharge, Phase I (88 LI, $4500K) would provide prototype equipment to reduce releases and Reduce Coolant Discharge, Phase II (90 LI, $13,400K) would implement the modifications defined in Phase I.

3.3.5 Monitoring

Future negotiations with the State of Tennessee and EPA may result in additional monitoring requirements. No project is currently proposed.

3.3.6 Remedial Action and Decommissioning

Three inactive burial grounds are located at the ORGDP site. In addition, an old metal storage yard which probably has material buried in it is located near the ORGDP adjacent to the intersections of Highways 95 and 58. These are old burial grounds and records for these facilities are incomplete. At the present time, there are no identified concerns; however, there are potential concerns relating to migration of contaminants. Evaluations of these facilities will be made to determine future needs. At a minimum, additional monitoring capabilities will be required.

A holding pond which was created by damming a stream, has received chromium wastes and sludges from cooling tower blowdown discharge and treatment. The discharge is through an NPDES point, and the sludges contain only chromium in the +3 valence state. Pending EPA regulations will deregulate trivalent chromium if they become finalized. Because of pending regulations and the relatively low toxicity of Cr^{+3}, remedial action project is currently proposed for removing the sludge from the pond.

Several environmental concerns should be considered in long-range planning for decommissioning. Removal of process equipment and decommissioning of the K-25 Building would have significant environmental and health concerns. The old purge cascade facilities are known to contain significant quantities of ^{99}Tc. Since high-assay uranium is also present, any removal, decontamination, or waste disposal activities would require special handling with particular emphasis on criticality safety precautions. No specific plans for dismantling the K-25 Building have been developed.

Another potential decommissioning concern is related to two buildings in the old K-25 Powerhouse Area that once housed operations involving beryllium. The air handling and cleaning equipment is presumed to still be contaminated. No specific plans for decommissioning these buildings have been developed.

4. REQUIRED RESEARCH AND DEVELOPMENT (R&D)

Research and development (R&D) plays a vital role in the resolution of environmental concerns and scoping of needed activities. Two principal areas of study are involved in efforts to meet existing environmental requirements. The first area considers ongoing operations and those studies leading to the development and demonstration of environmental control techniques or processes, material utilization (recycle), and substitution of process materials. R&D is most concentrated at the problem definition and alternative evaluation phase but may continue at a support level through engineering design and facility start-up and operation. The second area considers remedial activities to correct deficiencies of past operations and those studies related to questions of the occurrence, transport, and fate of pollutants in the general environs of the Oak Ridge Reservation. Research is identified to assess the current situation with respect to the distribution and interrelationships of contaminants in sediments and biota, to provide environmental data necessary in selecting between various remedial actions, and to support the effectiveness of the corrective actions.

The R&D funding required in support of the environmental activities addressed in Section 3 is summarized in this section. Additional details of funding schedules for each group of activities are contained in Section 5 and in Appendix B.

4.1 R&D IN SUPPORT OF ONGOING OPERATIONS

There are several environmental concerns that are unique to the Oak Ridge Complex and require significant R&D efforts. These are related to

the management of radioactive waste, the management of mixed or co-contaminated waste, the cleanup and disposal of mercury, the loss of volatile organics, and the identification of needed remedial actions. There are other concerns which are also unique because of the quantities of accumulated waste involved and the actions required, such as in the case of the continued storage of large quantities of lithium hydroxide and the disposal of sludge containing trivalent chromium.

4.1.1 Y-12 Plant

As shown in Sect. 3.1, a wide range of environmental projects are in progress or planned in the near future at the Y-12 Plant. R&D support will not be needed in some of these projects since existing technology can be used to meet requirements. Those that do need such support fall into three classes:

1. environmental control projects to provide processes or facilities for treating, storing, or discarding wastes;
2. projects relating to material utilization programs (recycle);
3. programs designed for substitution of process materials.

Brief program descriptions of R&D activities designed to support these projects are presented below. It is anticipated that major financial gains can be realized from material utilization (recycle) programs since waste volumes would be significantly reduced. R&D activities for substitution of materials will also lead to reduced costs because the modified processes will generate wastes that can be discarded with minimal environmental impact. Because of current regulatory requirements, a significant level of funding has been, and will continue to be, required for near-term solutions of waste management problems in addition to the longer-range solutions (material utilization and substitution).

4.1.1.1 Radioactive Waste

Radioactive waste at the Y-12 Plant is primarily uranium and uranium contaminated materials. A number of projects involve the development of methods for recycling and/or reducing or eliminating quantities of uranium in wastes. Some of the R&D efforts include the development of a monitoring instrument and a procedure to eliminate uranium from sanitary waste, the development of methods for recycling uranium waste chips, reduction of the amount of uranium lost in waste streams by process modifications, process development for changeout of percholorethylene coolant, and development of methods for removing uranium from process wastes, organic liquids, and soils and sediments.

4.1.1.2 Hazardous Waste

Plating solutions from various processes make up a sizable fraction of the hazardous wastes generated. R&D efforts in this area are devoted to the development of (1) methods for extending the lives of specific plating baths, (2) processes for treating of sludges, and (3) alternative plating baths. Processes are being developed for some aqueous waste streams to permit the removal of metal ions and organic concentrations to levels lower than required by BAT technology.

4.1.1.3 Co-contaminated Waste

Co-contaminated waste makes up a major portion of the waste streams currently generated at the Y-12 Plant. R&D efforts in this area are focused on process development, source elimination, development of methods for the removal of toxic organics, and technical support for the development and startup of the Central Pollution Control Facility (CPCF). Chlorinated solvents contribute to the disposal problems in many cases;

therefore, R&D efforts directed at developing substitute machine coolants, as well as new or modified cleaning and degreasing methods, have high priority. Furthermore, recycle and disposal methods for new machine coolants and cleaners have been proposed.

4.1.1.4 Conventional Waste

The Y-12 steam plant is a significant contributor to conventional waste streams. Pilot plant processes for the treatment of steam plant effluents, including coal pile runoff and in-situ treatment for waste water sources, are being investigated. R&D efforts involve the development of source treatment processes and technical support for tests on cooling tower treatments and water discharges.

4.1.1.5 Monitoring

In the area of monitoring, the evaluation of new analytical procedures for detecting lower levels of contaminants in waste streams and the development of stack sampling improvements and continuous biomonitors and NPDES monitors are of importance to determine the degree of treatment required.

4.1.1.6 Remedial Action and Decommissioning

The remedial action and decommissioning effort at the Y-12 Plant has three objectives: (1) the control, disposal, and cleanup of mercury; (2) the elimination of environmental insults to the EFPC; and (3) the control and cleanup of contamination in Bear Creek Valley. The control and disposal of mercury require source treatment and water treatment processes to be developed in order to attempt meeting the 0.05 ppb State standard for mercury in EFPC. Processes are also needed for cleaning and stripping mercury-contaminated buildings, for removing mercury from the waters of

EFPC, and for decontaminating the sediments of EFPC. One process that is being used for removing mercury from water collected from water-line breaks in contaminated areas involves the use of ion exchange resins, and a method is required for recycle of these resins.

With respect to Bear Creek Burial Grounds, remedial actions need to be developed for removing PCBs from the soil and for purifying the leachate collected from the burial grounds.

Funding requirements for FY-84 through FY-88 are summarized in Table 4, Sect. 5, and in Appendix B.

4.1.2 Oak Ridge National Laboratory

4.1.2.1 Radioactive Waste

Modifications or replacements are proposed for a number of the radioactive waste collection, processing, and disposal systems. Extensive field work is underway in many instances to characterize and qualify areas to be used for future waste management operations (e.g., the Central Waste Disposal Facility and SWSA 7). Techniques for improved use of decontamination equipment and volume reduction methods are also being investigated. Additional R&D in radioactive waste treatment and disposal is required in support of technological improvements. In particular, cost-effective processing of solid cellulosic and animal wastes, decontamination of equipment, and reduction of solid waste volume will benefit from continued study of techniques for converting solid waste to slurries for ultimate disposal by hydrofracturing, for incinerating combustible wastes, and for removing surface contamination from equipment to permit recycling. Improved operations of solid waste storage areas will make use of information obtained on site characteristics and application of impermeable

barriers. Alternatives to hydrofracturing will be studied in the event that this disposal technique were to be curtailed. Also new methods of in-situ stabilization and disposal of sludges are being developed.

4.1.2.2 Hazardous Wastes

Many ORNL waste streams, such as those containing waste oils, photographic wastes, solvents, waste mercury, and plating shop solutions, contain valuable constituents that could be recovered. Since direct release of these streams to the environment is unacceptable without prior treatment, the limitations of proposed recovery operations will be evaluated based on detailed waste characterizations already completed.

4.1.2.3 Co-contaminated Wastes

Handling, treatment, and disposal of co-contaminated waste will benefit from research activities involving radioactive wastes, hazardous wastes, and remedial measures. Separate research studies of co-contaminated wastes are not proposed at this time.

4.1.2.4 Conventional Wastes

Treatment and disposal of conventional wastes will benefit from the research activities proposed in Sect. 4.1.2, as well as the multisite applications discussed in Sect. 4.1.4.

4.1.2.5 Monitoring

Additional monitoring and measurement activities are necessary for each of the principal waste management projects identified in Sect. 3.2, which are associated with radioactive, hazardous, co-contaminated, and conventional wastes. Examples include developing new NPDES monitors, upgrading the monitoring capabilities at existing or proposed solid waste,

gaseous waste, and liquid waste release points, and determining the effectiveness of modifications to the sanitary sewer system and coal-yard runoff system.

4.1.2.6 Remedial Action

Two programs have been established to provide cost-effective remedial action for all ORNL facilities. The Surplus Facilities Management Program at DOE is used for decontamination and final disposal of contaminated laboratory structures, and the Site Corrective Measures Program is used to provide site stabilization of waste disposal areas and the surrounding environment. Activities presently underway are described in Sect. 3.2.6.

Several tasks that require additional research and development to select the most appropriate techniques for storage and stabilization of waste have been identified. These include: in-situ vitrification, chemical treatment, grouting, and removal techniques for intermediate-level liquid waste pits and trenches; passive groundwater drains and grouting techniques for low-level solid waste storage areas; mobilization rates for radionuclides present in White Oak Creek and White Oak Lake sediments; and interception of both surface water and groundwater at the site of solid waste disposal operations.

Projected funding requirements for these ORNL project areas total $3.7 million out of a total of $6.3 million for FY-1984.

4.1.3 Oak Ridge Gaseous Diffusion Plant

Most of the R&D efforts at ORGDP are conducted in support of gaseous diffusion or other uranium enrichment processes and the auxiliary processes. A part of this overall effort encompasses the technical support

efforts dealing with environmental, health, and safety issues. Major areas of the R&D efforts at ORGDP are presented in the following discussion.

4.1.3.1 Radioactive Waste

R&D activities in this area at ORGDP involve design review and technical support for the construction and operation of the Central Sludge Fixation Facility. This facility (see Sect. 3.3.1) is provided at the ORGDP site to fix a wide variety of waste sludges contaminated with traces of uranium and technetium. Reduction and elimination of these sludges, which accumulate during the operation of environmental systems such as scrubbers and waste neutralization systems, were special concerns of the TDHE and EPA in a recent inspection. The characterization of new and problematic wastes and the definition of concrete fixation recipes for these wastes (including waste sludges generated in the treatment of Y-12 wastes at ORGDP) are ongoing parts of this activity.

Technetium removal from specific waste streams from the decontamination area is another R&D project identified as a part of the requirements for Central Neutralization Facility technology. This activity is expected to define the ion exchange and solids removal technology required for treating these waste and provide technical support during startup.

Due to the nature of the operations of the gaseous diffusion plants, the possibility of releasing quantities of UF_6 to the atmosphere and the subsequent exposure of on-site and off-site populations and the environment to release products is an area of continuing concern. A study of the basic chemistry of UF_6 releases is in progress and will provide information necessary for definitive plume modeling and for defining knockdown/release control technology.

4.1.3.2 Hazardous Waste

The continued storage of large quantities of lithium hydroxide in the inactive K-25 vault areas poses a significant risk for an environmental insult in the event of an accidental water sprinkler system release. In addition, the cleanup from such an incident would be hazardous, of long duration, and expensive. R&D efforts are proposed to provide a technology base for dealing with this problem area.

4.1.3.3 Co-contaminated Waste

The control and disposal of toxic substances as regulated by TSCA are the intent of the TSCA Incinerator Project (Sect. 3.3). This project is required to dispose of or destroy the large quantity of PCB-contaminated wastes and other organic-contaminated wastes, both solid and liquid, that cannot be handled by commercial facilities because of radioactive contamination. R&D activities have been identified and are ongoing to define and verify technology in various areas to ensure the performance and operability of this high-temperature, high-destruction-efficiency incinerator.

Another area of vital concern is the treatment of the Y-12 waste streams. A major effort involves the identification, characterization, development and testing of treatment regimens for the S-3 waste streams at Y-12, which are to be treated in reactivated chemical processing systems at the ORGDP. Work will be continued in this area until the CPCF comes onstream at the Y-12 Plant in 1985.

4.1.3.4 Conventional Waste

Development work on defining, characterizing, and providing treatment processes for coal-pile runoff and steam plant fly ash containment/disposal

has been completed. As a result of this work, a treatment and retention facility will be provided through GPP funding (Sect. 3.3.4). Ongoing efforts involve design review and technical support through startup.

Large quantities of coolant, primarily refrigerant-114, are lost through operations in the gaseous diffusion plant, and projects are being proposed to reduce these coolant discharges. Studies directed at providing efficient, cost-effective technology will benefit this area of concern.

4.1.3.5 Monitoring

Separate R&D activities are not proposed at this time.

4.1.3.6 Remedial Action

A holding pond previously used for receiving trivalent chromium wastes and sludges from cooling tower blowdown discharges has been identified for possible remedial action. Pending EPA regulations would deregulate trivalent chromium. Definition of a disposal technology would be required for decommissioning and disposal of this chromium sludge. Processes envisioned could involve chromium recovery, or concrete fixation.

The technical program area for environmental, health, and safety studies at ORGDP derives is support from the Process and Long Range Technical Support (P&LRTS) budget funded through the Enriching Operations Division of DOE. Funding resources totaling $860K have been allocated for FY-1984. In addition, the Y-12 Plant is providing approximately $250K in FY-84 for technical support in the process development and treatment monitoring of S-3 waste streams at the ORGDP. Also included in this funding is a subtask being performed at ORNL on sewage plant treatability studies for some of the treated Y-12 waste.

4.1.4 Multisite Application

Tasks identified in this section are generally applicable to problems of environmental controls at more than one site with emphasis on waste treatment studies.

Removal of heavy-metal contamination from process streams and wastewater is one of the issues involved in environmental control and/or remedial action. Reducing the concentration of soluble heavy metals (e.g., uranium) contained in these streams to ppb levels in order to meet new and more stringent discharge standards based on toxicity rather than radioactivity, or on lowered allowed levels of radioactivity, is of concern. A project, Biosorbents to Remove Soluble Heavy Metals, involves the use of biosorbents (e.g., bacteria, yeasts) to retain soluble heavy metals and emphasizes characterization of the phenomena involved and demonstration of the feasibility of exploiting the process for the removal of the heavy-metal contamination.

The loss of volatile organics (e.g., perchloroethylene at Y-12 and refrigerant 114 at ORGDP) in large quantities to the atmosphere is a major concern. The loss of perchloroethylene at Y-12 may be ameliorated by the substitution of other materials. Modification to both Y-12 and ORGDP processes will be necessary for significant reductions in this type of emission. In a project on Advanced Environmental Control Technology, the development of advanced environmental control technology for removing chlorinated and fluorinated hydrocarbons from gas streams discharged to the atmosphere would be investigated, with emphasis on losses resulting from the loss of coolant from the gaseous diffusion cascade.

The development of remedial action approaches for removing contaminants (both chemical and radioactive), from sediment, pits, ponds,

and lagoons as an alternative to sealing these areas for indefinite periods is the thrust of a project on Decontamination of Sediments. Several techniques will be evaluated for dredging, cleaning, and replacing sediments, and experimental data will be developed to support proposed sediment cleaning processes. The objective of this work can be viewed as diminishing the source term for future concerns (e.g., eliminating sources of contaminants to White Oak Creek).

Funding requirements for the proposed multisite projects total $700K in FY-1984, $750K in FY-1985 and increase to $1100K in FY-1986. Funding levels for FY-84 through FY -88 are summarized in Appendix B, Table B.2.

4.2 R&D IN SUPPORT OF REMEDIAL ACTIVITIES

During the course of the Subcommittee's hearing and in its report it was emphasized that a need exists "to develop much additional data in order to comprehensively assess the problem and develop implementation plans for any necessary remedial action. In particular, this need involves . . ." (1) improve and expand the monitoring of groundwater; (2) conduct a broader overall assessment of the environmental fate of mercury discharge, both over time and across geographic locations; and (3) establish new sampling points so that the potential entry of mercury into potable groundwater or the human food chain can be quickly pinpointed." Similar needs exist for other pollutants. The general concern was raised of the potential for human exposure to pollutants as a consequence of transport through the environment.

Although the source of pollutants may be associated with specific operating facilities in Oak Ridge, the potential movement of these materials in groundwater or reentry to freshwater systems from soils or

sediments is a general concern and may transcend site boundaries. The research summarized in this section is designed to assess the current situation as related to pollutant sinks and food chain availability and to provide data to permit selection among alternative corrective actions and the effectiveness of these actions.

4.2.1 Surface Water and Biota

Contamination of aquatic sediments in the surroundings of the Oak Ridge Reservation represents a potential long-term problem in the protection of human health. Contaminated sediments may subsequently contaminate water and aquatic food chains of importance to humans. They may also result in contamination of the terrestrial environment under those circumstances where the sediment and/or water are used for industrial or agricultural purposes, or are utilized by terrestrial animals. The analysis of the potential problem associated with contaminants in sediment would include the possibility for remobilization and bioaccumulation in food chains.

Studies are proposed to investigate the processes affecting sediment contamination, sediment remobilization, and subsequent contamination of food chains of importance to critical groups or larger populations of humans residing in the vicinity of the Oak Ridge Reservation. Initial emphasis will be given to the quantification of relationships between the concentrations of contaminants in sediment and aquatic food products. Selection of chemicals for evaluation will be based, in part, on the screening prioritization results of the Assessment Group of the Oak Ridge Task Force.

Additionally, this activity will provide: a base line with respect to areas of the reservation and biotic components currently containing

enriched levels of contaminants (1-2 years); information relative to remobilization and resuspension of contaminants occurring as a result of natural events or remedial action that will enable selection of approaches to minimize potential hazards to human health; and documentation of effectiveness of remedial actions taken in reducing potential human health hazards existing from aquatic pathways.

4.2.2 Groundwater Flow Characterization

Although groundwater contamination does not represent the immediate, short-term pathway to man that contamination of surface water and biota do, the importance of groundwater resources and the long times that may be required for natural recovery require that the safety of the groundwater resource be assured. Groundwater flow beneath the Oak Ridge Reservation is dominated by preferred-flow pathways that are determined by geologic structure and weathering patterns. Most of the previous study of groundwater flow has focused on the relatively shallow flow systems where velocities are thought to be most rapid. Deeper flow is believed to occur largely along geologic boundaries. The most significant unresolved groundwater flow questions deal with the possibility that deep flow may cross the natural topographic boundaries of the reservation. Because of the long-term nature of deeper groundwater flow systems (i.e., flow times may be in decades), the characterization of these features is a longer-term activity that will require sustained attention. Nonetheless, significant progress can be made in improving the understanding of deeper flow with a relatively modest effort that is sustained for several years.

Current major attention is focused on the non-uniform nature of shallow flow systems and their intimate coupling with surface flows. The interaction between surface runoff and shallow subsurface flow that may

intersect shallow waste disposal trenches or soils that have been contaminated from the surface is only poorly known and is now the object of principal attention.

4.2.3 Soil Surface Management

Soil surface contamination is known to have occurred at various sites throughout the Oak Ridge Reservation. The spread of these contaminated soils beyond controlled zones through erosion of surface soils represents a long-term problem that, while not of critical immediate importance, may lead to sustained exposure of human populations to these contaminants. Therefore, a modest level of increased attention to surface soil erosion and land use/management schemes that adequately address problems of off-site movement of contaminants via soil should be undertaken.

Erosion at the Oak Ridge Reservation is almost totally via surface water runoff and the process of soil erosion is therefore closely related to the surface and subsurface hydrology of the site. The high annual precipitation and the high rates of precipitation that occur are only partially offset by the abundant vegetation of the site, especially where land management practices interfere with the mitigating effects of the natural vegetation. The soil water status, and soil structural properties need to be directly related to soil erosion potential for the reservation.

The R&D funding in support of remedial activities totals $1700K for the first full-year of study, distributed approximately between surface water/biota, groundwater, and soil studies as 75%, 15%, and 10%, respectively. FY-1984 is identified for the purpose of this report as the first year of study. Additional details of program and scheduling support may be found in Table 4, Sect. 5, and Appendix B, Table B.2.

4.3 RESOURCE DATA MANAGEMENT

It is proposed to integrate all the separate data sources compiled by the research activity into a single centralized database. This information system will be developed using the Statistical Analysis System (SAS) language and will be implemented on a VAX 11/750 computer with menu-driven interactive and batch access capabilities. This proposed system could be integrated with the existing Oak Ridge Reservation environmental data and the proposed Oak Ridge Task Force environmental data into the ORNL Department of Environmental Management's VAX 11/750 computer. Key entry for manual data collections will be accomplished through CRT screen mode menus that prompt data entry personnel for data values and provide for screening of values prior to data storage. The software for this process, the Easy Entry package, will operate through the centralized computer system. The research team could assist in implementing statistical analysis programs for estimating parameters or testing differences among sampling locations, background samples, or control samples.

A $200K level of effort would be required to set up the initial data management system; approximately, $150K/year effort, as shown in Appendix B, Table B.2 would be needed to maintain the system and provide routine computerized reports summarizing the current status of the information system.

5. FUNDING SCHEDULE SUMMARIES

5.1 OAK RIDGE COMPLEX

Estimated funding needs to resolve environmental problems approach $500 million for 1984 through 1988 and are summarized in Table 1. This funding level would allow resolution of problems associated with current waste management practices by 1990; however, remedial actions would not be completed. Planning, field testing, and research could be accomplished in this time frame and some remedial actions could be initiated. Such remedial activities account for 20 to 40 percent of the funding projected from 1984 to 1988 as seen by comparing Figs. 2 and 3. This proportion may increase significantly after 1988 when large expenditures ($200-300 million) may be required to implement recommended remedial actions.

Table 1. Total Funding.

Plant	Budget authority (millions of dollars) 1984	1985	1986	1987	1988	Total Funding
Y-12	39	48	46	52	38	220
ORNL	14	20	30	39	60	160
ORGDP	18	32	6	1	12	70
TOTAL	70	100	80	90	110	
					TOTAL	450

Total funding has been divided between 1) funded activities, 2) unfunded activities, and 3) RD&D. As indicated in Table 2, the approved funding level for the Oak Ridge Plants is about $75 million divided between expense, GPP, and line item budgets for 1984 and the continuing funding for

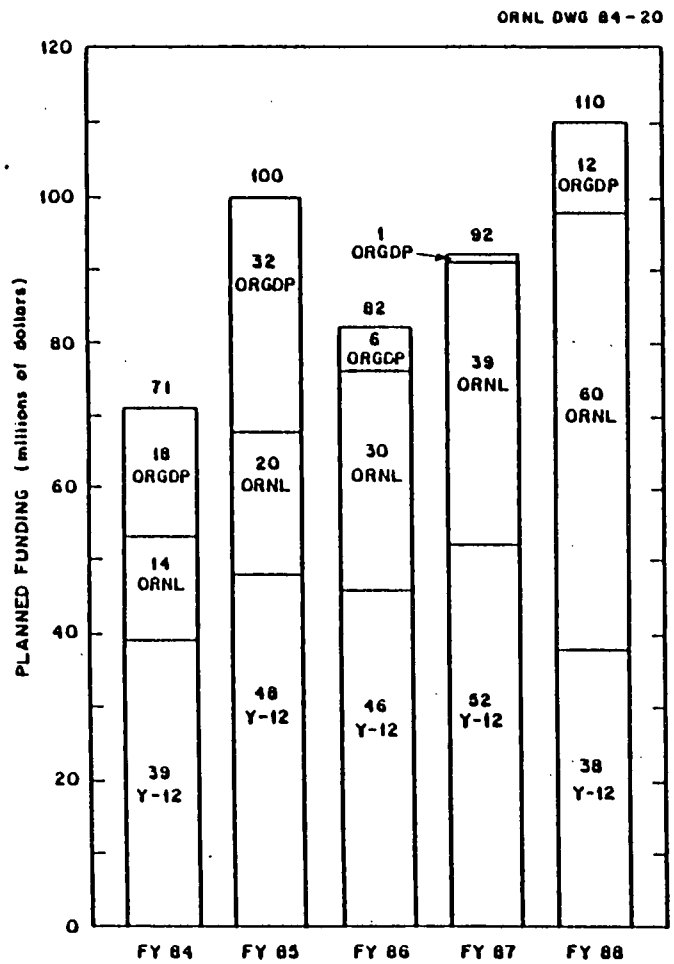

Fig. 2. FUNDING SCHEDULE FOR ENVIRONMENTAL ACTIVITIES FOR THE OAK RIDGE COMPLEX

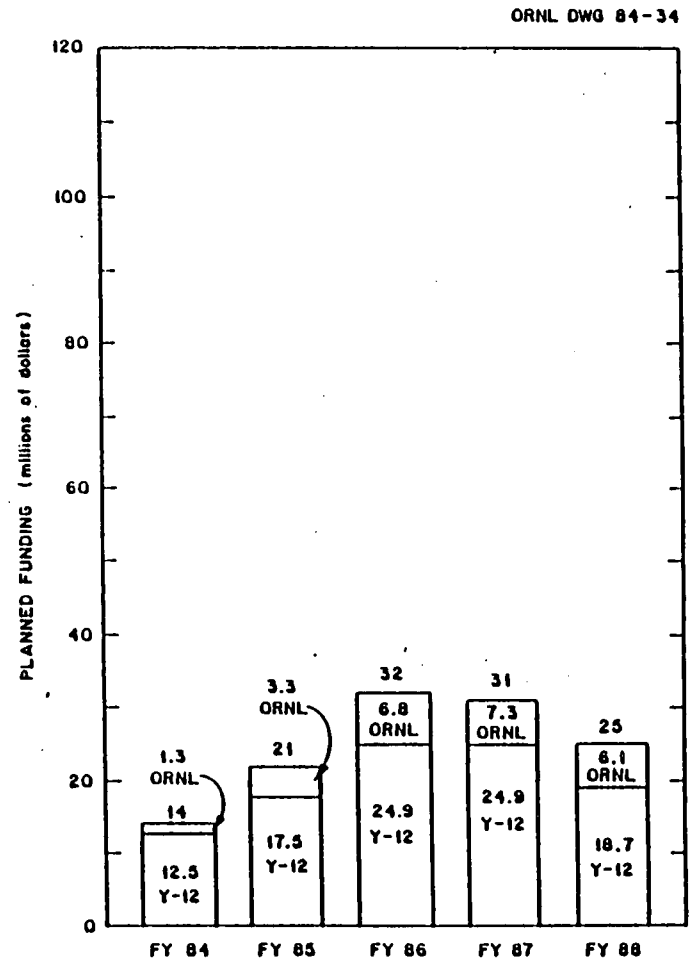

Fig. 3. FUNDING SCHEDULE FOR REMEDIAL ACTIONS FOR THE OAK RIDGE COMPLEX

previously approved line items, for 1985. The 1985 funding includes continuing activities on the TSCA incinerator (Sect. 3.3.3) and the Central Sludge Fixation Facility (Sect. 3.3.3), which are critical facilities for resolving problems related to disposal of co-contaminated waste. The requested funding for 1984 to 1988 of about $300 million (Table 3) represents a best estimate of the funding required to comply with the environmental planning basis (Sect. 3). There are two types of projects that have a significant impact on the total funding requested

1) projects to comply with proposed EPA regulations for airborne radioactive emissions (approximately $75 million) and
2) projects for remedial action (approximately $130 million).

Table 4 summarizes the needed RD&D funding for support of the environmental program. Environmental transport studies to be used for identification and evaluation of potential remedial actions have been included at a funding level of about $2 million per year.

Detailed funding schedules are contained in Appendix C.

5.2 Y-12 PLANT

Y-12 has requested total funds of about $200 million (exclusive of RD&D) to support environmental projects and activities during the period 1984-1988 (see Figs. 4-6). About $100 million of this total has been requested for remedial action. Fig. 4 shows the funding schedule by type of budget for all proposed environmental activities, and Fig. 5 shows the funding schedule by the categories discussed in Sect. 3. Fig. 6 breaks out the remedial action category.

Table 2. Funded Projects.

Plant	Fiscal-year funding (10^6) 1984	1985	1986	1987	1988		Total Funding
Y-12	24.2	1.4	-	-	-		25.6
ORNL	8.0	-	-	-	-		8.0
ORGDP	16.0	28.0	-	-	-		44.0
TOTAL	48.2	29.4	-	-	-		
						TOTAL	~ 75

Table 3. Funding Requested.

Plant	Fiscal-year funding (10^6) 1984	1985	1986	1987	1988		Total Funding
Y-12	11.4	42	40	47	34		174
ORNL	-	14	25	34	55		128
ORGDP	.65	3	5	0	11		20
TOTAL	12.1	59	70	81	100		
						TOTAL	~320

Table 4. R&D Funding.

Plant	Fiscal-year funding (10^6) 1984	1985	1986	1987	1988		Total Funding
Y-12	3.5[a]	5.0	5.6	5.4	4.5		24
ORNL	6.3	5.9	5.1	4.8	4.7		27
ORGDP	1.1[a]	1.1	1.1	1.0	1.0		5
TOTAL	10.9	12	12	11	10		
						TOTAL	~ 55

ORNL DWG 84-19

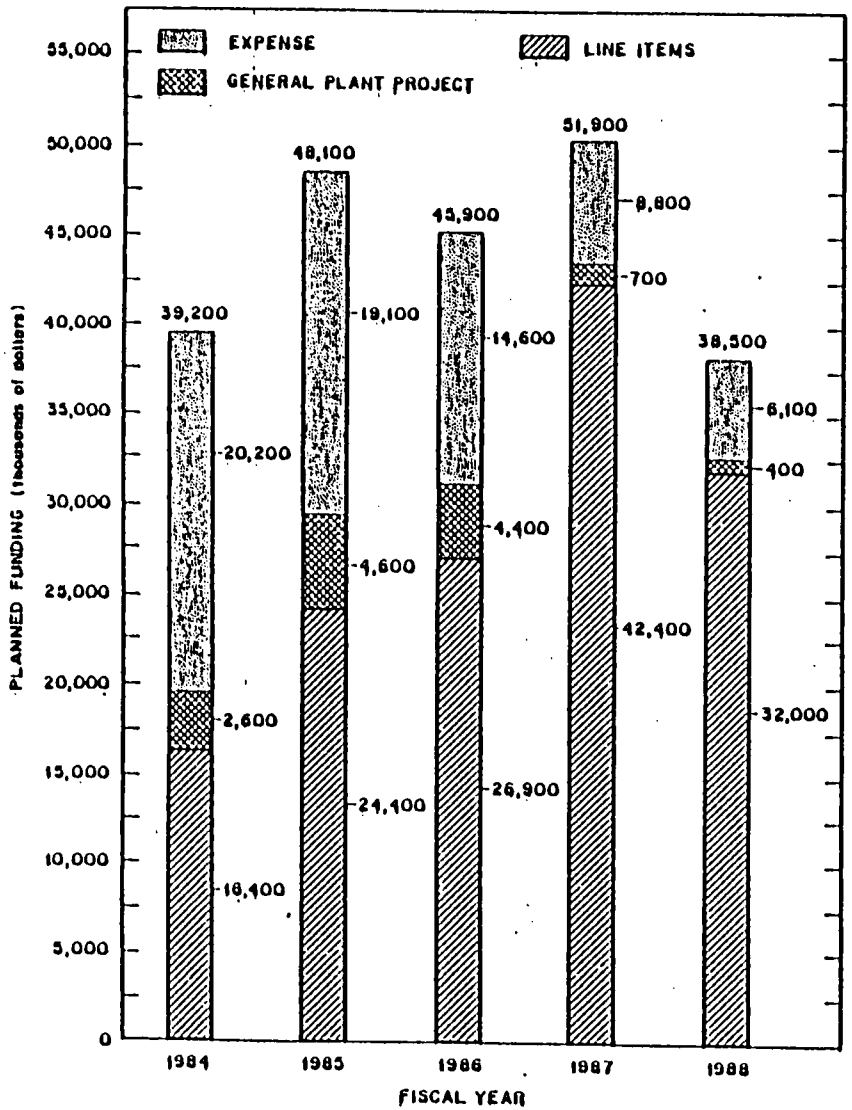

Fig. 4. Y-12 FUNDING FOR ENVIRONMENTAL ACTIVITIES BY BUDGET AUTHORITY

ORNL DWG 84-23

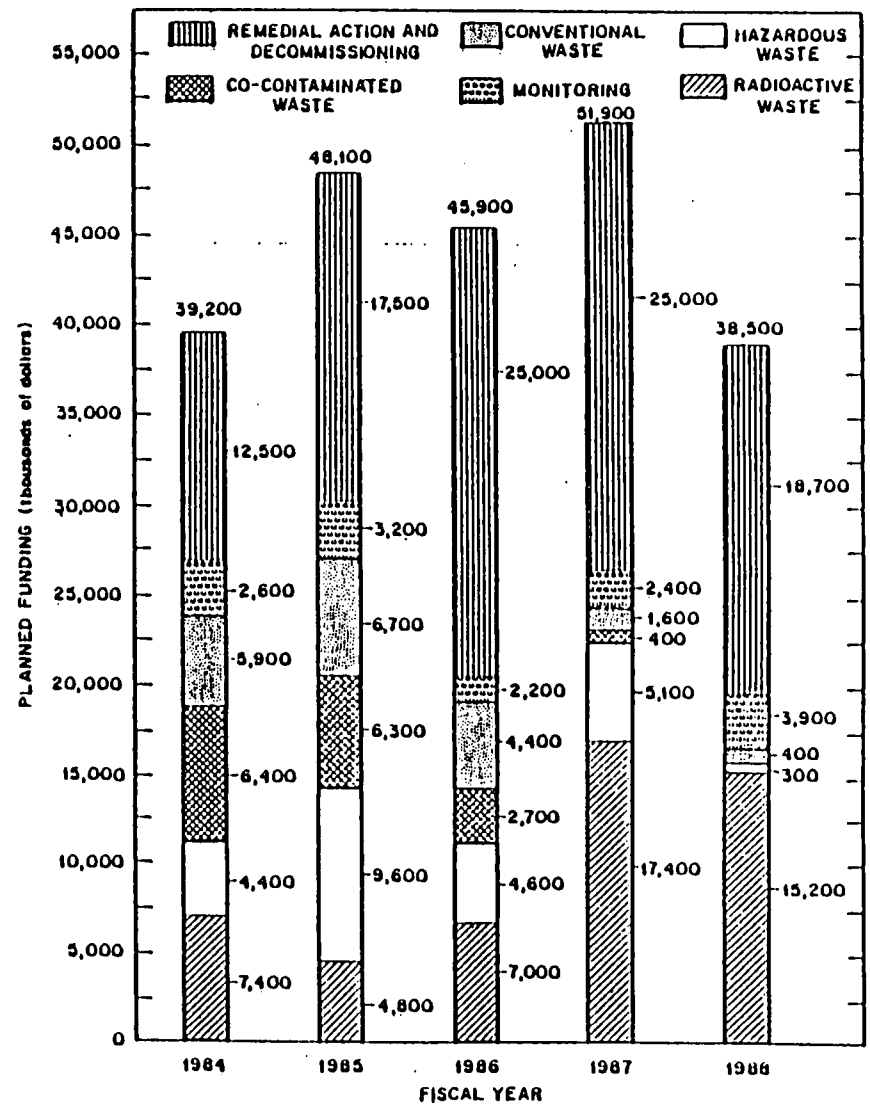

FIG. 5. Y-12 FUNDING FOR ENVIRONMENTAL ACTIVITIES BY CATEGORY

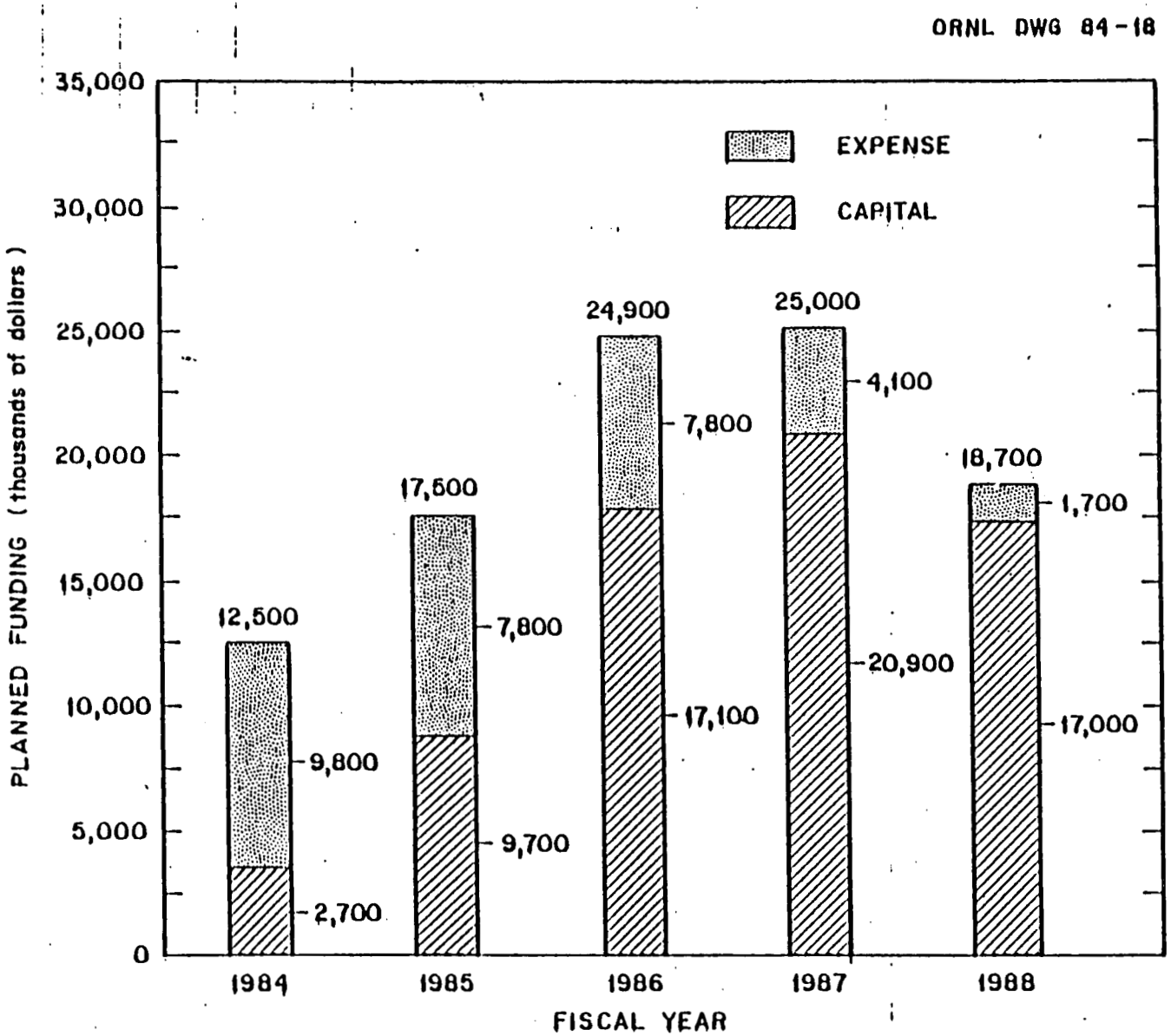

Fig. 6. Y-12 FUNDING FOR REMEDIAL ACTION AND DECOMMISSIONING

5.3 OAK RIDGE NATIONAL LABORATORY

ORNL has requested total funds of about $130 million (exclusive of RD&D) to support environmental projects and activities during 1984-1988 (see Figs. 7-9). About $50 million is proposed for funding by the Defense Waste Management Program for upgrade or replacement of portions of the ILW and process waste systems; improved monitoring, and remedial action. Fig. 7 provides a summary by type of budget for ORNL environmental activities, and Fig. 8 shows the funding schedule by the categories discussed in Sect 3. Fig. 9 breaks out the activities to be funded by the Defense Waste Management Program.

5.4 OAK RIDGE GASEOUS DIFFUSION PLANT

ORGDP has requested funds of about $70 million to support environmental projects and activities during the period 1984-1988, and over $50 million has been approved. Figure 10 summarizes the activities by type of budget, and Figure 11 provides a summary by the categories discussed in Sect. 3.

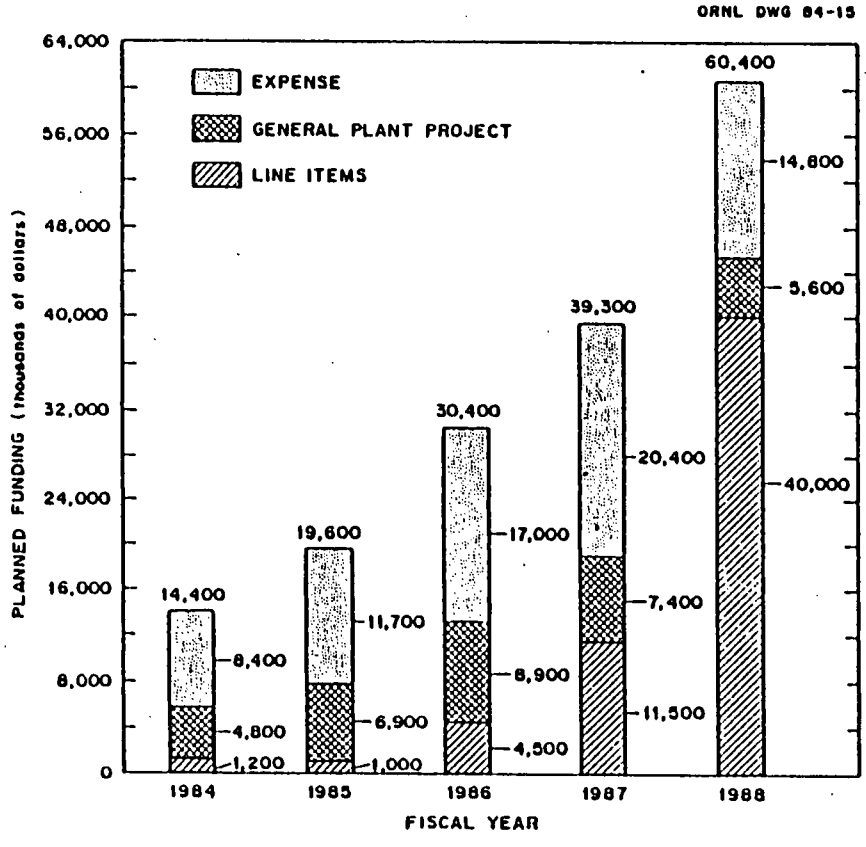

Fig. 7. ORNL FUNDING FOR ENVIRONMENTAL ACTIVITIES BY BUDGET AUTHORITY

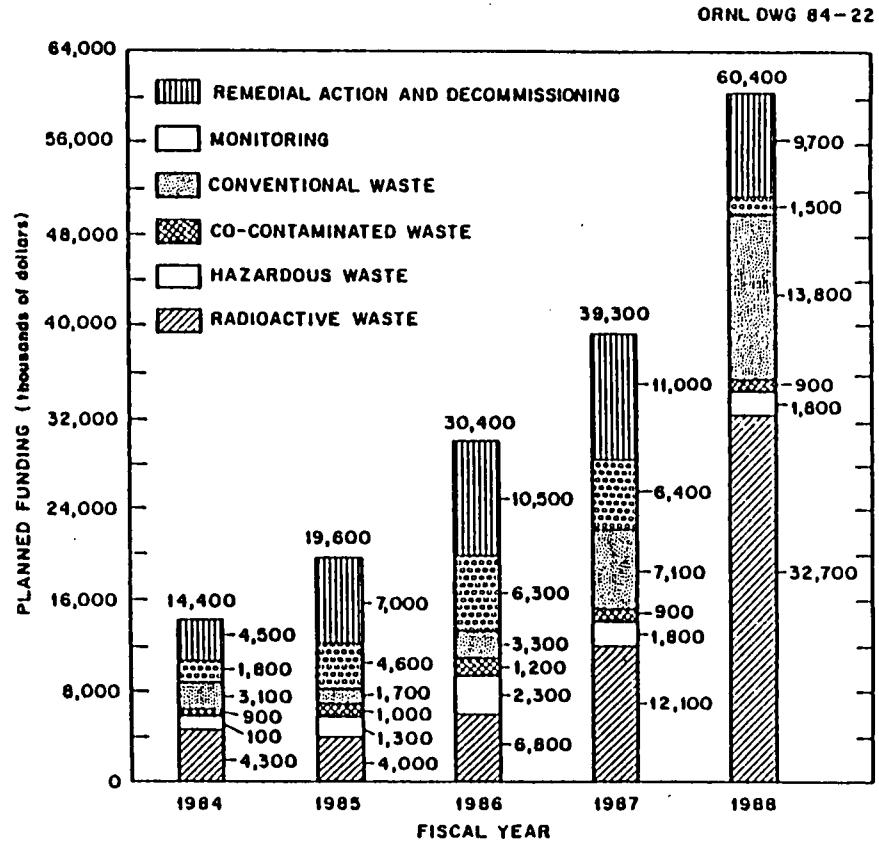

FIG. 8. ORNL FUNDING FOR ENVIRONMENTAL ACTIVITIES BY CATEGORY

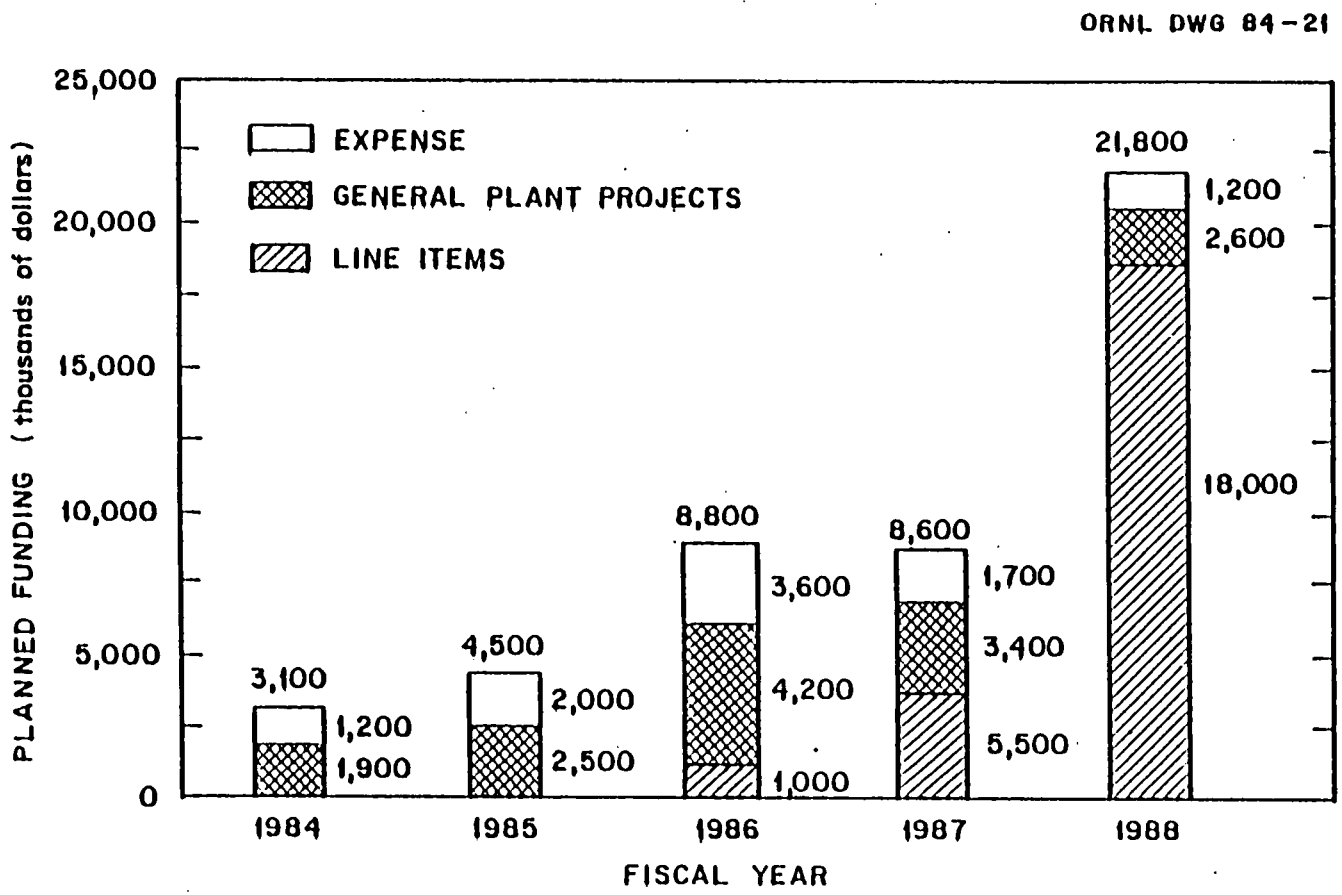

Fig. 9 ORNL FUNDING FOR DEFENSE WASTE MANAGEMENT PROJECTS BY BUDGET AUTHORITY

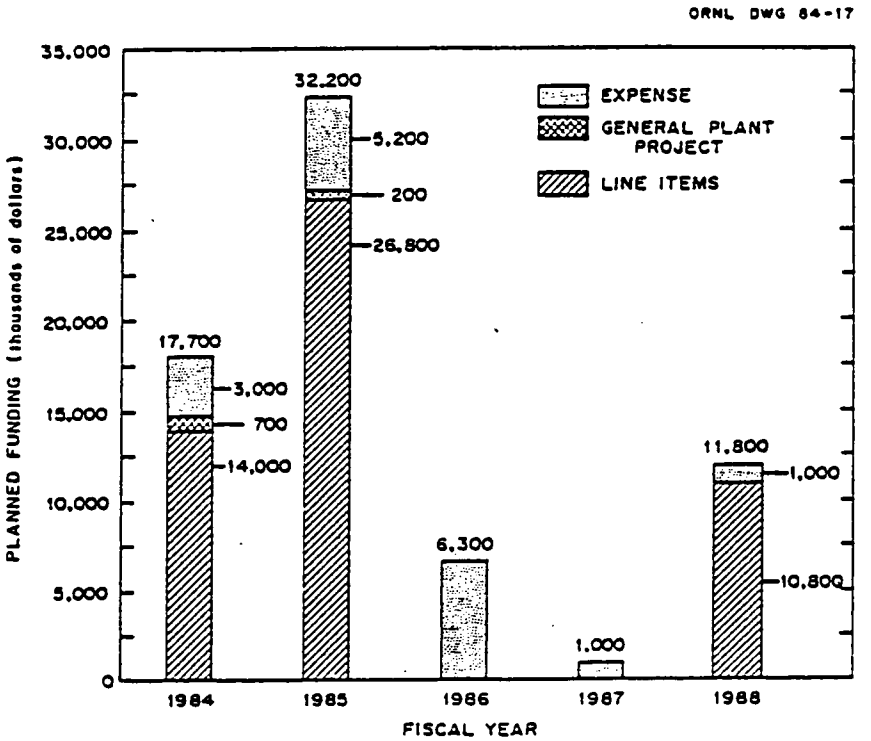

Fig. 10. ORGDP FUNDING FOR ENVIRONMENTAL ACTIVITIES BY BUDGET AUTHORITY

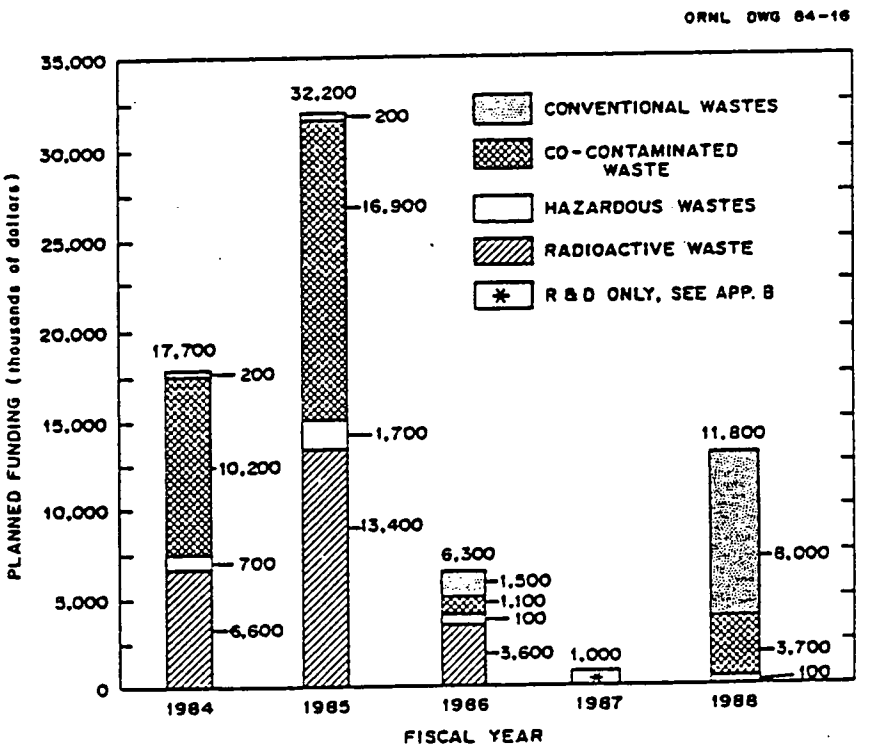

Fig. 11 ORGDP FUNDING FOR ENVIRONMENTAL ACTIVITIES BY CATEGORY

6. CONTINUING ANALYSES, UNRESOLVED ISSUES, AND PROPOSED REGULATORY ACTIONS

Several actual and potential environmental problems have been identified in the Oak Ridge Complex which will be very expensive to remedy, will require considerable study to resolve, and in some instances, may not be correctable to the extent of total compliance with environmental goals as expressed by the TDHE. In these latter instances, DOE intends to make every reasonable effort to reach these goals and will work with the TDHE and EPA to set acceptable alternative objectives on a case-by-case basis.

Tennessee has claimed ownership of all water within the State, and the TDHE has stipulated that, in general, all surface water must meet fish and aquatic life standards and all groundwater must meet drinking water standards. Application of this policy to DOE's on-site activities establishes a goal that will require a very large expenditure of resources. The physical constraints to be overcome to reach these goals will likewise require knowledge and technical capability beyond that presently existing or available in the foreseeable future. Therefore, the following plans for problem correction may not reflect total compliance with the stated TDHE policy.

The most prominent long standing problems falling in this category are those involving treatment or removal of contaminated soils and sediments which result in the contamination of both surface water and groundwater. At ORNL, these are primarily the radioactive burial grounds, White Oak Creek/Lake sediments and floodplains, and subsurface soils within the Laboratory resulting essentially from pipeline leaks. Each area causes localized groundwater contamination, and each area contributes to elevated radioactivity in surface water discharges from this DOE site. The primary

contributor to these elevated discharges is the older burial grounds, next is the contaminated soil, and last is White Oak Creek/Lake.

Solutions to the burial ground problem have been explored for several years through ongoing research, development, and demonstration (RD&D) efforts by both ORNL and USGS professional staff members. Section 5 of this plan discusses the planned and proposed RD&D efforts which are hoped to allow final remedial measures decisions to be made by 1988. The cost of these RD&D efforts has been about $5 million/year for the past several years and can be expected to remain at that level in the future. The costs of final remedial measures, although highly uncertain, are expected to be funded at about $5 million/year level until completed.

General cleanup of contaminated soil at the Laboratory will be undertaken as a part of an existing surplus facilities decontamination/decommissioning program and pipelines replacement program. Of course, the presence of buildings, tanks, other pipelines, etc., will preclude complete removal of all contaminated soil. The current level of effort in surplus facilities decontamination and decommissioning is about $5 million/year and is expected to be about $10 million/year in the foreseeable future. Pipeline replacement projects are specifically discussed in Sect. 3.2.1.

Decisions on White Oak Creek/Lake remedial actions must await a careful evaluation of costs versus benefits of reasonable alternatives. This evaluation should likewise be preceded by completion of remedial measures R&D such as the sediment cleaning study described in Sect. 5. Since the hazard associated with these sediments is small, a remedial measures decision milestone date of 1989 will be established. In the meantime, additional measures (e.g., increased fencing) will be taken to

further reduce the likelihood of public access to downstream sediments within the DOE Reservation.

Similar problems exist at the Y-12 Plant, extending off-site along EFPC, primarily within the City of Oak Ridge. The off-site sediment/floodplain soil contamination problem is currently under evaluation by the Interagency Oak Ridge Task Force, which is chaired by the TDHE representative with membership from DOE, EPA, USGS, TVA and the City of Oak Ridge. Environmental data collection within the City has been ongoing since early summer 1983 by the Oak Ridge Associated Universities (ORAU). Studies of surface water, groundwater, and fisheries will begin upon completion of technical work plans by the organizations selected by DOE to conduct those studies (TVA and USGS) and subsequent completion of interagency agreements authorizing their work for DOE. This latter procedural requirement is not expected to significantly affect the schedule for the studies. In addition to these studies, the Task Force requested DOE to select an organization to assimilate the data that are collected and to evaluate the public health benefits of alternative remedial measures versus their projected costs (both monetary and environmental). With the Task Force's concurrence, ORNL was selected for this activity.

Individual Task Force studies by the various participants are projected to require 1 to 3 years. The most extensive study, groundwater, is not expected to impact Task Force recommendations concerning remedial measures off-site along EFPC; therefore, these recommendations could be forthcoming in about 2 years, (i.e., in early 1986). In the interim, DOE is supporting City evaluations of data, as generated by ORAU to ensure that appropriate precautionary remedial measures are taken, if they are considered advisable, to protect the health of the general public.

Neither the cost nor the schedule for final remedial measures can be determined until the Task Force Study has been completed. Based on limited previous experience at Saltville, Virginia, however, costs of a few million dollars per mile are credible if sediment/floodplain soil removal, disposal as hazardous waste, and creek renovation are undertaken. Actual remedial measures would probably require preparation of an environmental impact statement. In this case, implementation of final remedial measures would be unlikely to commence before 1987. Information from the previously mentioned sediment cleaning research by ORNL would become available in the same time frame.

The Bear Creek Burial Grounds are expected to require remedial action of relatively large magnitude to rectify prior disposal of PCB-contaminated oils and other liquid organics. A DOE/TDHE agreed order established a July 1984 milestone for submission of a remedial action plan for the burial ground area to the State. For planning purposes it has been estimated that needed funding to accomplish these remedial measures is $5 million/year. There is, of course, a great deal of uncertainty surrounding these estimates, and the time schedule for their accomplishment is similarly uncertain. To enhance the possibility of success and to minimize expenditures, a decision may be made to phase the corrective action, starting with demonstration efforts designed to prove that acceptable groundwater quality can be reached. In the case of PCB-contaminated soil, levels exceeding the EPA limit of 50 ppm will require correction. Alternative techniques are being evaluated, as discussed in Sect. 5.1.1.

Similarly, studies of the area adjacent to the S-3 Ponds indicate a high degree of contamination to the soils and groundwater as a result of percolation of the materials from the pond. Initial discussions with the

TDHE on the rehabilitation of Bear Creek have focused on the clean-up of the white aluminum precipitate on the bottom of the stream. After use of the S-3 Ponds has been terminated and the liquid wastes in the pond treated and discharged, it is expected that an evaluation of the extent of remaining contamination will be performed and additional remedial actions defined. Because the response of the hydrologic system to the removal of the source of contamination is unknown at this time a phased approach is planned with the first actions directed at the immediate requirements of the TDHE.

The on-site mercury contamination problem is being evaluated for possible application of remedial measures. Until the present evaluation (Sect. 5.1.1) has been completed in approximately 1988, we will not know whether significant decontamination of subsurface soils is credible. Since the primary concern with this contamination is the groundwater discharge to EFPC, the project Reduction of Mercury in Liquid Discharges (86 LI, $15,000K) is proposed to greatly decrease current mercury discharges. While the combination of mercury cleanup and effluent treatment should further reduce mercury concentration in the creek as it leaves the plant site below drinking water standards (2 ppb), we are not sure whether the State's aquatic life standard (0.05 ppb) is attainable. Operation of a water treatment facility by 1989 would constitute our proposed final effort toward reduction of mercury losses, at least until final plant shutdown, decontamination, and decommissioning at some undefined future date.

Table 5 provides a funding schedule for addressing the problems discussed above: 1) contamination of soils and sediments at ORNL, 2) EFPC off-site remedial actions, 3) Bear Creek Burial Grounds, and 4) Y-12 on-site mercury cleanup.

Table 5. Unresolved Issues.

	Fiscal-year Funding (10^6)					Total Funding	Post 88
	1984	1985	1986	1987	1988		
Contamination of Soils and Sediments (ORNL)	2	2	2	2	2	10	30-100
EFPC Off-Site Remedial Action	1.2	1.2	1.2	3.1	8.8	16	30-50
Bear Creek Burial Grounds	1.9	3.1	3.2	7.9	8.5	25	30-50
Y-12 On-Site Mercury Cleanup	4.3	7.3	14.7	11.2	.7	39	30-50
TOTAL	10	14	21	24	20		
					TOTAL	~ 90	

APPENDIX A

Table A.1 Y-12 Environmental Activities

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
3.1.1 RADIOACTIVE WASTE				
Funded Activities				
Waste Material Preparation Facility	Y-12-generated low-level wastes will be shredded, compacted and baled prior to transport to the CWDF.	$750 FY 83 GPP	Low-speed waste shredder/ compactor housed in 60' x 60' Covered Building. A second 60' x 60' building is provided for material staging prior to transport.	Low-level uranium contaminated materials must be compacted for volume reduction or there will be insufficient capacity to dispose of them. Volume reduction serves several purposes. The greater density permits higher loads per truck transport and will extend the usable life of each trench thereby reducing the cost of transport and disposal.
Uranium Oxide Storage Vault	Above-ground, concrete vaults in which to store all depleted uranium metal (except chips and powders) and uranium oxide.	$350 FY 83 GPP	Aboveground completely enclosed, water proof concrete structure with ventilation and filtration for exhaust air.	See justification for chip oxidizers.
Engineering Assessment of Modifications to 9720 Warehouse Storage Area	Engineering assessments to determine modifications required, schedules, and funding requirements	$50 FY 84 Exp		Unclassified depleted uranium scrap from disassembled components as well as unclassified uranium scrap from machining and metal preparation operations are inside fenced areas near Buildings 9720-5 and 9720-13. Modifications are needed to minimize the possibility of low-level radioactive contamination reaching surface waters and/or groundwaters.
Engineering Assessment of Modifications to Salvage Yard Scrap Metal Area	Engineering assessment to determine modifications required, schedules, and funding requirements.	$50 FY 84 Exp		A wide variety of scrap metals contaminated with uranium are stored in the Salvage Yard at the west end of the Plant. Modifications are needed to minimize the possibility of low-level radioactive contamination reaching surface waters and/or groundwaters.
Source Control and Treatment	Revisions to several of Y-12's known radionuclide emissions sources to decrease airborne radionuclide emissions.	$4,000 FY 82 LI	Revisions to several of Y-12's known radionuclide emissions sources.	In keeping with DOE's ALARA (as low as reasonably achievable) program for control of exposure to ionizing radiation, Y-12 needs to begin revising stacks and sources of major radionuclide air emissions.

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
Funding Requested				
Initial Central Waste Disposal Facility Site Development	Installation of roads and other preparatory work necessary for Y-12 access and early utilization of CWDF site.	$1,575 FY 84 LI	Roads, site preparation	Continued use by Y-12 of the Bear Creek Burial Grounds is strongly discouraged. High and variable groundwater table and significant contamination from previous operations make continued long term use undesirable. The schedule for the CWDF must be expedited so that Y-12 can begin disposing of its low-level radioactive waste there ASAP.
Uranium Chip Oxidizers	Oxidizers (burners) will reduce the volume of uranium chips and convert them to a non-pyrophoric state	$500 FY 84 LI	Six (6) uranium chip oxidizers and offgas treatment system consisting of 95% prefilter, HEPA filter, draft fan and 15 foot stack. Each oxidizer will have uranium chip handling and oxide removal capabilities.	In order to cease disposal of depleted uranium chips in the Bear Creek Burial Grounds, a facility to reduce their volume and render them nonhazardous must be provided. The treated uranium can then be stored in a retrievable manner in above ground concrete storage vaults.
Uranium Oxide Storage Vaults	Same as above.	$350 FY 84 LI	Same as above.	Same as above.
Uranium Oxide Storage Vaults	Same as above.	$700 FY 86,88 GPP	Same as above.	As more storage area is needed for uranium metal and uranium oxide, additional vaults will be built.
Contaminated Scrap Disposition	TBD	TBD	TBD	Studies are underway in conjunction with ORGDP to devise mechanisms for disposal or recycling of scrap metal contaminated with uranium. Options to be explored include on-site smelting and contracting with an outside firm to smelt the material. Problems involved include the lack of a de minimis level for enriched uranium so that anyone buying scrap contaminated at all with enriched uranium must have an NRC license.
Modifications to 9720 Warehouse Storage Area	TBD	TBD	TBD	See Engineering Assessment of Modifications to 9720 Warehouse Storage Area.
Modifications to Salvage Yard Scrap Metal Area	TBD	TBD	TBD	See Eng. Assess. of Mods. to Salvage Yard Scrap Metal Area.

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
Stack Emission Control	This project is to make extensive modifications of enriched uranium operations stacks to reduce air-borne radionuclides emissions as low as reasonably achievably (ALARA).	$30,000 FY 86 LI	Install best available technology (BAT) on all Y-12 major radionuclide emission sources.	This project is in keeping with DOE's ALARA program. In addition, the EPA has proposed to promulgate BAT requirements on all emission points of radionuclides which would make this project essential if Y-12 is to be in compliance.
3.1.2 HAZARDOUS WASTE				
Funded Activities				
Modifications to Bldg. 9720-9	Building 9720-9 will be modified to meet RCRA requirements for an interim (less than 90 days) storage area.	$200 FY 84 Exp	Building 9720-9 modified to meet RCRA requirements for an interim (less than 90 days) storage area.	Beginning in April 1984, the Y-12 Plant will ship certain non-radioactive hazardous wastes to commercial storage and/or treatment facilities. These wastes must be staged through an interim storage area.
Waste Coolant Processing Facility	Facility to treat waste water-soluble coolants and dewater resulting sludges. Effluent from facility will be treated at West Tank Farm Treatment Facility prior to discharge.	$845 FY 83 GPP	Small, commercial, biological wastewater treatment plant; consists of extended aeriation system, clarification, oil-water sludge collection and processing equipment.	Waste oil and coolants were, at one time, disposed of in the Bear Creek Burial Grounds and Oil Landfarm. This material is currently being stored on-site with minimal processing and some disposition by public sale. Facilities are required for improved storage and treatment for minimization of contamination and increased salability.
RCRA Compliance Program	Approximately 25 additional technical people (@$50K/Yr) will be required to meet the requirements of DOE Order 5480.2. These people will be involve with evaluating Plant systems, formalizing procedures, training, etc.	$1,250 FY 84 Exp		DOE Order 5480.2 establishes hazardous waste management procedures for facilities operated under authority of the Atomic Energy Act of 1954, as amended. Y-12 has some 150 waste streams which are considered hazardous under DOE Order 5480.2. Y-12 also has 26 currently active hazardous waste management facilities which must meet very stringent requirements.
Revisions to Interim Storage Areas	Diking and other physical improvements to RCRA areas used to store hazardous wastes for less than 90 days.	$100 FY 84 Exp		Same as above for RCRA Compliance Program.

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
Coolant Biodegradation Reactor Analyses	Analyses to meet requirements of DOE Order 5480.2.	$10 FY 84 Exp		Same as above for RCRA Compliance Program.
Machine Coolant Storage Tanks Analyses	Analyses to meet requirements of DOE Order 5480.2.	$10 FY 84 Exp		Same as above for RCRA Compliance Program.
Modifications to Bldg. 9404-7 PCB Area	Modifications to increase the height of an existing dike at one point because this facility does not otherwise meet floodplain requirements	$20 FY 84 Exp		Same as above for RCRA Compliance Program.
Modifications to Salvage Yard Oil/Solvent Drum Storage Area	Modifications will include expanding the diked area in the Salvage Yard and replacing damaged or leaking drums which hold material awaiting future disposition.	$25 FY 84 Exp		Same as above for RCRA Compliance Program.
Spill Prevention Program	Diking and other special control features at hazardous liquid transfer points, around hazardous material storage tanks and at other high risk locations.	$50 FY 83 GPP		Same as above for RCRA Compliance Program.
Repair Existing Dikes	Repairs to existing dikes to assure that they meet requirements of the spill control regulations.	$240 FY 84 Exp		Same as above for RCRA Compliance Program.
<u>Funding Requested</u>				
Waste Oil/Solvent Separation and Storage Facility	Facilities to store and process waste oils and solvents to prepare for recycle, sale, or disposal.	$800 FY 84 LI	60' x 60' shed for drum handling; 2-30,000 Gallon Storage Tanks; Oil Water Separator; Relocation of Incinerator from 9731.	
Plating Waste Treatment Facility	This facility will provide a package treatment to remove trace amounts of metals, cyanides and organics from 8,700,000 gal of plating shop rinse water per year.	$750 FY 84 LI	Metal Plating effluents package treatment plant. Building 40' x 50' to house equipment.	Several Y-12 plant process waste streams have, for many years, been directed into Upper East Fork Poplar Creek (UEFPC). However, compliance with the Tennessee Water Quality Act makes this practice totally unacceptable.

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
East End Waste Treatment Facility	Facility to treat 1,500,000 gal/year of waste water from the Plant's paint spray booths as well as 52,000 gal/year of water with detergent, oil, and dirt from vehicle and equipment maintenance activities in the plant garage. All liquid streams are recycled. Only solid waste needs to be disposed.	$200 FY 84 LI	A packaged treatment unit providing oil skimmer, solid/liquid separator, liquid storage and feed tanks.	Several Y-12 Plant process waste streams have, for many years, been directed into UEFPC. These waste streams to be permitted under NPDES, must be treated to such a high degree that the effluent is suitable for recycle. Thus zero discharge and no NPDES permit.
RCRA Compliance Programs	Same as above.	$1,250 FY 85 Exp		Same as above.
Revisions to Interim Storage Areas	Same as above.	$100 FY 85 Exp		Same as above.
ACN Incinerator Analyses	Analyses to meet requirements of DOE Order 5480.2.	$25 FY 85 Exp		Same as above.
Modifications to Two Oil Retention Ponds	Modifications to Two Oil Retention Ponds, located in the Bear Creek Burial Grounds, must be further evaluated but may include fencing, pond liners, and spill prevention techniques.	$1,500 FY 85,86 GPP		Same as above.
Modifications to ACN Drum Yard	Acetonitrile is stored in 55-gallon drums until it is burned in a dedicated incinerator. Modifications to ACN Drum Yard will include a concrete pad and dike for the storage yard.	$500 FY 85 GPP		Same as above for RCRA Compliance Program.
Increase PCB-Contaminated Oil Storage Capacity	New tanks must be purchased and installed above ground.	$60 FY 85 GPP		PCB-Contaminated Oil Storage Capacity must be increased to phase out one 20,000 gal and one 10,000 gal underground storage tank. Underground storage of hazardous materials is likely to be precluded in the future by the State of Tennessee.

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
Modifications to Chestnut Ridge Security Pits	A detailed study must be made to define specific requirements for what will be included in Modifications to Chestnut Ridge Security Pits. Extensive modifications are required to meet all requirements for DOE 5480.2.	$1,700, FY 85,86,87 GPP		Same as above for RCRA Compliance Program.
Replacement of PCB Transformers	Replacement of PCB Transformers, in environmentally vulnerable locations, with non-PCB equipment is required for continued compliance with TSCA.	$5,000 FY 84 LI		Continued Compliance with the Toxic Substance Control Act requires elimination of PCB Transformers.
Multisite Electrical Systems Upgrade	Remaining PCB transformers will be replaced.	$5,000 FY 86 LI		Continued Compliance with the Toxic Substance Control Act requires elimination of PCB Transformers.
Spill Prevention Program	Same as above for Spill Prevention Program	$1,500 FY 85, 86 87 GPP		Same as above.
		$550 FY 84 LI		

3.1.3 CO-CONTAMINATED WASTES

Funded Activities

Processing Y-12 Wastes at ORGDP	Treat liquid waste at ORGDP that formerly went to the S-3 Ponds. Return for storage and further treatment in West End Tank Farm.	$1,950 FY 84 Exp		In order to close and discontinue use of the S-3 Ponds, alternative treatment methods must be provided for the waste streams that have historically been placed there. The interim plan is to collect these waste solutions at the Y-12 Plant and transport them via tank trailers and approved transport containers to ORGDP for treatment.
West Tank Farm - Storage	Provide Storage and treatment for nitrate waste streams from within the plant and returning from ORGDP neutralization.	$3,330 FY 83,84 CE	Three 500,000 gallon steel tanks in concrete diked basin and all associated appurtenances (pumps, valves, piping) loading and unloading system.	When waste disposal to the S-3 ponds ceases, these tanks will be necessary as temporary storage and treatment vessels while other facilities are completed.

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
Central Pollution Control Facility	Physical-Chemical treatment facility to provide primary treatment to Plant acid, caustic, HF scrubber solution, plating shop floor and mop water wastes in amounts of 2,000,000 gallons per year.	$6,800 FY 81 LI	New building housing waste storage, neutralization, treatment and dewatering equipment as well as chromate reduction unit.	The long-term plan for handling wastes now going to the S-3 Ponds consists of collection and transport of nitrate wastes to the West Tank Farm Treatment Facility (not yet funded) and non-nitrate wastes to a new Central Pollution Control Facility.
<u>Funding Requested</u>				
Processing Y-12 Wastes at ORGDP	Same as above.	$2,150 FY 85, 86 Exp		Same as above.
West Tank Farm - Treatment	Modification of the Tank Farm West of the S-3 Ponds to convert them into bioreactors for denitrification of nitrate wastes and disposal.	$1,050 FY 84 LI	Three 500,000 gallon tanks, neutralization, reactor clarifier, carbon absorption, filtration, and chlorination equipment.	See West Tank Farm - Storage above. This facility provides the replacement treatment facility for one of the S-3 Ponds. All nitrate waste streams in the plant will be treated to levels suitable for discharge to EFPC.
Expansion of West Tank Farm		$4,000 FY 85,86 CE		There is a possibility that an Expansion of West Tank Farm will be required in future years.
RCRA and Co-contaminated Liquid & Solid Waste Storage Facility	Facility to properly store (meeting RCRA requirements) wastes awaiting shipment to disposal sites.	$800 FY 84 LI		Large quantities of solid RCRA hazardous wastes co-contaminated with uranium have historically been disposed of in the Bear Creek Burial Grounds. Since this area is no longer to be used, it is planned to store these co-contaminated solid wastes in a temporary warehouse (Building 9720-9) until the design and construction of the RCRA and Co-Contaminated Liquid and Solid Waste Storage Facility is completed.
Expansion of RCRA and Co-Contaminated Liquid and Solid Waste Storage Facility		TBD		Future Expansion of RCRA and Co-Contaminated Liquid and Solid Waste Storage Facility will be required to add storage capacity and/or provide treatment for these wastes.

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
3.1.4 CONVENTIONAL WASTES				
Funded Activities				
New Hope Pond Sediment Removal	Removal of sediment from New Hope Pond, the distribution channel and EFPC just upstream of New Hope Pond.	$75 FY 84 Exp		The primary functions of New Hope Pond are pH adjustment (through flow equalization) and settling of insoluble materials, such as sediment which may be contaminated with uranium and mercury. In 1973, the pond sediment was removed and transferred to a dry basin on top of Chestnut Ridge, south of the pond. Recent evaluations of pond capacity have indicated continued sedimentation and a need for another New Hope Pond Sediment Removal project.
New Hope Pond Bypass		$410 FY 83 GPP	Lined diversion channel and new hydraulic control gates on the inlet to the distribution channel and the inlets to New Hope Pond.	Bypass is being constructed around the pond to allow for isolation during the next cleaning operation. This bypass will also allow for isolation of the pond for longer periods of time in the event of an accidental spill.
Steam Plant Improvements - Emissions Control	Installation of fabric filters (baghouses) to effect the control of particulates (fly ash) from the Steam Plant.	$13,500 FY 78 LI		On April 14, 1982, DOE signed a Federal Facilities Compliance Agreement with the EPA which placed the Y-12 Steam Plant on a plan and schedule to obtain compliance with the Clean Air Act and the State Implementation Plan for Tennessee. The Steam Plant Improvements project includes the installation of fabric filters (baghouses) to effect the control of particulates.
M-Wing Coolant Changeout	Piping and process equipment necessary to convert from perchloroethylene to water-soluble coolant	$3,800 FY 81 LI		Perchloroethylene is considered a health hazard and possible carcinogen, making it necessary to replace it as a standard process material. The M-Wing Coolant Changeout project is ready to begin and will replace the machine coolant with a propylene glycol-water mixture.

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
HF Scrubbers	Scrubbers for Buildings 9212 and 9206 to reduce HF emissions.	$1,000 FY 81 LI		Hydrogen fluoride emissions are almost exclusively from chemical processing operations in Buildings 9212 and 9206. Recent and projected increases in production will significantly increase emissions, to levels above State of Tennessee control limits. Process controls to minimize the necessity for use of excess HF in the chemical operation are being installed. In addition, an HF Scrubbers project is expected to be funded in FY 1985; it should essentially eliminate these operations as air pollution sources.
Stack Characterization		$85 FY 84 Exp		An overall inventory and evaluation of Y-12's stack effluents is underway as a basis for a more comprehensive, long range air emissions management plan.
Drainage System Verification	First phase of Field and plan survey incorporating all previous field notes and transfer of drawing to Computer Aided Design (CAD) system.	$250 FY 84 Exp	As built drawings on drainage and process drain connections.	A Drainage System Verification project is continuing in 1984 to assure that all effluents through the Plant's drainage system are well understood and documented.
Funding Requested				
New Hope Pond Sediment Removal	Same as above.	$75 FY 85 Exp		Same as above.
Source Collection and Treatment Facilities	Treatment Facilities will provide collection tanks with curbs, pumps, piping, and truck loading stations to allow for transport of each of the wastes to the appropriate treatment facility.	$7,725 FY 84 LI	Collection Tanks properly diked with pumps and piping necessary to transfer waste to trucks.	The majority of liquid waste streams from the Y-12 Plant facilities/ operations must be diverted from direct discharge to Upper East Fork Poplar Creek to an acceptable treatment system prior to release in order to meet the State Water Quality Criteria.

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
Steam Plant Wastewater Treatment Facility	Water treatment facility for Steam Plant Coalpile runoff, blowdown, and demineralizer regeneration wastes.	$4,000 FY 84 LI	Flow equalization basin and treatment equipment necessary for neutralization, sedimentation and NPDES discharge monitoring.	Approximately 4 million gal per year of acidic runoff results from rainfall contacting and percolating through the Y-12 Plant coal yard, located next to the Steam Plant. The runoff, containing suspended coal fines, a pH range of 2 to 3, and metal contaminants (Fe, Mn, As, and others) is subsequently discharged to the EFPC. About 20 million gal per year of ion-exchange regeneration acid having a pH range of 1.5 to 4.5 and 20 million gal per year of boiler blowdown typically having a pH of about 11 and elevated temperature are also released to the Creek. The Steam Plant wastewater Treatment Facility provides for the treatment of these acid and caustic discharges. The treated effluent is intended to be a permitted outfall to the UEFPC.
Trash and Scrap Monitoring Facility	Radiation detectors to be used in monitoring dumpsters of sanitary waste prior to the waste's being disposed in Sanitary Landfill #2.	$150 FY 84 LI		Because of the high potential for inadvertently mixing uranium-contaminated materials in with sanitary wastes, a Trash and Scrap Monitoring Facility is to be built. This project will provide radiation detectors to ensure that no radioactive wastes are placed in the Sanitary Landfill #2.
3.1.5 MONITORING				
Funded Activities				
Bear Creek Burial Grounds Groundwater Evaluation		$100 FY 84 Exp		To evaluate the extent of contamination of surface and groundwaters that has resulted from disposal practices in the Bear Creek Watershed, extensive Bear Creek Burial Grounds Groundwater Evaluation studies are underway.
Characterization of Liquid Wastes		$400 FY 84 Exp		Characterization of liquid wastes that are currently flowing into Upper East Fork Poplar Creek is required to determine which effluents must be treated.
RCRA Waste Analysis		$100		Compliance with DOE Order 5480.2 for

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
RCRA Groundwater Monitoring and Protection		$180 FY 84 Exp		including RCRA Waste Analysis Plan Development and RCRA Groundwater Monitoring and Protection.
Meteorological Towers	Prepare site and relocate towers from CRBRP to Y-12 and install electronics for collection of meteorological data at various elevations.	$500 FY 84 GPP	110 meter and 60 meter towers with automated data collection and solid state telemetry data transfer to computer.	To enhance Y-12's ability to manage its air emissions, two Meteorological Towers are to be installed on the Y-12 site. Site-specific meteorological data is required for computer modeling studies and to predict the effects of various air emissions. This information is essential if a PSD (Prevention of Significant Deterioration) Review is required by the State for any air pollutant.
Stack Monitoring Evaluation		$100 FY 84 Exp		Improved equipment and procedures will greatly contribute to the quality of Y-12's air monitoring data. An engineering evaluation currently underway (Stack Monitoring Evaluation) will define which of Y-12's stacks and stack monitoring equipment will need to be revised (Stack Monitoring Upgrade).
Refurbish and Expand Plant Laboratory Facilities		$200 FY 84 Exp		The tremendous increase in monitoring requirements has led to a 10-fold increase in the workload for the Y-12 analytical laboratory. Much work has been placed with outside laboratories,

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
NPDES Monitoring/ Sampling Stations	TBD	$1,300 FY 84 LI	TBD	Additional NPDES Monitoring/Sampling Stations will be required because of expected changes in Y-12's NPDES permit(s) in FY 1984. The actual number and type of NPDES monitoring stations required will not be known until the EPA has issued the permits, but the best current estimate is that at least nine new stations will be specified.
RCRA Waste Analysis Plan Development	Same as above.	$100 FY 85 Exp	Same as above.	Same as above.
RCRA Groundwater Monitoring and Protection	Same as above.	$150 FY 85 Exp	Same as above.	Same as above.
Stack Monitoring Upgrade	TBD	$5,000 FY 87 LI	TBD	Same as above for Stack Monitoring Evaluation.
Refurbish and Expand Plant Laboratory Facilities	Same as above.	$500 FY 85 Exp $850 FY 84 LI	Same as above.	Same as above.
3.1.6 REMEDIAL ACTION AND DECOMMISSIONING				
Funded Activities				
Closeout of S-3 Ponds	Treatment and disposal of liquids and sludges in S-3 Ponds; filling of ponds, capping, and seeding.	$1,500 FY 84 Exp		S-3 Ponds are a source of contamination to Bear Creek and UEFPC and must be closed out to meet the Tennessee Water Quality Act.
Burial Grounds Inventory	Review of past records to develop an inventory of wastes disposed of in the Bear Creek Burial Grounds.	$150 FY 84 Exp		To determine remedial actions required to prevent or mitigate unacceptable contamination of surface and groundwaters.

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
Burial Grounds Remedial Action Studies		$1,200 FY 84 Exp		To determine remedial actions required to prevent or mitigate unacceptable contamination of surface and groundwaters.
Oil Landfarm Remedial Actions		$200 FY 84 Exp		
Excavation of Coal Pile Burial Pit	Remove all buried material and relocate it to an appropriate site.	$250 FY 84 Exp		Classified material was buried in 1965 and 1966 under the site of the current coal pile. There is concern over the possibility that because of the acidic nature of rainwater leaching through the coal, the buried material is being dissolved, leading to contamination of UEFPC and the groundwater.
Mercury Source Identification and Remedial Action Planning	Investigations to identify existing sources of mercury in the Y-12 Plant that are contaminating the UEFPC.	$200 FY 84 Exp		Residual mercury in Y-12 results in continuous violation of the Tennessee Stream Guide for mercury (0.05 ppb) in UEFPC.
Mercury Cleanup	Same as above.	$500 FY 84 Exp		Same as above.
Treatment of Mercury-Contaminated Water	Mercury-contaminated water from steam condensate, groundwater and water main leaks is treated by selective ion exchange to less than 2 ppb mercury and discharged to UEFPC.	$1,000 FY 84 Exp		Pipes bursting under Building 9201-4 (former lithium isotope facility) have resulted in large quantities of water with mercury concentrations above the Tennessee Stream Guide. These must be treated before the water can be released to UEFPC.
Decommissioning of Lithium Isotope Facilities	Begin to strip and decontaminate Building 81-10 and Building 9201-4.	$500 FY 84 Exp		One of the old lithium isotope separation process buildings and a small support building must be stripped and decontaminated or they will continue to contribute to the unacceptably high level of mercury in UEFPC.

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
Mercury Health Study	Medical study of selected group of former mercury workers.	$400 FY 84 Exp		A study is to be conducted on Y-12 former mercury workers to determine whether any of this group have observable symptoms of chronic mercury poisoning or other effects of their exposure to mercury.
Special Off-Site Studies	Wide variety of evaluations, samplings, and analyses.	$215 FY 84 Exp		DOE request.
Off-Site Environmental Evaluations		$1,000 FY 84 Exp		Off-Site Environmental Evaluations associated with the DOE, EPA, TVA, TDHE, and U.S. Geological Survey interagency task force. This task force is charged with investigating contamination (mercury, uranium, thorium, plutonium, beryllium, PCB) of the sediment in the Tennessee and Clinch rivers downstream of Oak Ridge. Four areas of pollution are being studied: surface water, soils and sediments, groundwater, and fisheries.
Funding Requested				
Closeout of S-3 Ponds	Neutralize, denitrify, and treat Pond water; remove all contam. solids from pond walls and bottoms, and fix residues in concrete; clay top, topsoils and seed.	$4,500 FY 85,86 Exp	Water Treatment System (70 Gal/min) to finish treatment of pond water prior to discharge.	Closure and remedial action is necessary based on this facility operation not meeting requirements of the Tennessee Water Quality Act.
Rehabilitation of Bear Creek	TBD	$20,000 FY 87 LI	TBD	To meet requirements of Tennessee Water Quality Act.
Disposal Area Remedial Actions	TBD; Plan for closure and remedial action is to be submitted to EPA and TDHE July 1, 1984.	$12,000 FY 84 LI	TBD	Tennessee Water Quality Act, CERCLA, and RCRA all require remedial actions for the Bear Creek Burial Grounds to reduce ground and surface water contaminants from past disposal practices.

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
Mercury Source Identification and Remedial Action Planning	Develop mercury analysis procedure and Field sampling program. Sample, analyze, and report level of mercury contamination originating from area and point sources. Develop Remedial Action Plan with prioritized targets.	$600 FY 85-88 Exp		To meet Tennessee Stream Guidelines for mercury in EFPC. Non-point sources of mercury contaminants may not be able to be cleaned up.
Mercury Cleanup	See above.	$2,200 FY 85-88 Exp		To meet Tennessee Stream Guidelines for mercury in EFPC. Non-point sources of mercury contaminants may not be able to be cleaned up.
Reduction of Mercury in Plant Effluents	Treatment facilities for effluents to the EFPC to remove entrained mercury and isolation of contaminated areas.	$15,000 FY 85 LI		To meet Tennessee Stream Guidelines for mercury in EFPC. Non-point sources of mercury contaminants may not be able to be cleaned up.
Decommissioning of Lithium Isotope Facilities	Dismantling, decontamination and disposal of Lithium Isotope separation equipment and decontamination of building.	$12,000 FY 84 LI	Upgraded Ventilation for Environmental Control, Contaminated Water Treatment System.	Residual mercury contamination in these buildings is a major source of continuous levels of mercury going to EFPC. TN law requires treatment of point sources causing violation of stream guidelines.
Relocation of Production and Support Facilities	Relocation of Electrochemical Metal Removal (ECMR) to new building and construction of new office building to house all support personnel officed in 9201-4.	$6,400 FY 84 LI	Support Personnel office building approx 30,000 sq. ft. New building for ECMR approx, 32,000 sq. ft.	Active production and support operations currently located in the mercury-contaminated process building must be relocated to assure the health and safety of the building occupants during removal of the process equipment and asbestos-bearing insulation.
Mercury Health Study	Same as above.	$1,100 FY 85-88 Exp		Same as above.
Special Off-Site Studies	Same as above.	$635 FY 85-88 Exp		Same as above.
Off-Site Environmental Evaluations	Same as above.	$2,750 FY 85-88 Exp		Same as above.

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
Rehabilitation of EFPC	TBD	$20,000 FY 87 LI		The Interagency Task Force will determine the requirements for Rehabilitation of EFPC to meet State and Federal Water Quality Requirements.
CERCLA Site Evaluation Studies	TBD	$575 FY 85,86 Exp		All of Y-12's Inactive Waste Sites must be studied to determine what, if any, remedial actions must be taken.
CERCLA Site Remedial Action	TBD	TBD	TBD	To meet CERCLA, specific remedial actions will need to be taken.

APPENDIX A

Table A.2 ORNL Environmental Activities

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
3.2.1 RADIOACTIVE WASTE				
Funded Activities				
Anaerobic Waste Digestion System	Volume reduction of cellulosic solid waste and conversion to liquid for hydrofracture disposal.	665 FY-84 GPP	Facility and equipment to process about 20,000 cu ft per yr, and handle liquids and slurries generated.	Reduction of volume of LLW sent to burial grounds by 10,000 top 15,000 cu ft per yr (about 15% of the volume handled).
Remote Handled TRU Waste Facilities	Installation of Handling System for loading RH TRU Waste into WIPP certified transport and Sealing of Containers.	100 FY-84 GPP	Facility to support initial shipments of RH TRU waste to repositories.	Obtain data and convenience needed to design a full scale facility. Regulations require temporary storage of TRU waste, and ultimate repository disposal.
Process Waste Treatment Plant Improvements	Protect the storm drain system from overflow from the Process Waste Treatment Plant caustic storage tanks.	60 FY-84 GPP	Dyke and catch basin to contain an accidental spill or leak from the PWTP caustic storage tanks.	Overflow or leakage from the PWTF caustic storage tanks will drain into the storm drains, which discharge to White Oak Creek without treatment. This would result in a release of radioactivity to WOC.
Central ILW Collection System	Upgrade ILW drain system between Building 3019 and the evaporator storage tanks.	900 FY-83 GPP	New double-contained stainless steel ILW lines and associated valving and monitoring systems.	This portion of the ILW system has only single containment and does not comply with the requirements of ORNL radiation protection procedures and result in the potential for a release of contamination.
ILW Drain Line, Building 3517	Install approximately 450 ft of new doubly contained stainless steel line to replace ILW line between FPDL and the existing doubly contained ILW collection header. Both cathodic protection and a leak detection system will be provided. A new valve pit will be installed to provide necessary valving and tie-ins.	400 FY-84 GPP	An ILW drain line which is in complete compliance with requirements.	This portion of the ILW system has only single containment, and is therefore not in compliance with the requirements of the ORNL Health Physics Manual (Procedure 1.3: "Radiation Protection in the Design of Experiments and Plant Operations"). Due to the advanced age of the present singly contained ILW system components, an increasing potential for release of contaminants to the environment exists. Failure to make these and future improvements to the ILW system would risk continued increasing potential for the release of contamination which could adversely impact both on-site health and safety and the continued operation of hot cell operations in the FPDL.

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
Funding Requested				
Central Waste Disposal Facility	Establish a shallow land burial facility for LLW generated by the 3 facilities located on the Oak Ridge Reservation.	7,500 FY-86 LI 200 FY-84 CE	A LLW disposal facility for use by ORNL, Y-12, and ORGDP which will accommodate the needs of these sites for about 40 years.	The shallow land burial site used in the past by Y-12 and ORGDP was found unsuitable for continued use by the State of Tennessee Department of Health and Environment. Continued accomplishment of the important missions of these sites requires a means of LLW disposal. The SWSA 6 facility at ORNL has space for about 5 more years of operation at current ORNL generation rates. Use of SWSA 6 by all 3 Oak Ridge plants would deplete SWSA 6 very quickly. A new site for shallow land burial is therefore required by mid-FY 1985.
Initial Development of SWSA 7	Development of a Solid Waste Storage Area to replace SWSA 6 which has about 5 more years of capacity at current generation rates.	900 FY-87 GPP	A state of the art LLW burial area for use with high activity LLW which cannot be accepted at the CWDF.	Ongoing operations at all three facilities on the Oak Ridge Reservation generate Class B and Class C LLW. Current plans are for the Class A LLW to be disposed of at the Central Waste Disposal Area (CWDF), and the Classes B and C waste to go to SWSA 7.
Shielded TRU Waste Storage	Construct in SWSA 5 an array of approximately 20 stainless steel lined vertical holes, 15 ft deep, and ranging in diameter from 8 to 30 in. Each hole will be sealed with a 3 ft thick stepped concrete plug	200 FY-85 GPP	Increased storage capacity for TRU contaminated waste with high beta/gamma background.	This TRU waste storage will be used for stainless steel drums and capsules containing waste contaminated with transuranics with high levels of beta and gamma radiation. Remote handling is required for movement of these containers into and out of isolated storage. Based on current waste generation rates, additional retrievable shielded storage is required to avoid disruption on ongoing operations. Eventually the TRU waste will be shipped to a central repository, but it will be at least 5 years until the repository is ready to accept waste.
Upgrade LLW Transfer and Processing System	Replacement of manhole covers, grouting of interior of the manhole walls and using a membrane liner to fix the leaking pipes in the LLW transfer system.	10,000 FY-88 LI	An improved LLW transfer and processing system with reduced in-leakage and out-leakage.	It is difficult to accurately assess the condition of the existing collection system piping, which is all buried underground. There are numerous factors which point toward the conclusion that this system is leaking extensively. Much of the piping is vitrified clay pipe installed 30 or more years ago. When a section of clay pipe was repaired during summer 1983, excavation revealed

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
				broken and the joints were leaking. During periods of heavy rainfall the input volumes to the system are extremely high, approaching the system's processing limit. This suggests in-leakage of groundwater when the water table rises. This situation is undesirable both because of the increased costs, and decreased efficiency of the system for total removal of radionuclides. During periods of low water table, water probably leaks out into the environment.
Replace ILW System Phase I	The ILW waste collection and transfer system consists of 23 collection tanks with a total capacity of about 320 cubic meters (operating capacity is 218 cubic meters) and about 3 miles of stainless steel underground piping. Both collection tanks and most of the piping are singly contained and not in compliance with new regulations. This project will include new stainless steel tanks and doubly contained piping.	40,000 FY-88 LI	An ILW collection and transfer system which is compliance with requirements. Each tank and some pieces of auxiliary equipment will be enclosed in a concrete vault for weather protection, radiation shielding, and containment of potential leaks. A ventilation system with HEPA filters will service each tank. Where appropriate, charcoal absorbers will be included.	The existing system has been in service for over 27 years and does not meet existing requirements for containment of radioactive material. The continuous demand for this system as well as the increasing potential for leakage (and subsequent environmental problems) dictate early replacement.
Isotope Area ILW Lines	Installation of new doubly contained stainless steel ILW lines between the Isotope Area facilities and the existing, doubly contained ILW collection header. Both cathodic protection and a leak detection system will be provided. One or more new valve pits will be installed in the Isotope area to provide the necessary valving and tie-ins.	900 FY-86 GPP	An ILW drain line which is in compliance with requirements.	See item (4) above.
TRU/HFIR ILW Lines	Replace present ILW drain lines (which are not doubly contained with new doubly contained stainless steel lines.	950 FY-85 GPP	ILW drain lines which are in compliance with requirements.	See item (4) above.
HFIR ILW Lines	Replace cast iron transfer line from HFIR tanks to central pumping station.	950 FY-86 GPP	ILW drain line which is in compliance with requirements.	See item (4) above.

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
Rehabilitation of Contaminated Sanitary sewer	Rehabilitate or replace leaking sections of ORNL's sanitary sewer system which have been contaminated with radioactivity.	600 FY-85 GPP	Upgraded or new sanitary drainage lines.	To reduce the amount of sanitary wastewater requiring treatment and to eliminate possible radioactive contamination of sanitary wastewater.
HFIR Ponds Replacement	Replacement of ponds with tanks.	950 FY-88 GPP	Tanks for collection of process waste from the HFIR and Transuranium Processing Plant.	The position of the State is that permits must be obtained for ponds which collect radioactive materials and subsequently discharge into State waterways. It will be difficult to prove that no radioactivity will be released from these ponds. It is therefore planned to replace all such ponds with tanks, which do not release to State waterways.
Backup for Hydrofracture Facility	Provide a backup technology to the ORNL hydrofracture for disposal of ILW streams.	TBD Post FY-88 LI	A facility for solidification of liquid ILW streams, probably either in shale cement or borosilicate glass. A shielded above ground vault for storage of containers of solidified transported to a central repository.	The hydrofracture technique works well, but there are a number of technical and regulatory concerns. Should any of these concerns be sufficient to prohibit continued use of hydrofracture for ILW disposal, an alternate technology would be required to permit continuation of important operations at ORNL.
Stack Emissions Control and Treatment	Upgrade of the existing stack treatment equipment for Stacks 3039, 7025, and 7911 to reduce emissions of radionuclides.	45,000 FY-88 LI	Gaseous emissions treatment equipment.	To provide for best available control technologies in accordance with the Clean Air Act (CAA) for radioactivity.

3.2.2 HAZARDOUS WASTE

Funded Activities

Hazardous Waste Storage Facility	Provide a dedicated facility for storage of RCRA waste.	225 FY-82 GPP	New pre-engineered building will be erected.	Building will provide for safe storage of hazardous waste in compliance with RCRA regulations.
Chemical Waste Storage Facility	Provide a facility for packing and storing chemical waste.	350 FY-84 GPP	New pre-engineered building will be erected.	Building will provide for safe storage of incompatible chemicals in accordance with NFPA and RCRA requirements.
Improvements to PCB Transformer Dikes, ORNL Facility at Y-12	Improve containment dikes around ORNL PCB contaminated transformers at Y-12.	140 FY-84 Exp	Upgraded dikes around existing ORNL transformers at Y-12 will be provided.	To provide for containment of PCB contaminated materials in accordance with TSCA.

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
Funding Requested				
Improvements to Hazardous Waste Management Area	Provide support facilities for personnel working in ORNL's hazardous waste management area.	200 FY-85 GPP	New building will be provided to house the necessary support facilities.	To provide the necessary facilities for personnel at the waste management area as required by OSHA.
Material Recovery Facility	Provide a facility to house recovery options for various hazardous waste streams.	370 FY-85 GPP	New pre-engineered building will be erected.	To provide a central location which will be dedicated to recovery operations to meet the intent of RCRA.
Recovery Operations - Solvents	Provide for recovery operations of various solvents waste streams at ORNL.	100 FY-86 GPP	New equipment will be procured and installed to provide for recovery of solvents.	To provide cost-effective recovery techniques where possible as required by RCRA.
Recovery Operations - Plating Shop Solutions	Provide for recovery operations of various Plating Shop waste streams at ORNL.	100 FY-86 GPP	New equipment will be procured and installed to provide for recovery of Plating Shop solutions.	To provide cost-effective recovery techniques where possible as required by RCRA.
Recovery Operations - Oils	Provide recovery operations of various waste oil streams at ORNL.	100 FY-86 GPP	New equipment will be procured and installed to provide for recovery of waste oil.	To provide cost-effective recovery techniques where possible as required by RCRA.
Isotope Separations Facility Wastewater Collection System	Provide the best available technology to treat ORNL's Calcutron Facility wastewater prior to discharge.	100 FY-85 GPP	New process wastewater treatment equipment will be procured and installed.	To provide the best available technology treatment of wastewater from the Calcutron Facility as required by the Clean Water Act (CWA).
Hazardous Waste Staging Area, ORNL at Y-12	Provide building space at Y-12 for temporary storage of ORNL hazardous waste prior to shipment to ORNL.	300 FY-85 GPP	New pre-engineered building will be provided for the temporary storage.	To provide for adequate storage of various waste materials including temporary RCRA waste storage to enhance spill protection.
Replacement of PCB Transformers, Phase I, II, & III	Replacement or rework of PCB contaminated transformers	2100 FY-86-88 GPP	New or upgraded transformers which utilize non-PCB contaminated dielectric fluid.	To eliminate the use of PCB contaminated transformers and meet the requirements of TSCA.
Explosive/Shock Sensitive Chemical Disposal Facility	Provide a facility where excess explosive/shock sensitive chemicals can be detonated safely.	100 FY-86 GPP	New structure will be built which will allow safe storage and detonation of explosives.	To provide for increased personnel safety in the disposal of explosive materials.
Gas Cylinder Disposal Facility	Provide a facility where damaged gas cylinders can be vented safely to the atmosphere through appropriate emission control equipment.	200 FY-86 GPP	New pre-engineered building will be erected and the necessary gas cylinder disposal equipment procured and installed.	To provide increased personnel safety and to provide discharge of various gases in accordance with RCRA and CAA.

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
Asbestos Replacement	Replacement of asbestos insulation materials in various areas of ORNL.	4500 FY-86-89 Exp	New insulation will be provided.	To provide for reduced personnel exposure to asbestos materials.
3.2.3 MIXED OR CO-CONTAMINATED WASTE				
Funded Activities				
Temporary Co-contaminated Waste Pad	Provide a location for temporary storage of co-contaminated waste.	17 FY-84 GPP	40' ■ 40' curbed concrete pad.	This project provides a safe location to store drums of co-contaminated waste until they are removed from the site.
Scintillation Vial Crusher	Provide method to remove scintillation fluid from the numerous small scintillation vials.	40 FY-83 GPE	Procure and install a machine to shred and/or break scintillation vials generated at ORNL.	To provide method to remove RCRA controlled scintillation fluid from small vials prior to treatment in a cost-effective manner.
Funding Requested				
Long-Term Hazardous Waste Storage Facility	Provide a dedicated facility for long-term storage of ORNL's co-contaminated wastes.	300 FY-85 GPP	New pre-engineered building will be erected.	To provide for long-term storage of co-contaminated waste until acceptable RCRA treatment and disposal methods are developed.
Spill Prevention/and Countermeasures, Phase I, II, and III	Improve containment for spill sources at ORNL and provide facilities for effective countermeasures.	2700 FY-86-88 GPP	Interceptor systems for storm sewer systems and a spill containment area downstream of ORNL.	To provide best management practices in accordance with Clean Water Act (CWA) requirements.
Truck Transfer Station Diking	Provide diking at truck transfer station.	200 FY-85 EXP	Diking and spill control containment systems.	To comply with RCRA requirements for containment of hazardous materials.
Portable Cement Batch Plant	To provide the capability for fixation of co-contaminated sludges.	500 FY-85 GPP	Concrete batch plant.	To provide acceptable treatment for various ORNL sludges.
3.2.4 CONVENTIONAL WASTES				
Funded Activities				
Improvements to Existing Sewage Treatment System	Replacement of ORNL's existing sewage treatment plant.	1200 FY-84 LI	New package extended aeration sewage treatment plant.	Required to achieve compliance with present and proposed NPDES requirements in accordance with the CWA.
Corrections (Inflow/ Infiltration) to ORNL Sanitary Sewers.	Correct deficiencies in ORNL sanitary sewers by removing improper sources, replacing	200 FY-84 GPP	Upgraded or new sanitary sewer drainage lines.	To reduce the amount of sanitary wastewater requiring treatment and to eliminate possible contamination of sanitary

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
Coal Yard Runoff Treatment System Improvements	Improve Coal Yard Runoff Treatment System to provide better pH adjustment, sludge handling and process control.	700 FY-84 GPP	Equipment for line addition, for sludge handling and for process control at the Coal Yard Runoff Treatment System.	Required to achieve compliance with present and proposed NPDES requirements in accordance with the CWA.
Ash Hopper Solids Handling System	Provide improvements to eliminate settling of ash hopper solids in the Coal Yard Runoff Upper Basin.	50 FY-83 GPE	Equipment installed to provide for alternate method of handling ash hopper solids.	To provide for more efficient handling of ash hopper solids and to eliminate the upper basin at the cost of $20,000.
Treatment System 1500 Area	Provide for transportation by pipeline of wastewater from 1500 area to 190 Ponds for monitoring and treatment.	60 FY-84 EXP	New transfer piping and valves.	Needed to help ensure compliance with anticipated new NPDES permit limits in accordance with the CWA.
2000 Area Process Drain Isolation	Provide isolation of drains.	60 FY-84 EXP	New process piping.	Needed to help ensure compliance with anticipated new NPDES permit limits in accordance with the CWA.
Biology Area Wastewater Collection System	Provide capability of isolate process wastewater from area storm drainage and to collect process wastewater.	600 FY-84 GPP	New process wastewater drainage lines and tankage required to collect Biology Area Wastewater.	Needed to help ensure compliance with anticipated new NPDES permit limits in accordance with the CWA.
Process Pipe Lining	Provide isolation of Hg contamination in Building 9201-2.	60 FY-84 EXP	Lining of process pipes.	Needed to control mercury contamination from process piping in Building 9201-2.
Industrial Landfill	Provide the necessary services to get a new borrow area and contractors' landfill operational.	200 FY-84 GPP	New roads and site work required to open proposed contractors' landfill.	Needed to provide a state approved landfill for burial of various contractors waste material.
<u>Funding Requested</u>				
Improvements to Sewage System - HFIR/TRU	Reduce inflow/infiltration into the collection system, and improve the collection tank.	250 FY-85 GPP	New and upgraded sanitary sewage drainage lines and new collection tankage lines will be provided.	To reduce the amount of sanitary wastewater requiring treatment and to eliminate possible contamination of the sanitary sewer system.
Filter System ORNL Sewage Treatment Plant	Provide final filtering capability for the new ORNL sewage treatment plant.	300 FY-85 GPP	New sanitary wastewater filter equipment and any associated site work will be provided.	Needed to ensure compliance of sewage treatment plant discharge with current and proposed NPDES limits in accordance with the CWA.
Nonradiological Wastewater Treatment System	Provide for the necessary nonradiological treatment of ORNL's process wastewater prior to discharge.	16,000 FY-87 LI	New building will be constructed and new process treatment will be procured and installed.	Needed to ensure compliance with proposed new NPDES discharge limits in accordance with the CWA.
Volume Reduction Modifi-	To reduce nonradioactive	300	Isolate nonradioactive lines	Needed to allow efficient treatment of

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
Treatment Plant	Process Waste Treatment Plant.	GPP		
Biology Area Wastewater Treatment System	Installation of a treatment system to process Biology area wastewater prior to discharge.	900 FY-86 GPP	New wastewater treatment equipment required to treat the Biology area wastewater and any new structures required to house the new equipment.	Needed to help ensure compliance with anticipated new NPDES permit limits in accordance with the CWA.
Resin Regeneration Collection System, Building 9201-2	Provide treatment for resin regeneration wastewater prior to discharge.	150 FY-85 GPP	New wastewater treatment equipment and holdup tankage as necessary to handle the waste stream.	Needed to help ensure compliance with anticipated new NPDES permit limits in accordance with the CWA.
Sump Oil Separation for ORNL Facilities at Y-12	Provide the capability to remove oil from the sump discharges of Bldgs. 9201-2 and 9204-3.	150 FY-85 EXP	New oil separation equipment required to handle sump wastewater prior to discharge.	Needed to help ensure compliance with anticipated new NPDES permit limits in accordance with the CWA.
Improvements to HPRR Access Road	Provide improved access to the waste management area at ORNL	200 FY-86 GPP	Site work and road work as required to provide needed access.	Needed to provide adequate access to the ORNL waste management area and the proposed new industrial landfill.
Improved Containment/ ORNL Waste Ponds	Provide the necessary linings and containment pond upgrades to prevent leakage to area groundwater.	10,000 FY-89 LI	New pond linings and other upgrade items will be provided for existing ponds.	Needed to help ensure compliance with anticipated state requirements to line all ORNL containment ponds.
CAA/CWA Compliance Phase I, II, III	Provide treatment required by EPA and the State of Tennessee for air and water discharges determined to be out of compliance.	2850 FY-86-88 GPP	To be determined.	Needed to meet compliance orders from the EPA and/or State of Tennessee.
Process/Storm Drain Isolation, Phase I, II	To isolate process drains.	1800 FY-87,88 GPP	To be determined.	To isolate process drains to allow treatment under CWA to meet BAT.

3.2.5 MONITORING

Funded Activities

Upgrade 7911 Stack Monitoring System	Provide capability to perform representative sampling and real-time monitoring for the gaseous emissions from the 7911 Stack.	350 FY-84 GPE	Spoolpieces inserted in each duct leading to 7911 which will provide isokinetic sampling capability, real-time monitors for activity being emitted and an instrument shelter.	Needed to comply with DOE Order requirements (5480.1 and 5484.1) with proposed EPA NESHAP regulations, and with FEMA requirements.

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
	EGCR East, and EGCR West.			
Hydrostatic Head Measuring Stations, Phase I	Development of information about the deep groundwater flow system in and around ORNL disposal areas and related facilities.	220 FY-84 GPP	A system of wells to measure hydrostatic head at three depths (40, 200, and 400 ft below ground surface.)	This work is coupled to the FY 1987 milestone requiring long-term stabilization of the burial grounds. Information about the horizontal and vertical flow patterns of the groundwater are required to plan effective measures for preventing groundwater from coming into contact with buried waste.
Environmental and Effluent Data Computer System	Provide the capability to store and to reduce data being transmitted from ORNL's monitoring networks and to use that data in predicting environmental consequences for normal and emergency operations.	198 FY-83 GPE	Virtual memory computer tied to ORNL's monitoring networks and modifications to Building 2016 to house the computer.	Needed to comply with DOE Order requirements (5480.1 and 5484.1) with proposed EPA NESHAP regulations, and with FEMA requirements.
Funding Requested				
Upgrade 3020 Stack	New equipment for sampling of 3020 Stack.	250 FY-85 CE	New isokinetic sampling equipment.	To provide adequate monitoring of 3020 Stack discharge.
Environmental Monitoring Systems Upgrade Phase I, II	Replace existing vacuum tube electronics with commercially available solid-state units.	8500 FY-85,86 LI	New solid-state monitoring and sampling equipment will be procured and installed as required.	Needed to ensure adequate data is obtained on the various environmental discharges from ORNL and Oak Ridge Reservation in accordance with DOE Orders 5480.1 and 5484.1.
LLW System Sampling and Monitoring Upgrading, Phase I	Upgrading of an obsolete sampling and monitoring system by replacing 15 monitoring stations.	500 FY-85 GPP	An upgraded sampling and monitoring system for the low-level radioactive liquid waste collection and transfer system.	Reduction of quantities of misclassified waste, resulting in more efficient operation of PWTF, and better characterization of ORNL waste streams.
LLW System Sampling and Monitoring Upgrading, Phase II	(Same as above).	500 FY-86 GPP	(Same as above).	(Same as above).
New NPDES Monitors at ORNL	Provide new monitors and sampling equipment at new NPDES points at ORNL.	300 FY-85 GPP	New flow monitoring and sampling equipment will be installed at the various new NPDES discharge points.	Orders 5480.1 and 5484.1. Needed to ensure compliance with proposed new NPDES permit limits in accordance with the CWA.
New NPDES Monitors at ORNL at Y-12	Provide new monitors and sampling equipment at new NPDES points at ORNL	300 FY-85 GPP	New flow monitoring and sampling equipment will be installed at the various new NPDES discharge	Needed to ensure compliance with proposed new NPDES permit limits in accordance with the CWA

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
Hydrostatic Head Monitoring Stations, Phase II	Development of information about the deep groundwater flow system in and around ORNL disposal areas and related facilities.	550 FY-85 GPP	A system of wells to measure hydrostatic head at three depths (40, 200, and 400 ft below ground surface).	This work is coupled to the FY 1987 milestone requiring long-term stabilization of the burial grounds. Information about the horizontal and vertical flow patterns of the groundwater are required to plan effective measures for preventing groundwater from coming into contact with buried waste.
Hydrostatic Head Monitoring Station, Phase III	(Same as above).	700 FY-86 GPP	(Same as above)	(Same as above).
Groundwater Monitoring Network, Phases I, II, and III	Provide state of the art sampling and monitoring of groundwater in and around the solid waste disposal areas at ORNL.	2,100 FY-86-88 GPP	A permanent groundwater monitoring system to provide both a comprehensive spatial distribution of strategically placed wells to ensure well construction that meets modern standards for groundwater sampling.	Regulatory guidelines for monitoring well construction and placement requires major upgrading of the system currently in use in the ORNL solid waste disposal areas. This project will permit ORNL to keep pace with developing regulatory requirements.
Environmental Monitoring Center	Provide a new structure to house the various new environmental monitoring computer equipment and personnel in a central location.	900 FY-87 GPP	New building will be constructed to house the personnel and computer equipment.	Needed to ensure adequate facilities are available for new NPDES and CAA monitoring equipment, computers, and personnel.
Environmental Monitoring Equipment, Phases I, II, III, IV, V	Provide monitoring equipment for environmental monitoring of ORNL area.	2,500 FY-85-89 GPE	Equipment needed to provide adequate monitoring capabilities.	Equipment required to meet required monitoring activities.
3.2.6 REMEDIAL ACTION AND DECOMMISSIONING				
Funded Activities				
Engineered Groundwater Barriers, Trench 7	Intercept groundwater upgredient from Trench 7 and route groundwater to reduce contact with waste.	400 FY-84 GPP	Diversion drains.	Prevent groundwater from reaching disposal trench.
Solidify Sludge Pond in SWSA #5	Solidify sludges.	250 FY-84 EXP	None	Solidify sludges to prevent migration of contamination.
Metal Recovery Facility	Decontaminate inactive	5800	Upon project completion, seven	Building containment is inadequate to

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
	support structures to levels that allow facility reuse; fuel handling canal and dissolver pit will be entombed.	EXP	associated operating areas will be available for other Laboratory programs.	radioactivity.
Unfunded				
Additional Burial Ground Stabilization	Provide site corrective measures to inactive burial grounds in order to reduce long-term releases and facility maintenance.	TBD	None	Burial ground stabilization is required under DOE Order 5820.
Decommissioning of Pond 3513	Provide final disposition of contaminated sludge that has accumulated in bottom of pond and stabilize remaining site.	3000 FY-86 GPP		Pond contains significant quantities of long-lived activity in an environmentally unacceptable location on the floodplain of White Oak Creek.
Decommission of Ponds 3524, 3539, and 3540	Provide final disposition of process waste ponds when taken out of service.	TBD	None	Ponds contain contaminated sludge and water in a environmentally unacceptable location on the floodplain of White Oak Creek.
Contaminated Groundwater Control System	Reduce movement of water over and through soil contaminated by spills and leaks in antiquated transfer and collection systems. Collect water which does move over and through contaminated soil for treatment.	1350k FY-86,87 GPP	A system for diversion of water away from contaminated soil. Also a system for collection of contaminated water which cannot be diverted for treatment in the PWTF.	Intrusion radioactive water into the sanitary system is well documented. Contaminated soils due to spills and leaks in transfer lines and collection tanks cannot be economically removed, due to close proximity to buildings, etc. A system of water diversion, and collection of water which cannot be diverted can avoid the problem of water leaving the site containing radioactivity.
White Oak Lake/Creek Rehabilitation	Stabilize or remove residual radioactivity associated with the White Oak Creek watershed.	TBD	None	Watershed is contaminated due to past ORNL activities and should be stabilized to reduce the long-term release of radioactivity from the Oak Ridge Reservation.
Old Hydrofracture Facility	Perform decommissioning of contaminated facilities associated with the original shale fracture equipment.	TBD	None	Facilities are highly contaminated and require routine M&S; open pond is an environmental concern due to location in White Oak Creek floodplain.

APPENDIX A

Table A.3 ORGDP Environmental Activities

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
3.3.1 RADIOACTIVE				
Funded Activities				
Scrap Metal Management	Determine a plan for disposal of contaminated scrap metal. 80,000 tons of ferrous and non-ferrous scrap at 3 Plant sites.	2,400 FY-84, 85 EXP	Sub-contractor to provide equipment as part of contract for metal segregation and site reduction.	Location of stored contaminated metals does not meet requirements of DOE Order 5820 for sites that are to be used for disposal of LLW. Material is stored in 100-year flood plan of Clinch River.
Central Sludge Fixation Facility	Fix contaminated and co-contaminated sludge in concrete prior to land burial.	8,800 FY-81 LI	Cement batch plant including dry solids storage tanks, transfer and mixing equipment, liquid waste storage tanks, and transit mix trucks.	DOE Order 5820 EPA 40 CFR Subchapter I, Solid Wastes
Central Neutralization Facility	Treat effluents for K-1401, 1420, and 1501 areas. (Metal preparation, u-decon and recovery, and steam plant).	1,380 FY-81 LI	Tanks, pumps, piping, instrumentation, mixes, and chemical feed equipment.	For better compliance with the NPDES permits, and the Clean Water Act.
Floor Pan and Cylinder Cleaning	To collect and treat radioactive effluents from K-1420 decontamination areas, specially to remove Tc-99 to meet ALARA intent.	2,290 FY-81 LI	Collection tanks, chemical treatment equipment, and ion exchange columns.	DOE, ALARA regulations
Funding Requested				
Scrap Metal Smelting	Recover scrap metal in K-25 scrapyard by melting and pour into ingots. These ingots will be stored for future reuse.	6,000 FY-84, 85 EXP	Subcontractor to provide equipment as part of contract for smelting.	To either comply with DOE Order 5820 or provide a material (metal ingots) suitable for reuse at DOE facilities.
Classified Burial Ground	Expansion of existing burial ground.	650 FY-84 GPP	Provision of additional acreage (~ 20 acres) for burial of classified waste.	To provide needed additional capacity at ORGDP for disposal of classified wastes.
Oil Decontamination Facility	To treat potentially fissile oils and organic solvents to render them nonfissile.	250 FY-85 GPP	Storage tanks and treatment equipment.	To allow fissile oils and solvents to be safely disposed in the proposed PCB incinerator.

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
3.3.2 HAZARDOUS WASTES				
Funded Activities				
Chromate Sludge Collection	To dewater chromium sludges generated by electrolytic reduction of cooling tower blowdown.	2,230 FY-81 LI	Laminar settlers for sludge collection, centrifuges for sludge dewatering; solids disposal in contractors burial ground.	Clean Water Act, NPDES, resuspended solids transported over weir 1-2 times/yr. (<0.1 mg/L)
Funding Requested				
Lithium Hydroxide Containment	Undefined	Undefined	Undefined	Twenty-two million pounds of LiOH are being stored in deteriorating fiber drums in the basement of the K-25 Building. The building's sprinkler system affords potential for accidental release to Poplar Creek which could result in fish kills and remedial regulatory action.
PCB Contaminated Outside Transformers	Undefined	Undefined	Undefined	Toxic Substance Control Act
Corrective Actions for TSFS	Undefined	Undefined	Undefined	Resource Conservation and Recovery Act, Clean Water Act, and Toxic Substance Control Act.
3.3.3 MIXED OR CO-CONTAMINATED WASTES				
Funded Activities				
Compliance with TSCA Phase I	To dispose of PCB and other organic hazardous wastes contaminated with radioactivity.	31,900 FY-83 LI	High temperature incinerator with offgas, liquid waste, and solid waste handling equipment.	Toxic Substance Control Act, Resource Conservation and Recovery Act, and Atomic Energy Act.
Waste Oil Storage Facility	Provide storage capacity to handle waste oils pending status of TSCA Incineration	715 FY-81 GPP	Building and tanks to provide storage capacity.	Toxic Substance Control Act.
Funding Requested				
Compliance with TSCA Phase II	Provide for collection, handling and treatment/disposal of toxic materials that may be identified in future by EPA.	6,000 FY-88 LI	Undefined.	Toxic Substance Control Act.

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
3.3.4 CONVENTIONAL WASTES				
Funded Activities				
Coal Pile Runoff Treatment	Collection of coal pile runoff and ash handling system water washer blowdown, both to be collected in two new holding ponds located just south of K-1407-B pond. Treatment in existing K-1407-A pit.	240 FY-83 GPP	Two holding ponds and associated pumps and piping to transfer material to K-1407-A pit.	Clean Water Act, NPDES violations - 31 pH violations/2 yrs. with pH <4 for several days at a time.
Funding Requested				
Compliance with Clean Water Act	To reduce organics and heavy metals from liquid effluents.	8,000 FY-88 LI	Undefined	Clean Water Act to meet best available treatment and/or "zero" discharge goals.
Reduce Coolant Discharge Phase I	Provide prototype equipment to demonstrate feasibility of substantially reducing coolant losses from diffusion equipment.	4,500 FY-88 LI	Undefined	Clean Air Act. Anticipated EPA regulation of chlorinated, fluorinated hydrocarbons will require new control measures.
Reduce Coolant Discharge Phase II	Provide modifications at ORGDP based on the Phase I projects. Results to reduce, eliminate, control, and monitor coolant releases.	13,400 FY-90 LI	Undefined	Clean Air Act. Anticipated EPA regulations governing release of chlorinated, fluorinated hydrocarbons will require new control measures.
3.3.5 MONITORING				
Funded Activities				
Funding Requested				
NPDES Improvements	Undefined	Undefined	Undefined	As a result of potential tightening of NPDES requirements and promulgation of new requirements from EPA in regards to continued implementation of BAT/zero discharge goals of the Clean Water Act, additional improvements may be necessary to continue to be in compliance.

Project/Subproject	Scope	Funding/ Status ($ x 1000)	Facilities Provided	Justification
3.3.6 REMEDIAL ACTIONS AND DECOMMISSIONING				
Funded Activities				
Funding Requested				
Inactive Burial Areas	Undefined	Undefined	Undefined	Potential for migration of radionuclides and hazardous chemicals to surface and subsurface waters from inactive/closed disposal areas.
K-901-A Holding Pond	Undefined	Undefined	Undefined	The lagoon is unlined and does not provide a 2 ft. fireboard as is required by the State of Tennessee. Lagoon is used to collect trivalent chromium sludge. New sludge basins will be built and the 901-A lagoon will have to be decommissioned.
K-25 Building Decommissioning	Undefined	Undefined	Undefined	Process equipment in the K-25 Building contains unknown quantities of fissile uranium and technetium-99. Decommissioning will require addressing special environmental, health physics, and criticality concerns.
Powerhouse Decommissioning	Undefined	Undefined	Undefined	Buildings in the Powerhouse area were used for work involving beryllium. Demolition and disposal of wastes will require addressing special environmental, health physics, and industrial hygiene concerns.

APPENDIX B

Table B.1 R&D Activities in Support of Y-12 Environmental Projects

	Project/Subproject	Scope	Projected Funding ($1000)				
			FY-84	FY-85	FY-86	FY-87	FY-88
4.1.1.1	RADIOACTIVE WASTE		1,670	2,000	2,400	2,400	2,400
	Solid Uranium Waste	Develop recycle technology for metals to reduce waste and to reduce quantity of waste streams through development of new processes. Develop monitoring instrument and procedure.					
	Liquid Uranium Waste	Develop process for removing U from organic liquids and from aqueous process streams.					
	Stack Emission Control	Develop containment/treatment process for control of air exhaust systems to meet EPA/State criteria for radioactive and chemical emissions.					
4.1.1.2	HAZARDOUS WASTE		740	900	500	400	300
	Machine Coolants	Studies to develop and demonstrate new machine coolants as well as development of recycle/discharge methods for coolants for current and/or new coolants. New coolants should be suitable for bio-oxidation process.					
	Plating Wastes	Develop and demonstrate methods for source treatment of plating wastes. Develop alternate plating bath solutions and methods to extend life of specific plating baths to reduce quantities and type of waste.					
	Solvent and Cleaning Systems	Develop and demonstrate cleaning and degreasing methods to eliminate chlorinated solvents and provide disposal/recycle processes for the new materials.					

Project/Subproject	Scope	Projected Funding ($1000)				
		FY-84	FY-85	FY-86	FY-87	FY-88
4.1.1.3 MIXED OR CO-CONTAMINATED WASTE		200	300	300	400	400
Waste Water Treatment	Develop processes for purifying waste waters to meet standards of State of Tennessee. The processes will involve chemical and/or biological treatment and process development for source elimination.					
Central Pollution Control Facility	Provide technical support for development and startup of CPCF. Develop methods for removal of toxic organics and inorganics from wastes.					
4.1.1.4 CONVENTIONAL WASTE		100	200	100	100	0
Steam Plant Effluents	Develop source treatment methods for coal pile runoff and steam plant effluents to meet state discharge requirements.					
Cooling Tower Treatments	Develop environmentally acceptable in-situ treatment methods for removal of algae and other similar materials from cooling tower surfaces and provide treatment processes for those waste sources.					
4.1.1.5 MONITORING		200	800	1,300	1,300	800
New Analytical Methods	Test and evaluate new analytical methods for control of processes and detection of trace (i.e., less than part per billion) concentrations of impurities in aqueous waste.					
4.1.1.6 REMEDIAL ACTION						
Mercury Control	Develop source treatment processes to purify waste waters to 0.05 ppb Hg standard, and to develop processes for cleaning Hg contaminated buildings. Investigate processes for decontamination of Hg bearing sediments and other water sources. Develop recycle methods for Hg cleanup process.	590	800	1,000	800	600

Project/Subproject	Scope	Projected Funding ($1000)				
		FY-84	FY-85	FY-86	FY-87	FY-88
East Fork Poplar Creek Bear Creek	Develop processes for removal of toxic and hazardous impurities from streams, sediments and soils in identified contaminated areas.					
TOTAL		3,500	5,000	5,600	5,400	4,500

APPENDIX B

Table B.2 R&D Activities in Support of ORNL Environmental Projects

Project/Subproject	Scope	Projected Funding ($1000)				
		FY-84	FY-85	FY-86	FY-87	FY-88
4.1.2.1 RADIOACTIVE WASTE		2,700	1,800	1,000	700	700
Decontamination and Volume Reduction	Develop techniques for improved decontamination and volume reduction methods for radioactive waste management. Improve decontamination methods to permit recycle or modified disposal.					
Anaerobic Waste Digestion	Develop processes for conversion of solid cellulosic and animal waste into slurries for ultimate disposal by hydrofracture.					
Backup for Hydrofracture Operation	Develop processes, such as in-situ stabilization, or solidification as alternatives to disposal of liquid wastes by hydrofracture.					
Stack Emissions Control and Treatment	Develop and demonstrate technology required for control and treatment of radioactive and chemical stack emissions to meet State/EPA requirements.					
4.1.2.2 HAZARDOUS WASTE		50	50	50	50	50
Material Recovery and Disposal	Develop processes for recovery of valuable constituents from waste streams (i.e., photographic solutions, waste oils, plating solutions) and provide processes for treatment/disposal of these wastes.					
4.1.2.3 CO-CONTAMINATED WASTES						
	Treatment and disposal processes covered in projects 4.1.2.1, 4.1.2.2, and 4.1.2.6.					
4.1.2.4 CONVENTIONAL WASTES						
	Treatment and disposal processes covered in projects 4.1.2.1, 4.1.2.2, and 4.1.2.6.					

Project/Subproject	Scope	Projected Funding ($1000) FY-84	FY-85	FY-86	FY-87	FY-88
4.1.2.5 MONITORING		350	350	350	350	350
Upgrade Monitoring Capability	Develop and/or upgrade monitoring capabilities at existing or proposed solid, liquid or gaseous discharge points, and determine effectiveness of modifications to the sanitary sewer and coal-yard runoff systems.					
4.1.2.6 REMEDIAL ACTION		600	1,000	550	500	500
Stabilization of LL Solid Waste Storage Areas	Develop techniques for stabilization of burial grounds through groundwater diversion, in-situ grouting, or other methods.					
Stabilization of IL Liquid Waste Pits and Trenches	Develop techniques for stabilization of liquid waste through groundwater diversion, in-situ grouting, chemical treatment, or other methods.					
White Oak Creek/White Oak Lake	Determine extent of contamination and develop remedial measures for cleanup or stabilization of sediment contaminated with toxic, hazardous and radioactive materials.					
Decommission Ponds	Develop processes for removal or stabilization of radioactive and hazardous wastes.					
SUBTOTAL		3,700	3,200	1,950	1,600	1,600
4.1.4 MULTI-SITE APPLICATION		700	750	1,100	1,100	1,000
Biosorbents for Removal of Heavy Metals	Develop biosorbents technology and demonstrate feasibility for use in removal of heavy metal contamination from waste streams.					
Advanced Environmental Control Technology	Develop control technology for removing halogenated solvents from gas streams.					
Decontamination of Sediments	Evaluate techniques for dredging, cleaning and replacing sediments for decontamination processes to diminish source term.					

	Project/Subproject	Scope	Projected Funding ($1000)				
			FY-84	FY-85	FY-86	FY-87	FY-88
4.2	ENVIRONMENTAL TRANSPORT		1,700	1,800	1,900	2,000	2,000
	Surface Water and Biota, Groundwater Flow Characterization, and Soil Surface Management.	Investigation of transport behavior of specified contaminants in aquatic, sedimentary and biotic systems, and pathway analysis for food chain and human exposure. Studies on groundwater flow characterization and soil surface management are a part of this effort.					
4.3	RESOURCE DATA MANAGEMENT	Develop and maintain computerized data base management system for Oak Ridge Reservation.	200	150	150	100	100
	TOTAL		6,300	5,900	5,100	4,800	4,700

APPENDIX B

Table B.3 R&D Activities in Support of ORGDP Environmental Projects

Project/Subproject	Scope	Funded FY-84	Projected Funding ($1000) FY-85	FY-86	FY-87	FY-88
4.1.3.1 RADIOACTIVE WASTE						
Central Sludge Fixation Facility	Provide technical support for design construction and operation of facility, establish recipes for wide variety waste sludge fixation.	350	320	320	300	300
Central Neutralization Facility Floor Pan and Cylinder Cleaning	Develop process for removal of Tc from decontamination area waste, and provide technical support for design and startup of facility.					
Gaseous UF_6 Release Studies	Study the basic chemistry of UF_6 release with respect to hydrolysis reactions, particle growth, transport and knockdown/control processes.					
4.1.3.2 HAZARDOUS WASTE		40	100	80	80	80
Lithium Hydroxide Containment and Other Materials of Use	Provide a technology base for containment/disposal. Provide treatment/disposal methods for hazardous materials as identified.					
4.1.3.3 MIXED OR CO-CONTAMINATED WASTE		480	450	450	400	400
Compliance With TSCA, Phase I	Provide technical support for design, construction, and operation of TSCA Incinerator.					
Waste Oil Storage Facility	Major development complete. Provide technical support for design, construction and startup, and technical support during operation.					
Treatment of Y-12 S-3 Waste at ORGDP	Develop and monitor treatment processes for Y-12 waste. Provide technical support in startup and operation of ORGDP treatment facilities.					
Compliance With TSCA, Phase II	Studies required for compliance under future regulations under TSCA.					

	Project/Subproject	Scope	Funded FY-84	Projected Funding ($1000) FY-85	FY-86	FY-87	FY-88
4.1.3.4	CONVENTIONAL WASTE		200	180	180	150	150
	Coal Pile Runoff and Fly Ash Control	Provide technical support for design and startup of treatment system.					
	Reduce Coolant Discharge, Phase I and II	Study and demonstrate processes for reducing coolant discharge from gaseous diffusion plants.					
4.1.3.6	REMEDIAL ACTION		30	50	70	70	70
	Decommissioning K-901-A Holding Pond	Provide technical support required for defining decommission and disposal of K-901-A chromium sludge.					
	TOTAL		1,100	1,100	1,100	1,000	1,000

APPENDIX C

Table C1 Y-12 Environmental Activities Summary (Excluding R&D)

Project	FUNDING YEAR	TEC[a] ($ x 1000)	Completion Date	Funding Needs[b] ($ x 1000) FY-84	FY-85	FY-86	FY-87	FY-88
3.1.1 Radioactive Waste								
Funded Activities								
Waste Material Preparation Facility	83 GPP	750	12/84					
Uranium Oxide Storage Vault	83 GPP	350	6/85					
Engineering Assessment of Modifications to 9720 Warehouse Storage Area	84 Exp	50	9/84	50				
Engineering Assessment of Modifications to Salvage Yard Scrap Metal Area	84 Exp	50	9/84	50				
Source Control and Treatment	82 LI[e]	4,000		4,000				
Funding Requested								
Initial Central Waste Disposal Facility Site Dev.	84 LI[d]	1,575	9/85	725	850			
Uranium Chip Oxidizers	84 LI[d]	500	9/85	450	50			
Uranium Oxide Storage Vault	84 LI	350	6/86	50	300			
Uranium Oxide Storage Vaults	86,88 GPP	700	9/88			350		350
Contaminated Scrap Disposition	TBD	TBD						
Modifications to 9720 Warehouse Storage Area	TBD	TBD						
Modifications to Salvage Yard Scrap	TBD	TBD						
Stack Emission Control	86 LI	30,000	9/89			3,000	15,000	12,000
Expense Studies[c]		3,690		425	1,625	1,240	0	400
3.1.2 Hazardous Waste								
Funded Activities								
Modifications to 9720-9	84 Exp	200	9/84	200				
Waste Coolant Processing Facility	83 GPP	845	10/84					
RCRA Compliance Program	84 Exp	2,500	10/85	1,250				
Revisions to Interim Storage Area	84 Exp	200	3/85	100				
Coolant Biodegration Reactor Analyses	84 Exp	10	10/84	10				
Machine Coolant Storage Tank Analyses	84 Exp	10	9/84	10				
Modifications to Bldg. 9404-7 PCB Area	84 Exp	20	9/84	20				
Modifications to Salvage Yard Oil/Solvent Drum Storage Area	84 Exp	25	9/84	25				
Spill Prevention Program	83 GPP	2,100	10/85					
Repair Existing Dikes	84 Exp	240	9/84	240				
Funding Requested								
Waste Oil/Solvent Separation Facility	84 LI[d]	800	11/85	650	150			
Plating Waste Treatment Facility	84 LI[d]	750	10/85	100	600	50		
East End Waste Treatment Facility	84 LI[d]	200	6/85	200				
RCRA Compliance Program	85 Exp	2,500	10/85		1,250			
Revisions to Interim Storage Area	85 Exp	200	9/85		100			
ACN Incinerator Analyses	85 Exp	25	6/85		25			
Modifications to Two Oil Retention Ponds	85,86 GPP	1,500	7/86		1,000	500		
Modifications to ACN Drum Yard	85 GPP	500	1/87		500			
PCB Contaminated Oil Storage Capacity	85 GPP	60	9/86		60			
Modifications to Chestnut Ridge Security Pits	85-87 GPP	1,700	9/86		500	1,000	200	
Replacement of PCB Transformers	84 LI[d]	5,000	10/87	200	3,800	1,000		
Multisite Electrical Systems Upgrade	86 LI[d]	5,000	10/88			1,000	4,000	
Spill Prevention Program	85,86,87 GPP	2,100	10/88		500	500	500	
	84 LI[d]		10/85	500	50			
Expense Studies[c]		370	10/88	150	150	70		

Project	FUNDING YEAR	TEC[a] ($ x 1000)	Completion Date	Funding Needs[b] ($ x 1000) FY-84	FY-85	FY-86	FY-87	FY-88
3.1.3 Co-contaminated Waste								
Funded Activities								
Processing of Y-12 Wastes at ORGDP	84 Exp	4,100	FY 86	1,950				
West Tank Farm Storage	83,84 CE	3,330	12/84	2,390				
Central Pollution Control Facility	81 LI[g]	6,800	6/85	1,000	400			
Funding Requested								
Processing of Y-12 Wastes at ORGDP	85,86 Exp	4,100	1/86		2,010	140		
West Tank Farm Treatment Facilities	84 LI[d]	1,050	3/86	250	800			
Expansion of West Tank Farm	85,86 CE	4,000	9/86		2,000	2,000		
RCRA and Co-contaminated Liquid and Solid Storage Facilities	84 LI[d]	800	11/85	150	550	100		
Expansion of RCRA and Co-contaminated Liquid & Solid Waste Storage Facility	TBD	TBD						
Expense Studies[c]		945		460	285	200		
3.1.4 Conventional Wastes								
Funded Activities								
New Hope Pond Sediment Removal	84 Exp	150	11/84	75				
New Hope Pond By-Pass	83 GPP	410	4/84					
Steam Plant Improvement	78 LI[h]	13,500	12/85					
M-Wing Coolant Changeout	81 LI[i]	3,800	9/86	3,800				
HF Scrubbers	81 LI[j]	1,000	4/86		1,000			
Stack Characterization	84 Exp	85	9/84	85				
Drainage System Verification	84 Exp	250	9/84	250				
Funding Requested								
New Hope Pond Sediment Removal	85 Exp	150	11/84		75			
Source Collection and Treatment Facilities	84 LI[d]	7,725	9/87	500	2,225	3,500	1,500	
Steam Plant Wastewater Treatment Facility	84 LI[d]	4,000	8/86	200	3,000	800		
Trash and Scrap Monitoring Facility	84 LI[d]	150	12/84	150				
Expense Studies[c]		865		700	165			
3.1.5 Monitoring								
Funded Activities								
Bear Creek Burial Grounds Groundwater Evaluation	84 Exp	500	9/88	100				
Characterization of Liquid Wastes	84 Exp	1,000	9/86	400				
RCRA Waste Analysis Plan Development	84 Exp	200	1/85	100				
RCRA Groundwater Monitoring and Protection	84 Exp	330	12/85	180				
Meterological Towers	84 GPP	200	9/84	200				
Stack Monitoring Evaluation	84 Exp	100	9/84	100				
Refurbish and Expand Plant Laboratory Facilities	84 Exp	300	2/86	500				
Funding Requested								
Bear Creek Burial Grounds Groundwater Evaluation	85-88 Exp	500	9/88		100	100	100	100
Characterization of Liquid Wastes	85,86 Exp	1,000	9/86		510	90		
NPDES Monitoring/Sampling Stations	84 LI[d]	1,300	10/87	50	800	450		
RCRA Waste Analysis Plan Dev.	85 Exp	200	1/85		100			
RCRA Groundwater Monitoring & Protection	85 Exp	330	12/85		150			
Stack Monitoring Upgrade	87 LI[j]	5,000	6/89				1,000	3,000
Refurbish and Expand Plant Laboratory Facilities	85 Exp	1,850	2/86		500			
	84 LI[d]			700	150			
Expense Studies[c]		445		45	100	300		

Project	FUNDING YEAR	TEC[a] ($ x 1000)	Completion Date	Funding Needs[b] ($ x 1000) FY-84	FY-85	FY-86	FY-87	FY-88
3.1.6 Remedial Action and Decommissioning								
Funded Activities								
Close out of S-3 Ponds	84 Exp	6,000	1/87	1,500				
Burial Grounds Inventory	84 Exp	150	9/84	150				
Burial Grounds Remedial Action Studies	84 Exp	1,200	9/84	1,200				
Oil Landfarm Remedial Actions	84 Exp	200	9/84	200				
Excavation of Coal Pile Burial Pit	84 Exp	250	9/84	250				
Mercury Source Identification and Remedial Action Planning	84 Exp	800	9/88	200				
Mercury Cleanup	84 Exp	2,700	9/88	500				
Treatment of Mercury Contaminated Water	84 Exp	1,000	6/84	1,000				
Decommissioning of Lithium Isotope Facilities	84 Exp	500	9/84	500				
Mercury Health Studies	84 Exp	1,500	9/88	400				
Special Off-Site Studies	84 Exp	850	9/88	215				
Off-Site Environmental Evaluation	84 Exp	3,750	9/88	1,000				
Funding Requested								
Closeout S-3 Ponds	85,86 Exp	6,000	1/87		2,000	2,500		
Rehabilitation of Bear Creek	87 LI[j]	20,000					2,500	8,500
Disposal Area Remedial Actions	84 LI[d]	12,000	7/88	300	3,125	3,175	5,400	
Mercury Source ID & Remedial Action Planning	85-88 Exp	800	9/88		200	200	100	100
Mercury Cleanup	85-88 Exp	2,700	9/88		550	550	550	550
Reduction of Mercury in Plant Effluents	85 LI[k]	15,000	9/88		2,000	8,000	5,000	
Decommissioning of Lithium Isotope Facilities	84 LI[d]	12,000	9/88	250	2,550	3,700	5,500	
Relocation of Production & Support Facilities	84 LI[d]	6,400	3/86	2,175	2,000	2,225		
Mercury Health Studies	85-88 Exp	1,500	9/88		400	400	200	100
Special Off-Site Studies	85-88 Exp	850	9/88		215	215	140	65
Off-Site Environmental Evaluation	85-88 Exp	3,750	9/88		1,000	1,000	500	250
Rehabilitation of East Fork Poplar Creek	87 LI[j]	20,000	TBD				2,500	8,500
CERCLA Site Evaluation Studies	85,86 Exp	575	9/86		300	275		
CERCLA Site Remedial Action	TBD	TBD	TBD					
Expense Studies[c]		7,880		2,060	2,320	1,700	1,800	0

[a] TEC is the total estimated cost for the activity. The column cannot be added because some activities are only partially funded.
[b] Tentative split in funding may change during criteria development.
[c] Estimated advance expense funding needed for project definition.
[d] Environmental Improvements (84-D-124); TEC $56,000K.
[e] UGR III (82-D-107); TEC $228,300K.
[f] Stack Emission Control (86-OR-GB-1); TEC $30,000K.
[g] CEP I (81-D-120); TEC $7,800K.
[h] Steam Plant Improvements (78-17-D); TEC $24,000K.
[i] MX (W87) (81-D-115); TEC $46,000K.
[j] Stack Modifications and Rehabilitation of East Fork Poplar Creek and Bear Creek; TEC $45,000K.
[k] Air and Water Pollution Control (85-D-121); TEC $15,000K.
[l] Multisite Electrical Upgrade (86-OR-GB-13); TEC $62,000K.

APPENDIX C

Table C2 ORNL Environmental Protection Projects (Excluding R&D)

Project	FUNDING/ YEAR	TEC[a] ($ x 1000)	Completion Date	Funding Needs[b] ($ x 1000) FY-84	FY-85	FY-86	FY-87	FY-88
3.2.1 Radioactive Waste								
Funded Activities								
*Anaerobic Waste Digestion System	84 GPP	665	86	665				
Central Waste Disposal Facility	84 CE	200	84	200				
*Remote Handled TRU Waste Facility	84 GPP	100	86	100				
*Process Waste Treatment Plant Improvements	84 GPP	60	86	60				
*Central HLW Collection System	83 GPP	900	85					
*HLW Drain Line, Building 35117 (FPDL)	84 GPP	400	86	400				
Funding Requested								
*Central Waste Disposal Facility	86 LI[d]	7,500	89			1,000	3,500	3,000
*Initial Development, SWSA #7	87 GPP	900	89				900	
*Shielded TRU Waste Storage	85 GPP	200	87		200			
*Upgrade LLW Transfer & Proc. Sys.	88 LI	10,000	92					10,000
*Replace HLW System, Phase I	88 LI	40,000	91					10,000
*Replace HLW System, Phase II	TBD	TBD						
*Isotope Area ILW Lines	86 GPP	900	88			900		
*TRU/HFIR ILW Lines	85 GPP	950	87		950			
*HFIR ILW Lines	86 GPP	950	88			950		
*Rehabilitation of Contaminated Sanitary Sewer	85 GPP	600	87		600			
*HFIR Ponds Replacement	88 GPP	950	90					950
*Backup for Hydrofracture Operation	89 LI	TBD	TBD					
*Stack Emissions Control & Treatment	88 LI	45,000	92					5,000
Expense Studies[c]				200	540	3,000	7,000	3,000
3.2.2 Hazardous Waste								
Funded Activities								
Hazardous Waste Storage Facility	82 GPP	225	84					
Chemical Waste Storage Facility	84 GPP	350	86	350				
Improvements to PCB Transformers Dikes, ORNL Facility at Y-12	84 Exp	140	87	140				
Funding Requested								
Improvements to Hazardous Waste Mgt. Area	85 GPP	200	87		200			
Material Recovery Facility	85 GPP	370	87		370			
Recovery Operatins - Solvents	86 GPP	100	86			100		
Recovery Operations Plating Shop Solvents	86 GPP	100	86			100		
Recovery Operations - Oil	86 GPP	100	86			100		
Isotope Separations Facility Wastewater Collect.	85 GPP	100	87		100			
Hazardous Waste Staging Area, ORNL at Y-12	85 GPP	300	87		300			
Replacement of PCB Transformers, Ph I, II, III	86-88 GPP	2,100	89			700	700	700
Explosive/Shock Sensitive Chemical Disposal Facility	86 GPP	100	88			100		
Gas Cylinder Disposal Facility	86 GPP	200	88			200		
Asbestos Replacement	86-89 Exp	4,500	90			1,000	1,000	1,000
Expense Studies[c]				90	250			

Project	FUNDING/ YEAR	TEC[a] ($ x 1000)	Completion Date	Funding Needs[b] ($ x 1000) FY-84	FY-85	FY-86	FY-87	FY-88
3.2.3 Co-contaminate Waste								
Funded Activities								
*Temporary Co-contaminated Waste Pad	84 GPP	17	84	17				
Scintillation Vial Crusher	83 GPE	40	84					
Funding Requested								
Long Term Hazardous Waste Storage Facility	85 GPP	300	87		300			
Spill Prevention and Countermeasures, Ph I, II, III	86-88 GPP	3,000	90			900	900	900
Truck Transfer Station Diking	85 Exp	200	85		200			
Portable Cement Batch Plant	85 GPP	500	87		500			
Expense Studies[c]				80		300		
3.2.4 Conventional Wastes								
Funded Activities								
Improvements to Existing Sewage Treatment Sys.	84 LI[a]	1,200	86	1,200				
Corrections (Inflow/Infiltrations) to ORNL Sewers	84 GPP	200	86	200				
Coal Yard Runoff Treatment System Improvements	84 GPP	700	86	700				
Ash Hopper Solids Handling System	83 GPE	50	84					
Treatment System 1500 Area	84 Exp	100	84	100				
2000 Area Process Drain Isolation	84 Exp	60	84	60				
Biology Area Wastewater Collection System	84 GPP	600	86	600				
Industrial Landfill	84 GPP	200	86	200				
Funding Requested								
Improvements to Sewage System HFIR/TRU	85 GPP	250	87		250			
Filter System ORNL Sewage Treatment Plant	85 GPP	300	87		300			
Nonradiological Wastewater Collection System	87 LI	16,000	90				4,000	12,000
*Decrease Volume to PWTP-ORNL	85 GPP	300	87		300			
Biology Area Wastewater Treatment System	86 GPP	900	88			900		
Resin Regeneration Collection System Bldg. 9201-2	85 GPP	150	87		150			
Sump Oil Separation for ORNL Facilities at Y-12	85 Exp	150	87		150			
Improvements to HPRR Access Road	86 GPP	200	88			200		
Improved Containment/ORNL Waste Ponds	89 LI	10,000	92					
CAA/CWA Compliance, Ph I, II, III	86-88 GPP	2,850	90			950	950	950
Process/Storm Drain Isolation, Ph I, II	87-88 GPP	1,800	90				900	900
Expense Studies[c]				70	550	1,200	1,200	
3.2.5 Monitoring								
Funded Activities								
Upgrade 7911 Stack Monitoring System	84 GPE	350		350				
Water Quality Monitors-ORNL	84 GPP	300	86	300				
*Hydrostatic Head Measuring Stations, Ph I	84 GPP	220	86	220				
Environmental and Effluent Data Computer System	83 GPE	198	85					
Funding Requested								
Upgrade 3020 Stack	85 CE[f]	250			250			
Environmental Monitoring Systems Upgrade, Ph I	85 LI[f]	3,500	87		1,000	2,500		
Environmental Monitoring Systems Upgrade, Ph II	86 LI[g]	5,000	88			1,000	4,000	
*LLW Sampling & Monitoring UPGR., Ph I, II	85-86 GPP	1,000	88		500	500		
New NPDES Monitors at ORNL	85 GPP	300	87		300			
New NPDES Monitors at ORNL at Y-12	85 GPP	300	87		300			
*Hydrostatic Head Measuring Stations, Ph II	85 GPP	550	87		550			

Project	FUNDING/ YEAR	TEC[a] ($ x 1000)	Completion Date	Funding Needs[b] ($ x 1000) FY-84	FY-85	FY-86	FY-87	FY-88
*Hydrostatic Head Measuring Stations, Ph III	86 GPP	700	88			700		
*Groundwater Monitoring Network, Ph I, II, III	86-88 GPP	2,100	89			700	700	700
Environmental Monitoring Center	87 GPP	900	89				900	
Environmental Monitoring Eqpmt., Ph I, II, III, IV, V	85-89 GPE	2,500			500	500	500	500
Expense Studies[c]				515	810			
3.2.6 Remedial Action and Decommissioning								
Funded Activities								
*Engineered Groundwater Barriers Trench 7	84 GPP	400	86	400				
*Solidify Sludge Pond in SWSA #5	84 Exp	250	84	250				
*Metal Recovery Facility	84-88 Exp	5,800	88	600	1,310	1,370	1,400	1,120
Funding Requested								
*Additional Burial Ground Stabilization	TBD	TBD	TBD					
Decommissioning of Pond 3513	86 Exp	3,000	87			3,000		
Decommissioning of Ponds; 3524, 3539,3540	TBD	TBD	TBD					
*Contaminated Groundwater Control, Phase I	86 GPP	450				450		
*Contaminated Groundwater Control, Phase II	87 GPP	900					900	
White Oak Lake/Creek Rehab.	TBD	TBD						
*Old Hydrofracture Facilities	TBD	TBD	TBD					
Expense Studies[c]					2,000	2,000	5,000	5,000

*Defense Waste Management Projects.
[a]TEC is the total estimated cost for the activity.
[b]Tentative split in funding may change during criteria development.
[c]Estimated advance expense money needed for project definition.
[d]Central Waste Disposal Facility (ORNL-86-AR-2); TEC $7,500K.
[e]Improvements to Existing Sewage Treatment System (84-E-104); TEC $1,200K.
[f]Environmental Monitoring Systems Upgrade, Phase I (ORNL-85-6); TEC $3,500K.
[g]Environmental Monitoring Systems Upgrade, Phase II (ORNL-86-6); TEC $5,000K.

APPENDIX C

Table C3 ORGDP Environmental Protection Projects (Excluding R&D)

Project	YEAR	TEC[a] ($ x 1000)	Completion Date	Funding Needs[b] ($ x 1000) FY-84	FY-85	FY-86	FY-87	FY-88
3.3.1 Radioactive Waste								
Funded Activities								
Scrap Metal Management	84, 85 Expense	2,400	5/85	1,700	700			
81-R-506 Central Sludge Fixation Facility	81 LI[d]	8,800	1/86	2,589	6,211			
Central Neutralization Facility	81 LI[d]	1,380	1/87	406	974			
Floor Pan & Cylinder Cleaning	81 LI[d]	2,290	3/86	674	1,616			
Funding Requested								
Scrap Metal Smelting	85, 86 Expense	6,000	6/86		3,000	3,000		
Classified Burial Ground	84 GPP	650	5/85	650				
Oil Decontamination Facility	85 GPP	250	6/86		250			
Expense Studies[c]		865		195	370	300		
3.3.2 Hazardous wastes								
Funded Activities								
Chromate Sludge Collection	81 LI[d]	2,230	1/87	656	1,574			
Funding Requested								
Lithium Hydroxide Containment	(3)	?						
PCB Contaminated Outside Transformers	(3)	?						
Corrective Actions for TSFS	(3)	?						
Expense Studies[c]		0						
3.3.3 Mixed or Co-contaminated Wasted								
Funded Activities								
83-N-402 Compliance with TSCA, Phase I	83 LI[e]	31,900	11/86	9,670	16,430			
Waste Oil Storage Facility	81 GPP	715	4/84					
Funding Requested								
Compliance with TSCA, Phase II	88 LI[f]	6,000	9/92					3,000
Expense Studies[c]		600				600		
3.3.4 Conventional Wastes								
Funded Activities								
Coal Pile Runoff Treatment	83 GPP	240	9/84					
Funding Requested								
Compliance with Clean Water Act	88 LI[g]	8,000	9/92					3,330
Reduce Coolant Discharge, Phase I	88 LI[h]	4,500	9/92					4,500
Reduce Coolant Discharge, Phase II	90 LI[i]	13,400						
Expense Studies[c]		1,250				1,250		
3.3.5 Monitoring								
Funded Activities								
Funding Requested								
NPDES Improvements	(3)	?						
Expense Studies[c]								

Project	Completion YEAR	TEC ($ x 1000)	Date	Funding Needs[a] ($ x 1000) FY-84	FY-85	FY-86	FY-87	FY-88
3.3.6 Remedial Actions and Decommissioning								
Funded Activities								
Funding Requested								
Inactive Burial Areas	TBD	TBD						
K-901-A Holding Pond	TBD	TBD						
K-25 Building Decommissioning	TBD	TBD						
Powerhouse Decommissioning	TBD	TBD						
Expense Studies[c]								

[a] TEC is the total estimated cost for the activity.
[b] Tentative split in funding may change during criteria development.
[c] Estimated advance expense funding needed for project definition.
[d] Environmental Protection and Safety Modifications, Phase I (81-R-506); TEC $14,700K.
[e] Compliance with the Toxic Substances Control Act, Phase I (83-N-402); TEC $31,900K.
[f] Compliance with the Toxic Substances Control Act, Phase II (88-); TEC $6,000K.
[g] Compliance with the Clean Water Act (88-); TEC $8,000K.
[h] Reduce Coolant Discharge, Phase I (88-); TEC $4,500K.
[i] Reduce Coolant Discharge, Phase II (90-); TEC $13,400K.