APPENDIX D

STIPULATED FACTS

A. Oak Ridge National Laboratory (ORNL)

1. Process Ponds

a. Fourteen surface impoundments (process ponds) were constructed during the 1940–1978 time period for use in waste management activities at ORNL. These contain residual radioactivity, requiring further evaluation.

b. There are seven active ponds located in Melton Valley, four active sites in the High-Flux Isotopes Reactor-Transuranium Processing Facility (HFIR/TRU) complex (7905, 7906, 7907, and 7908), one inactive site in the Homogeneous Reactor Experiment (HRE) Area and two inactive ponds in the WAG 5 Area (Old Hydrofracture Pond and 7835 Sludge Pond). The four ponds in the HFIR/TRU complex have served as process liquid waste collection and sampling basins since 1965 and are earth-bermed, clay-lined, and open with gravel riprap on the basin walls.

c. The HRE Pond served as the retention pond for reactor shield tank water from 1958 to 1961 and in 1970 was filled with earth and capped with asphalt.

d. The inactive sludge pond (7835) located at SWSA 5 was lined with 30 mil plastic during construction. During operation from 1976 to 1981, sludge was pumped from the PWTP to this basin, sludge was allowed to settle, and the supernatant pumped back to the Equalization Basin.

e. Another contaminated site is the Old Hydrofracture Facility (OHF) pond used from 1963 to 1980 as an emergency retention basin for grout and equipment washdown wastes.

2. Low-Level Waste Seepage Pits and Trenches

a. During the period 1951 to 1966, four uncovered seepage pits and three covered seepage trenches were used for disposal of liquid low-level waste (LLLW).

b. The initial pit was intended to store LLLW; however, an undetermined quantity of liquid waste leaked from the pit during the July-October 1951 time period.

c. Three additional seepage pits were then constructed for the direct disposal of LLLW.

d. In 1960, concerns about external radiation exposures to personnel working near these pits and potential for overflow from rainfall led to the design of covered waste trenches into which the LLLW was pumped and allowed to seep into the soil.

e. During the period of 1951-1966, the amount of LLLW discharged to the pits and trenches is estimated to have been about 16,000,000 gal, containing around 650,000 Ci of Cs-137, and 190,000 Ci of Sr-90, and much lesser amounts of other moderate-to long-lived radionuclides.

f. The presence of very large inventories of residual radioactivity in Pits 2, 3, and 4 and Trenches 5 and 7, in particular, and continuing releases of radionuclides requires further evaluation.

g. In 1964, seven special auger holes were drilled near the south end of Waste Trench No. 5 for disposal of residual Homogeneous Reactor Test fuel.

h. In 1964, approximately 510 liters of 4 m sulfuric acid solution containing 4,700 g of irradiated, highly enriched uranium and some fission products were disposed in these auger holes. These sites will also require further evaluation.

3. Solid Waste Storage Areas

a. Since operations at ORNL began in the 1940s, six solid waste storage areas (SWSAs) have been used to dispose of solid low-level radioactive waste (SLLW), principally through shallow-land burial.

b. Data on the quantity and chemical or radiological composition of the SLLW wastes disposed or stored in the first five SWSAs is virtually nonexistent. However, based on the information available, it has been estimated that about 200,000 cubic meters of SLLW containing about 630,000 Ci of radioactivity have been buried in the six SWSAs. Because of reporting limitations, the existing radionuclide inventory for SWSA 6 provides only an order-of-magnitude estimate -of the radioactivity disposed; essentially no information exists to document the amount of hazardous chemical wastes disposed of prior to 1986.

c. In the early 1970s, shallow-land burial of TRU wastes was prohibited by DOE Order; and, since that time, solid TRU wastes have been stored retrievably in facilities located in the northern part of SWSA 5.

d. The Closed Contractors' Landfill was utilized from 1950 to 1975 for disposal of uncontaminated construction debris. This site is inactive.

e. ORNL stored contaminated equipment at the White Wing Scrap yard site from 1950 to 1970, at which time the equipment was removed.

f. Retrievable storage of solid TRU wastes was established in the SWSA 5 facilities in 1970, and continues to date.

g. Solid Waste Storage Area (SWSA) 6, opened in 1973 for the disposal of low-level radioactive waste (LLW), is the only currently operating LLW shallow land burial facility at ORNL. Investigations in April 1986 revealed that RCRA regulated waste (F-listed solvents as scintillation fluids, and lead) had been disposed in SWSA 6.

h. In April 1986, DOE revised its RCRA Part A Permit application to reflect the hazardous waste deposited in SWSA 6 since 1980. Procedures were implemented to ensure that RCRA waste was not included in the LLW and operations were resumed for the disposal of LLW in greater confinement disposal systems (concrete vaults or silos).

i. Administrative controls were established in April 1986 to ensure that no hazardous wastes are disposed in either the active portion of SWSA 6 or the new contractors' landfill located in WAG 3 west of SWSA 3.

j. A Closure Plan for SWSA 6 was submitted by DOE to the TDHE in October 1986.

k. A tumulus (above-grade storage facility) was constructed in SWSA 6 in September 1987.

l. A Notice of Deficiency for the SWSA 6 Closure Plan was issued by TDHE and subsequently received by DOE on January 27, 1988. A revised plan was requested to be submitted to TDHE by April 15, 1988.

m. A revised Closure Plan for SWSA 6 was submitted by DOE to TDHE and EPA on April 14, 1988. Included with the Closure Plan was a Post-Closure Permit application.

n. A Notice of Violation (NOV), Closure Plan - SWSA 6, was issued to DOE by TDHE on July 5, 1988. A Response to the NOV was submitted in August 1988. As agreed upon at a meeting on July 27, 1988, at Oak Ridge between TDHE, EPA, and DOE, a separate Closure Plan (excluding the Post-Closure permit information) was prepared and submitted by August 22, 1988.

o. On September 28, 1988, DOE was notified by the TDHE that the Closure Plan, as modified by the TDHE after public comments, was approved.

p. Closure of SWSA 6 was initiated on November 4, 1988, by implementation of the Interim Corrective Measures (ICM) Program as outlined in the approved Closure Plan.

4. Inactive Hydrofracture Injection Wells

a. Four different sites in Melton Valley were used in the development and full-scale application of hydrofracturing.

b. The initial experimental injection (HF-1) was accomplished in 1959 using a 300 ft cased well and leased pumping equipment. Near the end of the injection, grout slurry was observed to be exiting through a uncapped observation well near the injection well and the injection was halted. The estimated discharge of radioactivity was less than 0.1 Ci, resulting in localized surface contamination at the site.

c. The second experimental injections (HF-2) were conducted in 1960 in a new well located about 6000 ft southeast of HF-1. There were no reports of spills or leakage during either of these injections; this injection well is currently covered by a road.

d. In 1963, a full-scale experimental facility (named the Old Hydrofracture Facility or OHF) was constructed to allow experimentation with an integrated solids storage, handling, mixing and grout injection facility. Five underground LLLW storage tanks, an emergency waste pond, and a waste pit were installed. The facility was used for seven experimental and 18 operational injections from 1963 to 1980. A total of 1,430,000 gal of LLLW were injected during this period containing 604,000 Ci of Cs-137, 39,000 Ci of Sr-90, and lesser amounts of other radionuclides. Injections were made at depths ranging from 792 to 872 ft.

e. In 1982, the New Hydrofracture Facility (NHF) was completed. Between 1982 and 1984, a total of 8,475,000 gal of LLW containing 645,000 Ci of Sr-90, 83,000 Ci of Cs-137, and approximately 23,000 Ci of other radionuclides (including Cm-244 and transuranic radionuclides) were injected at depths ranging from 990 to 1069 ft. Injections of grout were discontinued and in 1986 the DOE decided not to pursue a permit required for continued operation of the facility. Plans for a remedial investigation covering all of the injection sites have since been developed.

5. Hazardous Waste Sites

    a. Most ORNL facilities for management or storage of RCRA-hazardous chemical wastes are either new or have operated for a short period of time under stringent monitoring requirements. Thus, no known releases have occurred from these facilities since 1984.

    b. Four Hg-contaminated sites have been identified in facilities which were constructed during 1950-1960 (portions of Buildings 3502, 3592, 4501, and 4508) and three of these have known releases. The amounts of Hg used in the laboratory and pilot-scale processes in these buildings ranged from a few pounds to several thousand pounds, but no accurate estimates of the amounts of Hg spilled or lost are available. Soil contamination in the vicinity of three of the buildings requires further evaluation.

    c. A 4500 gallon capacity underground tank (7860A) located east of Building 7863 at the New Hydrofracture Facility (NHF) primarily contains waste oil derived from lubrication of the pumps used in the hydrofracturing process. It also received organic solvents transferred from SWSA 3 in the process of cleaning up a drum storage area. The waste oil is thus contaminated with a variety of solvents and some radionuclides. This tank was used from approximately 1981-1985.

6. Environmental Research Areas

    a. In 1954, a radiation ecology program was initiated to study the environmental behavior and effects of radioactive materials, including fallout from nuclear weapons, through both laboratory and field studies.

    b. As part of this research, a wide assortment of radionuclides, generally in tracer quantities, were purposefully applied to 37 field sites from 1960 through 1984.

    c. At six study sites, grouped into three areas (Cs-137-contaminated fields in the 0800 Area, Cs-137-contaminated forest sites in the Health Physics Research Reactor Area, and the Cs-137- and Co-60-contaminated forest area on Chestnut Ridge), residual radioactive contamination is significant enough to warrant further evaluation and continued institutional control, along with possible remedial action.

7. White Oak Creek Watershed

    a. The Main Plant Area and the SWSA 3 Area are sources of continuing radioactive and hazardous releases to White Oak Creek in Bethel Valley.

    b. Releases from ORNL operations since 1943 have resulted in radionuclide and hazardous chemical contamination of sediments in White Oak Creek and White Oak Lake. (Cerling, T. E. and B. P. Spalding, 1982, Distribution and Relationship of Radionuclides to Streambed Gravels in a Small Watershed. Environ Geol. 4, 99-16; RFA ORNL/RAP-12/V1 (pp. I-37, I-39).

    c. White Oak Dam, located approximately 1 km above the junction of White Oak Creek with the Clinch River, was built in the fall of 1943 to form White Oak Lake for the purpose of providing a dilution and settling basin for ORNL effluents. The largest single accumulation of contaminants in the White Oak Creek system is in White Oak lake sediments. (Sherwood, C. B. and J. M. Loar, 1987. Environmental Data for the White Oak Creek/White Oak Lake Watershed. ORNL/TM-10062, pp. 8-11).

d. The principal radioactive contaminants in White Oak Creek/Lake are Cs-137 and Sr-90; significant chemical contamination is associated with Cr and polychlorinated biphenyls. (RFA ORNL/RAP-12/V1 (pp. I-37, I-39)).

8. Groundwater Monitoring

a. Groundwater quality monitoring wells were installed according to RCRA specifications as outlined in the RCRA Groundwater Monitoring Technical Enforcement Guidance Document (TEGD) around seven ORNL surface impoundments Basins 3523, 3539, 3540, 7905, 7906, 7907, and 7908 in 1985. Quarterly sampling was initiated in September 1985. Additional samples were collected in December 1985, March 1986, and June 1986. Upon completion of quarterly sampling, samples were collected semiannually for one (1) year and then annually.

b. The RCRA groundwater monitoring wells were initially installed around the surface impoundments in order to assess the possible contaminant releases from surface impoundments.

c. Further testing of the effluent and sludge contained in the surface impoundments revealed that they did not contain RCRA hazardous waste. On July 9, 1987, the TDHE informed DOE that the seven surface impoundments, since they were not receiving nor storing hazardous waste, were not subject to RCRA permitting requirements.

9. Inactive Low Level Liquid Waste (LLLW) Storage Tanks

a. There are 33 “inactive” LLLW storage tanks which are typically grouped in tank farms and were interconnected to provide flexibility in operations; tanks/transfer lines are located in waste area groupings (WAGS) 1, 4, 5, 7, 8, and 9. Several tank farms contain both active and “inactive” tanks.

b. Tanks vary in age and construction design, with the majority being gunite (12) or stainless steel (16) and >30 years old; all are of single-containment design; 1000- to 170,000-gal capacity (median 4,000 gal.)

c. Interconnecting, singly contained transfer piping is of similar age and design variability; tens of miles of piping with 35 known leak sites.

d. Before 1974, 18 tanks were taken out of service; 15 after 1974; 15 tanks have evidence of past leakage (5 generated known soil contamination and 10 collect groundwater/surface water) and 3 others may have leaked.

e. Three tanks are empty (W-19, W-20, and 7560); sampling of 3 others was delayed till 1989 because of access problems (WC-1, WC-15, TH-2).

f. Most (>95%) of the waste volume (400,000 gal.) and radionuclide inventory (30,000 curies; primarily Sr-90 and Cs-137) are in 13 tanks located in 3 tank farms; nearly all contain transuranic (TRU) waste sludges and all appear to contain mixed wastes.

g. The current surveillance program emphasized the monitoring of these 13 tanks.

h. Incomplete analytical results from sampling 27 “inactive” tanks in 1988 indicate that 11-14 have TRU-waste sludges and 24 contain mixed waste liquids/sludges (Cr, Pb, Hg, Cd, and some organics); there is wide variation in levels/types of constituents and homogeneity of contents.

10. Active Low Level Liquid Waste (LLLW) Tanks

    a. There are 36 active LLLW tanks which are typically grouped in tank farms (often with "inactive" tanks) and interconnected to provide flexibility in operations.

    b. Tanks vary in age and construction design, with the majority of the collection tanks being 20 to 30 years old and of single-containment design; 500- to 15,000-gal capacity (median <2000 gal.)

    c. Evaporator service tanks and Melton Valley Storage Tanks (MVSTs) are doubly contained; 50,000-gal. capacity each.

    d. Interconnecting transfer piping is of similar age and design variability, with the majority of the collection tanks served by singly contained lines.

    e. LLLW system upgrade is currently being addressed through a series of line item and GPP projects.

    f. The active tank systems are covered by a TDHE permit by rule, utilizing the wastewater treatment system exemption from RCRA regulation, until replaced and deactivated via the system upgrade projects.

11. General

    a. The Remedial Action Program (RAP) was established in 1985 to comply with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) [DOE Order 5480.14.]

    b. By letter of December 20, 1985, the EPA requested of DOE information concerning DOE's plans for remedial investigation and corrective action at the DOE facilities. DOE replied to this request by letter on February 24, 1986, by outlining the five (5) phases of DOE 5480.14. After reviewing the response of February 24, 1986, the EPA submitted comments and questions in a letter dated April 17, 1986.

    c. By letter of May 2, 1986, EPA informed the DOE of its intent to enforce regulatory requirements for ORNL remedial actions through the authority of the section 3004(u) RCRA of the 1984 Hazardous and Solid Waste Amendments (HSWA) as part of the RCRA permit for ORNL's Hazardous Waste Storage Facility - Building 7652.

    d. On June 23, 1986, DOE/ORO submitted a response to the EPA letter of April 17, 1987, which provided preliminary schedule information concerning implementation of the ORNL RAP. A table listing all known active and inactive waste management areas, contaminated facilities, and potential sources of continuing releases was attached. In this correspondence DOE/ORO proposed the concept of Waste Area Grouping (WAG) for use in remedial investigations. DOE transmitted this information along with a topographic map showing the location of the WAGs.

    e. On July 16, 1986, DOE submitted information concerning the technical and regulatory basis for WAGs to the EPA in response to a request by the EPA on May 16, 1986, for additional information and clarification concerning the WAG concept.

    f. In August 1988, DOE submitted to the EPA a map showing the location and boundaries of all WAGS and eight (8) detailed maps showing the location of SWMUs within each WAG.

g. A HSWA RCRA permit was issued by the EPA in conjunction with the Hazardous Waste Permit (Tennessee Department of Health and Environment - TDHE) for ORNL's Hazardous Waste Storage Facility Building 7652 that became effective October 25, 1986. The permit contained schedules for submission of a RCRA Facilities Assessments (RFA) and RCRA Facility Investigation Plans (RFIs).

h. In January 1987, DOE submitted an updated SWMU list to the EPA and TDHE.

i. According to conditions outlined in the RCRA HSWA Permit, DOE submitted the following SWMU identification/characterization reports to EPA.

   a. RFA, Volumes 1 and 2 (April 20, 1987)

   b. RFA, Volume 3, Addendum (August 24, 1987)

   c. RFA, Volume 4, Container Storage Areas (October 28, 1987)

   The RFA was structured according to the WAG concept and presented preliminary schedules for the submittal of WAG specific RFI plans. It also contained recommendations that no further action was deemed necessary for WAGs 14, 16, 18, and 20. WAGs 1-10 were recommended for remedial investigation while the remainder were deemed to need additional assessment before a final determination of RFI status.

j. DOE submitted an updated list of ORNL SWMUs to EPA and TDHE on February 3, 1988. The submittal contained a list of SWMUs that DOE recommended as requiring no additional assessment/investigation.

k. Discussions between the EPA, TDHE, and DOE personnel were held in August 1988 concerning the assessment status of all ORNL SWMUs. Agreement was reached as to which SWMUs required remedial investigations, additional assessment, or no further assessment.

l. In late 1988 a document control program was implemented resulting in the re-issuance of WAG RFI plans.

   Copies of the following RFI Plans were submitted to EPA, TDHE, and DOE Headquarters as follows:

   WAG 1 - January 25, 1989

   WAG 3 - December 30, 1988

   WAG 6 - January 10, 1989

   WAG 7 - December 30, 1988

   WAG 8 - December 30, 1988

   WAG 10 - January 25, 1989

   WAG 17 - December 30, 1988

m. By letter on October 28, 1988, the TDHE in conjunction with the EPA notified DOE of intent to modify the RCRA HSWA Permit by public notice on November 3, 1988. Significant modifications included schedules for submittal of RFI plans and the additional requirement to implement corrective action beyond the facility boundary [RCRA HSWA, Section 3000(v)].

n. DOE submitted an updated ORNL SWMU list in January 1989. The updated list reflects those SWMUs that do not require additional assessment as agreed upon at the August 1988 meeting between the EPA, TDHE, and DOE.

12. Oak Ridge Associated Universities (ORAU)

a. The Comparative Animal Research Facility (CARL) was operated by the University of Tennessee from 1948 to 1981. ORAU assumed operations of the Comparative Animal Research Facility in October 1981.

b. Purpose of the facilities is to study the long-range biological effects of radiation, radioactive entrance and transport in the food chain, and study of human risks from toxic materials.

c. Potential local remedial action sites include the Laboratory Road Facility, RE/ACTS Facility, Vance Road Facility, and Turnpike Facility.

d. Potential remedial action sites at Scarboro Facility include Surgery Building, nutrition facility, NECROSCOPY building, large animal containment building, pony barn, maintenance/storage facility, general storage shed, carpenter shop, isolated barn, serine facilities, biochemistry laboratory, buried septic tanks, and previously removed USTs.

e. Potential remedial action sites at the Freels Bend Facility include the Low Dose Rate Facility, Variable Dose Rate Irradiation Facility, Animal Burial Sites I, II, and III, and UST.

B. Y-12 Plant

1. Tennessee Eastman Corporation was operating contractor for the Y-12 Plant from 1942 until May 1947, when they were replaced as operating contractor by Union Carbide.

2. In 1951, use of the abandoned Kerr Hollow Quarry (KHQ) was started for the treatment of water-reactive materials, potentially explosive chemicals, and empty compressed gas cylinders. Wastes received at KHQ were defined as hazardous only by the characteristics of reactivity, corrosivity, or ignitability.

3. In 1951, the S-3 Ponds (4 unlined surface impoundments) were constructed in the west end of the Y-12 Plant as a disposal site for liquid wastes.

4. In 1952, the S-2 Pond was closed, neutralized, and filled.

5. The first trench in Burial Ground A [first phase of the Bear Creek Burial Grounds (BCBG)] was excavated in 1955 for the disposal of solid wastes.

6. In 1955, an earthen dam was constructed across the northern tributary of McCoy Branch, south of Chestnut Ridge which runs along the southern boundary of the Y-12 Plant. The dam and resulting impoundment (Coal Ash Pond) were designed to provide settlement pond storage for ash sluice water pumped from the Y-12 Steam Plant.

   By 1967, the Coal Ash Pond had filled with coal ash. The ash sluice water began flowing across the filled pond, into McCoy Branch, and eventually into Rogers Quarry where sedimentation of the ash occurred.

7. In July 1959, the Atomic Energy Commission authorized the Y-12 Plant to begin using BCBG for the disposal of liquid wastes.

8. In 1962, New Hope Pond was constructed near the eastern boundary of the Y-12 Plant. This unlined settling basin was intended to remove suspended sediments from Upper East Fork Poplar Creek prior to its discharge from the Y-12 Plant.

9. In 1962, Burial Grounds B and C were opened. Burial Ground B was used for the disposal of depleted uranium metals and oxides. Burial Ground C was opened for the disposal of beryllium, beryllium oxide, thorium, and solid wastes contaminated with these materials; also disposed of were materials contaminated with enriched uranium.

10. Burial Ground D was opened in 1968 for the disposal of depleted uranium metals and oxides after Burial Ground B had reached capacity.

11. Operation of Sanitary Landfill I was started in 1968. Prior to 1968, sanitary wastes were burned.

12. Oil leakage was first observed from Burial Ground A in 1970.

13. Oil Retention Pond (ORP) #1 was constructed in May 1971 to collect and contain oils that had leached into a surface stream flowing along the western edge of Burial Ground A.

14. In May 1972, Oil Retention Pond #2 was constructed at the northeast corner of Burial Ground A. ORP #2 was also built to collect and contain oils that had leached from the burial ground.

15. Accumulated sediments were dredged from New Hope Pond in 1973 and placed in the Chestnut Ridge Sediment Disposal Basin.

16. In 1973, operations at the Oil Landfarm were started. This EPA-approved project was used for the biological degradation of waste oil and machine coolants via landfarming, a process involving application of waste oils and coolants to nutrient-adjusted soil during the dry months of the year (April through October).

17. The first National Pollutant Discharge Elimination System (NPDES) permit was issued to the Y-12 Plant in February 1975. This permit was for East Fork Poplar Creek (New Hope Pond), Bear Creek, and Rogers Quarry.

18. Operations were ceased at the Oil Landfarm in 1982.

19. Operations were ceased at Sanitary Landfill I in 1983.

20. In March 1983, Sanitary Landfill II, a facility permitted by the Tennessee Department of Public Health (now Tennessee Department of Health and Environment), was opened.

21. On May 26, 1983, a Memorandum of Understanding (MOU) was agreed upon by the DOE, U.S. EPA, and TDHE concerning compliance with pollution control standards at the Y-12 Plant. To carry out the intent of the MOU, DOE agreed to take action with respect to each of the areas of the Y-12 Plant described in the March 8, 1983 TDHE Notice of Noncompliance; summarized as follows:

    Upper East Fork Poplar Creek (UEFPC) - DOE agreed to submit to EPA and TDHE a report describing all Y-12 discharges to UEFPC and interim treatment/control measures for the same. Also agreed to was an assessment of coal storage and steam plant management plans, including the water quality impacts of the same.

New Hope Pond (NHP) - DOE agreed to take steps to eliminate NHP as a NPDES discharge point. Included in this was a report containing a characterization of NHP sediments, assessments of active sources of mercury contamination, plans and specifications of the NHP by-pass and its use for spill prevention and control, and plans and specifications for cleaning out NHP.

New Hope Sludge Disposal Area - DOE agreed to submit results of leachability tests as well as a report evaluating site suitability and management practices.

S-3 Ponds - the defined objective of the MOU was to cease all contributions to the S-3 Ponds and to eliminate the S-3 Ponds as sources of contamination to surface and groundwater. This objective was to be accomplished by DOE by following these four major objectives:

1. Elimination of waste contributions to the S-3 Ponds;
2. Close out of S-3 Ponds;
3. Upon elimination of the S-3 Ponds as a source of contamination to surface waters, submit a plan and schedule for rehabilitation of Upper Bear Creek; and
4. Establish a monitoring point at the S-3 Ponds' discharge and establish parameters to be monitored.

Burial Ground Oil Pond - DOE agreed to submit reports that would (1) characterize wastewaters discharged from the pond; (2) inventory the wastes deposited in the pond watershed; and (3) assess the sediment, inventory existing contamination, and present biological information regarding the area. An NPDES application was to be submitted for the pond discharge. DOE also agreed to take further appropriate action, which could include a plan for elimination of sources of pollution to the pond and ultimate cleanup and closure of the pond.

Isolation Area - DOE agreed to submit an inventory of waste deposited in the area.

Disposal Pits - DOE agreed to submit a schedule for closure, including plans for alternate disposal.

Oil Landfarm - DOE agreed to implement a plan for preventing material from reaching "waters of the State and United States;" submit a description of site runoff; submit an evaluation of alternative actions at this site, including submission of a NPDES permit application, if applicable; and submit a report that included an inventory material deposited in the area and an inventory of existing contamination.

Contamination of East Fork Poplar Creek and Bear Creek - EPA, TDHE, and DOE agreed to establish a Task Force for the purpose of studying contamination and formulating a remedial plan if it is determined that one is necessary.

Groundwater Study for Y-12 Facility - DOE agreed to award a contract to investigate the hydrologic characteristics of the Bear Creek Valley disposal areas, the S-3 ponds, and the New Hope Pond sludge disposal basin to evaluate the groundwater flow, monitoring data, and the adequacy of the existing Y-12 groundwater monitoring program.

Master Monitoring Plan - DOE agreed to submit a master monitoring plan for groundwater and surface waters of the entire Y-12 Facility, indicating all sampling locations and all analytical parameters.

22. On September 15, 1983, a Complaint and Order was issued by the TDHE against DOE concerning discharges into UEFPC. Agreed to were the items outlined below:

    a. DOE would submit a report describing the discharges from the Y-12 Plant into UEFPC;

    b. DOE would provide an effluent sampling proposal, including analytical parameters, as well as NPDES permit applications for the steam plant, laundry, and cooling towers;

    c. DOE would implement a sampling proposal, submit NPDES applications, and implement management plans for area source and process source discharges, including the laundry, steam plant, and cooling towers; and

    d. DOE would submit reports characterizing waste deposited, site suitability, and management practices for the New Hope Sludge Disposal Area and the United Nuclear Corp. (UNC) site.

23. The TDHE issued a Complaint and Order in December 1983 concerning Bear Creek Valley. In particular, the Order addressed the following areas:

    - S-3 Ponds;
    - Burial Ground Oil Pond and Burial Ground Disposal Pits; and
    - Oil Land Farm, Isolation Area, and Stand Pipe Area.

    Agreed to were the items outlined below:

    a. DOE would cease the disposal and/or discharge into the S-3 Ponds of all materials except those materials necessary for the treatment of the S-3 Ponds.

    b. DOE would cease disposal of solid wastes in the existing Burial Ground Disposal Pits.

    c. DOE would submit a plan and schedule for rehabilitation of Bear Creek.

    d. DOE would submit a report characterizing wastewater discharged from the Burial Ground Oil Pond and submit an NPDES permit application for the same.

    e. DOE would submit a report consisting of (1) an inventory of waste deposited in the Burial Ground Oil Pond watershed, (2) a sediment assessment of the area, (3) an inventory of existing contamination, and (4) biological information regarding the area.

    f. DOE would submit a proposal for remediation of the Bear Creek watershed area.

24. Discharges into the S-3 Ponds were terminated in March 1984.

25. Martin Marietta Energy Systems, Inc. was awarded the contract for operations of the Y-12 Plant in April 1984.

26. On May 10, 1984, the TDHE issued an amendment to the 12/83 Complaint and Order with respect to the remediation of the Bear Creek watershed area. The information required for the remediation proposal was amended to include:

    a. A definitive statement on existing and potential impact(s) to surface and groundwaters from Bear Creek disposal areas;

    b. An assessment of imminent environmental hazards, with a description of interim remedial measures;

    c. A preliminary assessment of applicable long-term remedial action alternatives;

    d. Identification of additional information needed to effect evaluation of long-term remedial action alternatives; and

    e. An implementation schedule for progressing to a final decision with respect to long-term remedial action alternatives.

27. An Order of Correction was issued by the TDHE on December 6, 1984 against DOE concerning the management of hazardous and mixed waste at treatment, storage, and disposal facilities of the Y-12 Plant. The Order directed DOE to:

    a. Comply with the interim status standards for all mixed waste facilities;

    b. Comply with hazardous waste permits and conditions thereon issued by TDHE; and

    c. Submit a schedule for submittal of all Part B Permits.

28. A second Order of Correction was issued on December 6, 1984 by TDHE concerning the S-3 Ponds, New Hope Pond, Bear Creek Burial Grounds, and the Oil Landfarm at the Y-12 Plant. The Order directed DOE to:

    a. Submit a Hazardous Waste Permit application for each of the four facilities; and

    b. Submit closure and post-closure plans for each of the four facilities.

29. In March 1985, a Federal Facility Compliance Agreement (FFCA) was entered into between the U.S. EPA and DOE to assure compliance by the Y-12 Plant with the Clean Water Act.

    Included in the Agreement were compliance schedules, funding requests, reporting requirements, conflict resolutions, and sanctions. Attachment “A” of the Agreement specified construction schedules for planned construction of treatment facilities. Category III (Process Wastewaters) discharge elimination plans were outlined in Attachment “B”.

30. An amendment to the March 1985 FFCA was issued in March 1986. This amendment was made necessary by the following two items:

    a. An extension to the schedule for the Central Pollution Control Facility (CPCF II); and

    b. Establish a schedule for the proper control and disposal of fly ash from the steam plant.

31. A ‘comprehensive’ NPDES Permit was issued to the Y-12 Plant effective May 25, 1985. This permit covered all known surface water discharges from the plant including New Hope Pond, UEFPC, Bear Creek, Kerr Hollow Quarry, Rogers Quarry, etc.

32. In September 1986 the FFCA was amended to address the following three items:

    a. Revised schedule for CPCF II;

b. Revised schedule for West End Treatment Facility; and

c. Revised conditions of operation for the S-3 Ponds Liquid Treatment Facility.

33. During April 1988, the construction of the West Borrow Area [a part of the Y-12 Closure and Post-Closure Activities (CAPCA) Program] was started.

34. Construction of Lake Reality, intended to serve as a replacement for New Hope Pond, was started in May 1988.

35. Dewatering of the impoundments of the S-3 Ponds and placement of sediments from the upper portion of Bear Creek, known as Blue Lagoon, into the S-3 Ponds were completed in June 1988.

36. The construction of the East Borrow Area for the Y-12 CAPCA Program was started in July 1988.

37. Backfill of S-3 Ponds' impoundments was completed and construction of multi-layer cap started in September 1988.

38. Draining of water from the Oil Retention Ponds was initiated and construction of ORP soil storage facilities started during September 1988.

39. Preliminary CAPCA work (e.g. clearing of vegetation, installation of soil erosion control devices, etc.) started on the Bear Creek Burial Grounds in October 1988.

    East Borrow Area was completed in October 1988.

40. In November 1988, closure of Burial Ground A was started under the Y-12 CAPCA Program.

41. Construction of a Soil Storage Vault, a part of the RCRA closure of the Oil Landfarm, was started in October 1988.

42. Disassembly of equipment and other facilities at Kerr Hollow Quarry was started in October 1988.

43. The first PCB-contaminated (>50 ppm) soil from the Oil Landfarm was placed in the Soil Vault in November 1988.

44. West Borrow Area construction was completed during November 1988.

45. The closure of New Hope Pond under the Y-12 CAPCA Program was started in November 1988 by diverting UEFPC into Lake Reality.

46. Treatment/disposal operations at Kerr Hollow Quarry were ceased in November 1988.

47. Lake Reality was completed in December 1988.

48. The last of the PCB-contaminated soil from the Oil Landfarm was placed in the Soil Vault in January 1989.

49. The following data is taken in its entirety from an unclassified document entitled Mercury at the Y-12 Plant - A Summary of the 1983 UCC-ND Task Force Study, Document Number Y/EX-23.

- Between 1951 and 1955, between 100,000 and 120,000 pounds of mercury were spilled in three separate incidents involving pilot plant operations in Building 9201-2. Approximately 95,000 pounds of the spilled mercury were lost to the ground and were not recovered.
- On January 1, 1956, a couplings broke on a pump in Building 9201-5, releasing between 113,000 and 170,000 pounds of mercury. Of the amount released, approximately 70,000 pounds of the mercury were lost to the ground and were not recovered.
- On July 17, 1956, a valving error was responsible for the release of 22,500 - 90,000 pounds of mercury at a ramp north of Building 9201-5. Of this amount, approximately 85,000 pounds of mercury were lost to the ground and were not recovered.
- In the summer of 1956, a valving error between Buildings 9204-4 and 9201-5 was responsible for the release of 22,500 - 90,000 pounds of mercury. Of this amount, approximately 85,000 pounds of mercury were lost to the ground and were not recovered.
- On November 15, 1956, a Colex column in building 9201-5 plugged, causing the release of an estimated 22,500 - 45,000 pounds of mercury. Of the amount released, approximately 40,000 pounds of mercury were lost to the ground and were not recovered.
- On March 28, 1966, a "sight glass" tube broke on a tank in Building 9201-5, releasing an estimated 105,000 pounds of mercury. Of this amount, approximately 49,800 pounds of mercury were lost to the ground and were not recovered.

50. In a report published in 1983 by the Union Carbide Corporation entitled Mercury at the Y-12 Plant - A Summary of the UCC-ND Task Force Study, Document Number Y/EX-23, unclassified, the following estimated mercury losses by the Y-12 Plant were reported.

Lost to air	51,300 pounds
Lost to East Fork Poplar Creek	238,944 pounds
Lost to New Hope Pond sediment, Chestnut Ridge	6,629 pounds
Lost to New Hope Pond sediments now in place	8,475 pounds
Lost to ground, Building 9201-5 spill accident	49,853 pounds
Lost to ground, seven other spills	375,000 pounds
Lost to ground, Building 81-10 operations	3,000 pounds
Lost Total	733,201 pounds

51. On November 3, 1983, DOE authorized the Tennessee Valley Authority (TVA) to prepare a technical work plan for an Instream Contaminant Study on EFPC which involved sampling of instream water, sediment, fish, and the floodplain. The primary purpose of the TVA Instream Contaminant Study was to provide water, sediment, and fish data for identifying off-site contaminants and assessing potential public health risks.

52. An Instream Contaminant Study was initiated by TVA in April 1984.

53. Results indicated that total mercury concentrations were at or above the Tennessee Water Quality Criteria for Protection of Aquatic Life (0.2 ug/L) (1200-4-3-.03(3)) and the EPA Interim Primary Drinking Water Standard (0.002 ug/L) during the storm events. In addition, dissolved mercury concentrations were slightly above the analytical detection limit of 0.2 ug/L (TVA 1985a).

54. ORAU, at the request of DOE and the ORTF, has been involved in efforts to define the extent of contamination within the Oak Ridge community. The general ORAU sampling effort through 1985 focused on (1) sampling of private residences, (2) a rapid scan of the entire length of the Oak Ridge Turnpike, (3) participation in an interim cleanup effort at the Oak Ridge Civic Center, (4) cleanup of two small contaminated areas in the city, (5) removal of contaminated soil from a private residence, (6) a rapid scan for preliminary determination of the contamination distribution in the EFPC floodplain, (7) monitoring for radioactivity and other contaminants in municipal wastewater, and (8) sampling of a salvage yard to determine the composition and distribution of contamination on that property (Energy Systems 1986).

55. Most recent references containing information regarding mercury contamination in EFPC include: Martin Marietta Energy Systems, Inc. 1986. Environmental Surveillance of the Oak Ridge Reservation and Surrounding Environs During 1985. ORNL-6271. Oak Ridge National Laboratory, Oak Ridge, Tennessee; Tennessee Valley Authority. 1985a. Oak Ridge Task Force, Instream Contaminant Study-Task 1: Water Sampling and Analysis. Tennessee Valley Authority, Office of natural Resources and Economic Development and Tennessee Valley Authority. 1985b. Oak Ridge Task Force, Instream Contaminant Study - Task 2: Appendices, Volume 2. Tennessee Valley Authority, Office of natural Resources and Economic Development.

C. Oak Ridge Gaseous Diffusion Plant (ORGDP)

1. Burial Grounds - The K-1070-C/D Classified Burial Ground, which is currently in use, has been in operation since the 1970s. The burial ground has been used for disposal of organic wastes and currently is used for disposal of classified radioactive waste. The other burial grounds at ORGDP, which are no longer in use, began operation between 1940 an 1970, and operation ended in the mid 1970's. Included in the wastes buried at these sites are low level radioactive solid waste, mixed chemical waste, radioactive and nonradioactive classified materials, and construction and renovation rubble.

   These burial grounds include: K-1070-A Contaminated Burial Ground, K-1070-C/D Classified Burial Ground, K-1070-F Old Contractors Burial Ground, K-1070-G Burial Ground, K-1070-B Classified Burial Ground, and K-901-A Waste Disposal Area.

2. Surface Impoundments - Surface impoundments subject to RCRA 3004(u) include sites which were used for settling and/or diluting of chemical waste discharges, metal hydroxide sludges and sludge storage. Sources of sludge include the ORGDP laboratory area, treated recirculated cooling water system blowdown, and neutralized waste streams from K-1407-A. Sludges from the chemical wastes contain a large number of different hazardous materials from the laboratory operations. Cooling water sludges primarily contain chromium hydroxide precipitates. The neutralized waste contains precipitates from the cleaning of nickel plated materials in addition to small quantities of radioactive materials. The K-901-A pond contains approximately 6,500 cubic yards of chromium (Cr^{+3}) and iron hydroxide

sludge from the recirculating cooling water treatment process. **t**he K-1007-B pond contains approximately 200 cubic yards of sludge containing chromium, copper, lead, mercury naphthalene, and zinc which was deposited from laboratory drains. The K-1407-B pond contains approximately 12,400 cubic yards of metal laden (F006) sludge generated from neutralization and decontamination activities. The K-1407-C Basin contains approximately 13,200 cubic yards of sludge which was dredged from the K-1407-B pond as well as some potassium hydroxide.

3. Various underground tanks at ORGDP contained a variety of wastes including low level waste from cleaning operations; solutions from backwash and regeneration of steam plant water softening resins; corrosive solutions from plating facilities. Most of these facilities have been in operation since the 1940's and are suspected of leaking these liquids into the ground.

   The specific underground tanks that require further investigation and potentially require remediation are: K-1410 Neutralization Pit, K-1503 Neutralization Pit, K-1413 Neutralization Pit, K-1085 Old Firehouse Burn area, J-1407-A Neutralization Pit, and K-1004-L Vaults.

4. Several storage facilities were used for the storage of radioactively contaminated materials, paint wastes, and other organic wastes including PCBs. Radioactively contaminated wastes stored at the sites include waste oils, PCBs, mercury, asbestos, and incidental scrap metals.

   The storage facility sites are: K-1064 Burn Area/Peninsula Storage, K-770 Scrap Metal Yard and Contaminated Debris, and K-1420 Oil Storage Facility.

5. Treatment facilities listed in this plan are used for the recovery of metals and the treatment of wastes before discharge from the plant. Metals include mercury and nickel, along with other heavy metals, as well as small amounts of uranium. Waste are nitrate and non-nitrate wastes with small amounts of organics. The treatment facilities include: K-1420 Mercury Recovery Room, K-1232 Treatment Facility, K-1421 Incinerator, and K-1410 Nickel Plating Facility.

6. Process lines were used to transport wastes to and from the K-1407-A Neutralization facility and from the K-1004 lab area. In addition there are several large underground cooling water lines running to the gaseous diffusion process buildings from the cooling towers. Some of the lines are known to have had leaks which may have allowed hazardous materials to escape into the environment. Other lines not having known leaks will be evaluated since they contained hazardous chemicals. Suspected contaminants include radioactive materials, metal hydroxides, corrosives (acids), and chromates.

   The process line sites are: K-1401 Acid Line, K-1413 Process Lines, Cooling Towers and Process Lines (10 units), and D-1004 Area Lab Drain.

7. Buildings K-1031 and K-1095 are used not only as painting facilities, and also as storage for paints, solvents, thinners, and various other associated paint materials (brushes, rags, etc.). Due to the nature of these materials, the contaminants of concern are semi-volatile and volatile organics.

8. A number of other RFI sites exist at the ORGDP which do not fall into any of the previous categories. These sites are unique due to the source of contamination and/or history of the facility. Hazardous materials in these sites will include heavy metals, organics, PCBs, and

radioactivity. Each site is being evaluated separately to determine the exact source, type and potential risk due to the hazard(s).

The miscellaneous sites are: K-720 Fly Ash Pile, K-725 Beryllium Building, K-1099 Blair Road Quarry, K-1700 Stream, and ORGDP Switchyards (4 units).

9. In addition to a major scale research and development (R&D) effort for support of the operating uranium enrichment cascade and the Cascade Improvement and Uprating Program (CIP/CUP), the R&D efforts for developing alternatives to the diffusion process for uranium isotope separation were initiated at ORGDP.

10. The ORGDP was placed in standby in September 1985. At the same time, work at ORGDP on two other uranium enrichment development programs (GCEP and AVLIS) were terminated. In 1988, it was decided that the gaseous diffusion process in Oak Ridge would not be restarted, and the gaseous diffusion cascade was shutdown permanently.

11. The ORGDP Groundwater Protection Program and Storm Drain Characterization Program were initiated in 1985.

12. Solid Waste Management Units (SWMUs) suspected of releasing contamination to the environment were identified and reported in the II.A.1 report submitted to by DOE to EPA in March 1987. Additional SWMUs have since been identified and have been reported to EPA.

13. Preparation of RCRA Facility Investigation (RFI) Plans for SWMUs began in 1987. About 25% of the plans were submitted in 1987, and the remainder of the plans were submitted by December 1988 (for sites identified previous to July 1988) in compliance with an EPA mandated schedule.

14. The closure plan for the K-1407-B Pond was submitted to Tennessee Department of Health and Environment (TDHE) April 1988, and the K-1407-C Pond closure plan was submitted to TDHE in May 1988.

15. RFI field activities began in January 1989 at the K-1070-A and K-1070-C/D Burial Grounds. Field activities include soil sampling to bedrock and analysis for inorganics, organics, and radioactivity.

D. Clinch River Study (Offsite)

1. The impounded Clinch River (i.e., Melton Hill Reservoir, impounded on the Clinch River in 1963, and the upper portion of Watts Bar Reservoir, impounded on the Tennessee River in 1942) bounds the Oak Ridge Reservation on the south and west for a distance of approximately 63 km from CRK 79 to CRK 16.

2. Tributaries of the Clinch River drain the Oak Ridge Reservation on which the Y-12 Plant, ORNL, and ORGDP are located.

3. The Clinch River flows into the Tennessee River system of mainstream multipurpose impoundments at Watts Bar Reservoir near Kingston, Tennessee, 34 km downstream from the Oak Ridge complex.

4. A variety of contaminants (radionuclides, metals, organics) have been released from the Oak Ridge facilities to on-site tributaries of the Clinch River and to the Clinch River directly from 1943 to present.

5. As a result of the issuance of the RCRA 3004(u) permit for the Oak Ridge Reservation, DOE accepted responsibility for evaluating off-site contamination in the Oak Ridge area (13 Feb 1987 letter from J. La Grone to K. Jarmolow).

6. A preliminary survey has indicated that particle-reactive contaminants have accumulated in the sediments of Watts Bar Reservoir. (Loar, J. M. Et al., 1987, First Annual Report on ORNL Biological Monitoring and Abatement Program, ORNL/TM-10395; Loar, J. M. et al, Second Annual report on ORNL Biological Monitoring and Abatement Program (1989 Draft). Turner, R. R., C. R. Olsen, and W. J. Wilcox, Jr., Fate of Hg and Cs-137 Discharged from the Oak Ridge Facilities, pp. 329-338.)

7. A RCRA Facility Investigation plan to address off-site contamination is now being prepared by DOE. The Clinch River RFI will be conducted in compliance with RCRA/HSWA Section 3004(v) which addresses requirements for releases of hazardous wastes or constituents beyond the boundaries of RCRA-permitted facilities.