July 1 - December 31, 1994
Environmental Monitoring Plan
Tennessee Department of Environment and Conservation
Department of Energy Oversight Division
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ACRONYMS

AA -	Atomic Absorption Spectrophotometry
AEA -	Atomic Energy Act
ALARA -	As Low As Reasonably Achievable
APC -	Air Pollution Control
ARAP -	Aquatic Resource Alteration Permit
ASER -	Annual Site Environmental Report
BDAT -	Best Demonstrated Available Technology
BMAP -	Biological Monitoring and Abatement Plan
BRW -	Bedrock Well
BTX -	Benzene, Toluene, and Xylene
CAA -	Clean Air Act
CEI -	Compliance Evaluation Inspection
CERCLA -	Comprehensive Environmental Response, Compensation and Liability Act
CFR -	Code of Federal Regulations
CRM -	Clinch River Mile
CSI -	Compliance Sampling Inspection
CWA -	Clean Water Act
DOE -	Department of Energy
DOE-O -	Department of Energy - Oversight
DMRs -	Discharge Monitoring Reports
DRH -	Department of Radiological Health
DQO -	Data Quality Objective
EA -	Environmental Assessment
EIS -	Environmental Impact Statement
EM/C -	Environmental Monitoring and Compliance
EMP -	Environmental Monitoring Plan
EPA -	Environmental Protection Agency
ERAMS -	Environmental Radiation Ambient Monitoring System
ER -	Environmental Restoration
ES -	Engineering Support
FFA -	Federal Facilities Agreement
FFCA -	Federal Facilities Compliance Agreement
GW -	Groundwater Well
HAPs -	Hazardous Air Pollutants
HONs -	Hazardous Organic NESHAPS
LREPP -	Long Range Environmental Protection Plan
ICP -	Inductively Coupled Plasma
NEPA -	National Environmental Policy Act
NESHAPS -	National Emission Standards for Hazardous Air Pollution Sources
NOAA -	National Oceanographic and Atmospheric Administration
NPDES -	National Pollutant Discharge Elimination System
NPL -	National Priority List
O&M -	Operation and Maintenance
ORNL -	Oak Ridge National Laboratory
ORR -	Oak Ridge Reservation
ORTF -	Oak Ridge Task Force

ACRONYMS cont.

OU - Operating Unit
PAI - Performance Audit Inspection
PCB - Polychlorinated Biphenyls
PCI - Pretreatment Compliance Inspection
PM₁₀ - Particulate Matter (10 micron)
PWS - Public Water System
QA/QC - Quality Assurance/Quality Control
RCRA - Resource Conservation and Recovery Act
RM/O - Radiological Monitoring and Oversight
RWA - Residential Well
SAFE - Site and Facility Evaluation
SDWA - Safe Drinking Water Act
SOP - Standard Operating Procedures
SWSA - Solid Waste Storage Area
TDEC - Tennessee Department of Environment and Conservation
TEMA - Tennessee Emergency Management Agency
TOA - Tennessee Oversight Agreement
TPH - Total Petroleum Hydrocarbons
TSCA - Toxic Substances Control Act
TSP - Total Suspended Particulates
TVA - Tennessee Valley Authority
TWRA - Tennessee Wildlife Resources Agency
UEFPC - Upper East Fork Poplar Creek
UNW - Unconsolidated Well
USFWS - United States Fish and Wildlife Service
UST - Underground Storage Tank
VOCs - Volatile Organic Compounds
WM - Waste Management
WOC - White Oak Creek
WPC - Water Pollution Control
WWTF - Waste Water Treatment Facility

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Executive Summary

The Tennessee Department of Environment and Conservation (TDEC) DOE Oversight Division (DOE-O) monitoring effort will serve as oversight with ongoing compliance and ambient sampling by Oak Ridge Reservation (ORR), Department of Energy (DOE) and contractor staff programs. These sources provide a comprehensive database which must be reviewed and analyzed in order to streamline DOE-O sampling efforts. DOE-O monitoring is necessary to provide quality control, to ensure compliance, to ensure completeness, and to assure protection of public health and the environment. The Tennessee Oversight Agreement (TOA), includes a section on Environmental Monitoring as Attachment A. To accomplish these objectives, DOE-O will implement the following monitoring programs.

SURFACE WATER MONITORING/WATER POLLUTION CONTROL

Parameters for surface water sampling are based on various NPDES permit standards, disposal sites with identified or suspect types of materials, and stormwater runoff from operations impacting surface water. A tremendous amount of information from past surface water sampling performed by various agencies is available and will be reviewed as needed. NPDES required data is used to guide on-site instream investigations as well as to predict off-site problems. Off-site problems can often be traced back to solid waste and/or groundwater-related issues, as well as to stormwater problems. In order to project the possible extent of this pollution and its possible hazard(s) to human health and the environment, ambient surface water monitoring has been established at sampling points on the Clinch River, at wells, and springs. Ambient surface water sampling also establishes a baseline data source to assess water quality before it reaches the ORR, as the Clinch River flows around, and as it leaves any potential impact from the ORR. Aquatic sediment sampling and analyses will be conducted as part of this surface water monitoring plan. This medium often contains contaminants which may not be evident in surface water samples due to its adsorptive ability .

SAFE DRINKING WATER AND SAFE DAMS

There are 14 public drinking water systems located within the potentially impacted area of the ORR. The closest drinking water systems are Anderson County Utility, DOE/Oak Ridge, K-25, West Knox Utility District, Melton Hill Park, and the City of Kingston. DOE-O will assist local governments and public

utilities with operation, planning, sampling of non-standard constituents, and analysis. Samples will be obtained and evaluated on an as needed basis in order to supplement the required finished and raw water monitoring performed by the system owner.

TDEC/DOE-O functions in a general oversight and advisory role on dam safety issues. White Oak and Radder Dams are potentially impacting on human health and the environment with respect to the ORR. DOE-O will inspect ORR dams to assure functionally equivalent compliance with State of Tennessee Safe Dam requirements.

BIOLOGICAL/FISH AND WILDLIFE

The Biological/Fish and Wildlife Monitoring Subsection reviews Oak Ridge Reservation (ORR) monitoring reports and initiates independent biological monitoring and oversight to confirm ORR monitoring completeness. Initially, two indices of stream health will be implemented. The "EPT richness index" measures the absence of pollution intolerant species and the "Index of Biotic Integrity" (IBI) rates streams from very poor to excellent. Contaminant monitoring will be accomplished by water, sediment, and fish flesh sampling. This section also assists the NEPA/Audits subsection with ecological/environmental indicators and the Radiological Monitoring and Oversight Program with deer and goose monitoring, mussel surveys, and wildlife sampling designed to ensure the public health.

GROUNDWATER, HAZARDOUS & PETROLEUM UNDERGROUND TANKS MONITORING
Groundwater sampling will initially consist of replicating samples for Resource Conservation and Recovery Act (RCRA), Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), solid waste disposal, low level waste disposal, and underground storage tanks (UST) and exit pathways. Off-site monitoring will be conducted to investigate the potential migration of contaminants in groundwater.

DOE-O will closely review all soil and groundwater sampling activities associated with petroleum UST's. Replicate samples will be taken to verify DOE's analytical results. In selecting sampling points, DOE-O will consider: 1) where contamination is most likely to be present; 2) potential for contamination migration; 3) areas of visual contamination (fuel saturated soil, free product, or groundwater) and 4) data gaps. Analytical parameters will include BTX and TPH, unless additional parameters are required.

Hazardous USTs are regulated under the Resource Conservation Recovery Act (RCRA), Subtitle C and Subtitle I. Specific sampling requirements are given in these regulations for tank closure and to delineate the extent of contamination, if substances are released to the environment. TDEC/DOE-O will collect replicate soil and groundwater samples when deemed appropriate.

AIR POLLUTION CONTROL

Air quality monitoring will be met by the oversight of air emission, both source and fugitive, and the oversight of the ambient air quality on the ORR and surrounding areas. DOE-O will co-locate air sampling equipment, and review air movement models and sample station locations on the ORR. Audits of DOE's stack sampling will also be performed. DOE-O will perform inspections of all permitted sources on the reservation. All radiological and non-radiological air monitoring systems on the ORR will be reviewed along with the data produced by these systems. Current DOE and NOAA meteorological data will be evaluated to provide additional support for air quality monitoring.

RADIOLOGICAL SURVEILLANCE

Radiation surveillance will be directed toward the development of a comprehensive monitoring program utilizing the expertise and contribution of all Division Program areas (RM/O, WM, ER, EM/C) to address: the review and comment on DOE radiological control and surveillance systems; the analysis of pathway indicators (vegetation, milk, biota) and all media (soil, air, water); the assessment of radiological hazards associated with DOE operations (past and present); the remediation of the ORR; and programs to warn of and respond to emergency conditions.

WASTE MANAGEMENT

The Waste Management Program has responsibilities in the areas of air and water pollution, solid, hazardous, and radioactive waste. The Program contributes to the Division's monitoring efforts through an integrated multimedia program of inspections, audits, compliance data, and treatment and facility plans review. This is supplemented as appropriate by air and surface water sampling.

ENVIRONMENTAL RESTORATION

The Environmental Restoration (ER) Program within the DOE Oversight Division provides cross media monitoring of DOE's ER program for the Oak Ridge Reservation (ORR) as a National Priorities List (NPL) site. Monitoring activities include the review, analysis, and oversight of data from all contaminated media associated with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) activities (i.e., soil, air, sediment, surface and groundwater).

QUALITY ASSURANCE

All field and laboratory procedures for all samples comply with applicable State and Environmental Protection Agency (EPA) regulations and standards. Strict adherence to quality assurance/quality control (QA/QC) practices is done for all environmental monitoring activities. The Tennessee Department of Health, Environmental Laboratory and Microbiological Laboratory Organization (Laboratory Services) has developed Standard Operating Procedures (SOP) which outline QA/QC practices for producing legally defensible data. All procedures will follow these SOP's.

MONITORING STAFF

The DOE-O Environmental Monitoring Plan will include monitoring by staff members within the Environmental Monitoring and Compliance Program (Environmental Monitoring and Groundwater), the Waste Management Program, the Radiological Monitoring and Oversight Program, the Environmental Restoration Program of DOE-O (Figure 1); and the Tennessee Wildlife Resources Agency. The manager of the DOE-O Environmental Monitoring and Compliance Program will have lead responsibility for this Environmental Monitoring Plan.

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION - DOE OVERSIGHT DIVISION

Position Number: 327.3603601000000.(xx)

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1. INTRODUCTION

A Department of Energy Oversight (DOE-O) Division of the Tennessee Department of Environment and Conservation (TDEC) was established and based in Oak Ridge in 1991. This office has implemented the Tennessee Oversight Agreement (TOA) with the Department of Energy (DOE) in regard to Oak Ridge Reservation (ORR).

The Tennessee Oversight Agreement (TOA) Attachment A on Environmental Monitoring represents a program objective to monitor all media (air, water, soil, sediment, and biota) and to also document and monitor emissions (hazardous, toxic, chemical, radiological) from known source(s), potential new source(s), and/or from random suspect locations on a site-by-site basis. A tremendous amount of data exists concerning these media and emissions which upon review has and will continue to provide guidelines for DOE-O sampling efforts.

This sampling is not part of the formal regulatory compliance schedule sampling, but is rather an independent quality control assurance oversight activity. Specific sampling points, parameters, schedules of samples and total samples expected under each program are included in this document when possible.

Many of the sampling needs for the sections within DOE-O will overlap due to the integrated nature of wastestreams. Contaminated soils often lead to contaminated groundwaters, which in turn, tend to become surface waters somewhere downgradient of the source.

Pathways by which contaminants travel to and through the terrestrial environment must be defined before meaningful sampling can be done to help protect human and ecological health. Crops, meat, and milk are major matrices which may be sampled to insure public health.

Terrestrial monitoring may include ideas from Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and Resource Conservation and Recovery Act (RCRA) as well as from temporally-oriented monitoring programs at ORR. Initially, sampling has been to check current ORR programs and will likely evolve into an independent comprehensive investigative strategy. DOE-O will continue to cooperate with DOE and other agencies such as the Environmental Protection Agency (EPA), Tennessee Valley Authority (TVA), Tennessee Wildlife Resources Agency (TWRA), United States Fish and Wildlife Service (USFWS), etc. in order to optimize efficiency, data quality, and compliance with regulations.

Environmental Protection Agency (EPA) standard methods are utilized for all environmental monitoring activity. Where EPA methods are not available, a review of existing methodology, including DOE contractor Standard Operating Procedures (SOP), is conducted and an acceptable sampling methodology is developed. The quality assurance and quality control (QA/QC) provided will be consistent with that presently applied to other regulatory programs.

2. SURFACE WATER MONITORING

SURFACE WATER EFFLUENT MONITORING

Waste Management (WM)

The three major facilities that make up the Oak Ridge Reservation (ORR) have many National Pollutant Discharge Elimination System (NPDES) permitted outfalls which discharge into at least nine (9) streams considered as waters of the State (Table 1). Each site has over one hundred discharges which require monitoring under their respective NPDES permits. Wetland delineation and stream determinations are often necessary during permit approval. This would include Aquatic Resource Alteration Permits (ARAP's) and any erosion control concerns. Waste Management/Water Pollution Control (WM/WPC), has the lead for the effluent monitoring program and receives support, as needed, from the Environmental Monitoring/Compliance (EM/C) and Radiological Monitoring and Oversight (RM/O) Programs. In addition to sampling, the WM/WPC section is responsible for monthly review of discharge monitoring reports and operating reports, and for coordination of the stormwater monitoring programs for each facility. RM/O will review the radiological components of the NPDES Discharge Monitoring Reports (DMRs) and compare data generated by the TDEC/Department of Radiological Health and MMES samples, split monthly. WM/WPC also reviews engineering reports, plans, and specifications for treatment facilities as well as modifications or repairs to existing pipelines. Pollution Prevention Plans are also addressed within this program.

Sampling efforts will emphasize quality assurance/quality control (QA/QC) of present ORR programs. At present, split samples are collected annually during NPDES compliance audits at K25, X10, and Y-12. Due to the large work load during these audits, WM/WPC draws support from a number of programs within the division including RM/O and EM/C. Short notice or no-notice sampling may be performed by the Division for situations such as storm events, non-permitted discharges, or spills. If appropriate, DOE will be informed of sampling times and locations as soon as possible, provided such prior notification would not allow opportunity for

bias. A strategic goal is for DOE-O to have a sampling plan that both checks and compliments the ORR sampling programs.

Information from other agencies and from past sampling activities is available. This can include surface water and biological data from ambient stations upstream and downstream of the ORR collected by the Tennessee Valley Authority (TVA), Tennessee Wildlife Resources Agency (TWRA), Tennessee Department of Environment and Conservation Water Pollution Control Division (TDEC-WPC), Environmental Protection Agency (EPA), and the Oak Ridge Task Force (ORTF). The Biological Monitoring and Abatement Plan (BMAP) and Resource Conservation and Recovery Act/Comprehensive Environmental Response, Compensation and Liability Act (RCRA/CERCLA) studies conducted on-site and off-site will be used to evaluate surface water pollution. NPDES information will be used to guide instream investigations as well as to predict off-site problems. The RM/O program has initiated an investigation of NPDES outfalls exhibiting radiological contamination in order to identify the genesis of radiological releases on the ORR.

All major waste water treatment facilities (WWTF) are required by the EPA and State NPDES program to have annual compliance inspections. The inspection type can vary and may include a compliance evaluation inspection (CEI), performance audit inspection (PAI), compliance sampling inspection (CSI), operation and maintenance (O&M) inspection or a pretreatment compliance inspection (PCI). Each kind of inspection examines a variety of aspects ranging from record keeping, operational performance and laboratory analyses to sample collecting and effluent monitoring.

Each site on the ORR has a unique complex of Waste Water Treatment Facilities (WWTFs) that handle the specific waste streams generated by DOE processes. The intent of the Division's NPDES monitoring program is to evaluate compliance of the operating permit as well as to ensure that effluents are not causing pollution via unpermitted discharges or by exceeding water quality criteria not addressed by the NPDES permit.

Due to the large number of outfalls discharging into waters of the State, only a portion of the outfalls will be sampled. It is expected that DOE contractor personnel may split or duplicate all samples with the Division collected during an inspection. The type (i.e. grab, composite) of sample and parameters analyzed will be process/effluent specific. Most analyses will only include those listed in the NPDES permit unless there is reason to believe that other compounds are being released that are not limited by the permit. Specific limits for each outfall are outlined in the applicable NPDES permits. Site specific NPDES Permits are shown in Table 2.

In addition to outfall monitoring, DOE-O also intends to complete randomly selected, pretreatment-type inspections at internal monitoring points. These inspections may be more involved primarily due to access and security clearance restrictions.

Toxicity-biomonitoring samples will be collected at discharges that having biomonitoring limits specified by the NPDES permit. Suspect wastestreams and some of the effluents designated as stormwaters will also be targeted; unscheduled grab samples will most often be used for this kind of sampling. Biomonitoring will be used by the Division to further define sources of potential toxicity to aquatic ecosystems in streams receiving wastewater from ORR. The Division plans future instream macroinvertebrate surveys in East Fork Poplar Creek and selected reference streams which will be coordinated between the WM/WPC and the EM/C sections.

TABLE 1
WATERS OF THE STATE WHICH
RECEIVE NPDES DISCHARGES
ON THE OAK RIDGE RESERVATION

<u>SITE</u>	<u>STREAM</u>
K25	Mitchell Branch Poplar Creek Clinch River
Y12	East Fork Poplar Creek Bear Creek
X10	White Oak Creek First Creek Fifth Creek Melton Branch Northwest Tributary

TABLE 2
SITE SPECIFIC NPDES PERMITS

<u>SITE</u>	<u>NPDES PERMIT #</u>
K-25	TN0002950
Y-12	TN0002968
X-10	TN0002941

AMBIENT SURFACE WATER MONITORING

Environmental Monitoring and Compliance (EM/C)

Surface water is an important pathway by which contaminants enter the ecosystem and create ecological and human health risks. It is anticipated that surface water sampling will result from, and be an indicator of; solid waste, stormwater, or groundwater related contaminated sites. Most streams on the Oak Ridge Reservation are classified for supporting wildlife, recreation, fish and aquatic life, livestock watering and irrigation. Since the Clinch River is the major surface water body that receives discharges from the Oak Ridge plants, it is necessary to collect samples of surface water to obtain data that reflects the quality of potential drinking water and projects the pollution extent and possible hazard to human health and the environment. The data from these samples are intended to represent surface water quality as it approaches, contacts, and leaves the Oak Ridge Reservation boundaries. Additionally, this data is intended to fill in any data gaps and support sampling efforts within the ER/Clinch River study which begins at Melton Hill dam and proceeds downstream.

Ambient surface water sampling follow protocols outlined in the Ambient Water Standard Operating Procedures and derived from guidance of EPA approved methods. These protocols include site selection criteria, sampling procedures, sample handling, record keeping and chain-of-custody procedures to ensure adequate QA/QC.

The Environmental Monitoring and Compliance (EM/C) program will also participate in, or observe, sampling that is conducted by Martin Marietta Energy Systems (MMES) or subcontractors.

In addition to the five stations initially sampled on the Clinch River for the ambient surface water monitoring, two stations were added after an indication of a heavy metals influx (Table 3). Stations #1 and #2 are used as background data collection sites and are located upstream of the ORR before any possible impact by the three DOE sites. Stations #3 through #7 are potentially impacted directly by the DOE sites. Each sample is screened for radiological activity by the RM/O program. All sites are sampled quarterly and the results are reported in the TDEC/DOE-O Environmental Monitoring Annual Report. If results warrant a more concentrated study, the frequency of sampling or number of sampling stations may increase.

TABLE 3
AMBIENT WATER QUALITY
SAMPLING STATIONS

<u>STATION</u>	<u>LOCATION</u>
Station #1	Downstream of Norris Dam just above canoe launch at Clinch River Mile 78.7.
Station #2	At Anderson County Water Treatment Plant at the raw water intake line.
Station #3	Melton Hill Lake, Clinch River Mile 35.5.
Station #4	Clinch River Mile 17.9 near Grubbs Island.
Station #5	Clinch River Mile 10.1 near Brashears Island.
Station #6	Clinch River Mile 48.7 just above the Bull Run Steam Plant.
Station #7	Clinch River Mile 41.2 located downstream of the Johnson Controls water intake.

Some sampling efforts need to be addressed on a case-by-case basis. "Spot check" or generic field monitoring can include the collection of ambient monitoring samples for radiological and/or chemical components, or under any situation that might potentially have an adverse effect on human health and the environment. Additionally, some split samples will be taken for agreement with laboratory procedures and analysis results.

Radiological Monitoring and Oversight (RM/O)

The Radiological Monitoring and Oversight (RM/O) program reviews data generated by the TDEC Department of Radiological Health (DRH) at eleven locations surrounding the ORR. Location, frequency, and analytical parameters are contained in Table 4. The RM/O program will supplement this activity by procuring samples for radiological analysis at sites determined by geohydrological investigation to appear more vulnerable to radiological contaminant migration. Proposed locations include Clinch River Mile (CRM) 11, CRM 12.5 at the K-25 scrap yard, CRM 20.0 at Jones Island/Raccoon Creek, CRM 41.5 below Scarboro Facility, and CRM 51.0 below the Atomic City Auto Parts. Additionally, RM/O is attempting to acquire EPA's Environmental Radiation Ambient Monitoring Systems (ERAMS) surface water program.

Table 4

Division of Radiological Health Ambient Water Samples						
ID	FREQ	Gross Alpha and Beta	Gamma	H-3	SR-89/90	LOCATION
W07	Q	Q	Q	---	-----	Clinch R. M23 Melton Hill Dam
W08	Q	Q	Q	---	-----	Clinch R. M21.6 Melton Hill Bridge
W09	Q	Q	Q	Q	-----	Clinch R. M14 Gallaher Bridge
W10	Q	Q	Q	Q	-----	E. Fork Poplar Crk. @ Oak Ridge Turnpike
W11	Q	Q	Q	Q	QC	Clinch R. M48 Bull Run Steam Plant
W13B	Q	---	Q	---	-----	Braden Branch Downstream of ANC
W13S	M	---	M	---	-----	Small Spring on TVA Prop. @ ANC
W49	M	M	M	---	-----	E. Fork Poplar Crk. @ Gum Hollow Road
W50	Q	Q	Q	---	-----	Bear Creek @ Hwy. 95 across from old county road
W51	M	M	M	M	M	White Oak Crk. @ Dam
W58	M	M	M	M	M	Clinch R. M11.5 ORGDP Pumphouse
M = Monthly Q = Quarterly C = Composite						

SEDIMENT ANALYSIS

Environmental Monitoring and Compliance (EM/C)

Aquatic sediment analysis can identify temporal and spatial patterns of water pollution. Due to their adsorptive capacity, sediments may contain contaminants not identified from water samples because of low contaminant concentrations or a missed event. Therefore, DOE-O is collecting sediment samples in conjunction with the ambient surface water samples at stations 3,4,5,6 and 7 (Table 3) to reflect possible contamination at the surface as well as at the river's benthic level, which carries the potential for bioaccumulation. All sediment samples are screened in the field before collection for radiation activity by a representative of the RM/O program. Sediment samples can and will be taken when necessary to "Spot check" if the presence of a contaminant is suspected and carries the potential to harm human health or the environment. Sediment sampling procedures follow protocols and guidance of EPA approved methods.

3. SAFE DRINKING WATER

There were twelve public water systems (PWS) previously identified by this Division as having the potential to be adversely impacted by DOE activities on the ORR. However, the 1992 annual Environmental Report (page 1-17) identified two additional PWS, Soddy-Daisy and Dayton, as also being potentially affected. Five of these PWS have intakes located on the Clinch River within close proximity of the ORR.

The intent of this monitoring effort is to conduct evaluations and collect samples in order to supplement the required sampling currently performed by PWS owners and DOE personnel. In order to accomplish this, TDEC/DOE-O staff will work closely with local governments and public utilities with regards to operations, planning, sample collection, and analysis. Applicable state requirements include the Tennessee Safe Drinking Water Act including 1988 amendment, and Chapter 1200-5-1, Regulations for Public Water Systems and Drinking Water Quality.

Safe Drinking Water

Environmental Monitoring and Compliance (EM/C)

To date, sample data is being analyzed for contaminants which might threaten the quality of drinking water on or near the Oak Ridge Reservation (ORR). This data largely consists of ambient data collected both in-house and through outside sources such as the Department of Energy (DOE), Tennessee Valley Authority (TVA), and other divisions of Tennessee Department of Environment and Conservation (TDEC). Compliance data which is currently being submitted to the Division of Water Supply is reviewed upon submittal. By December 31, 1994, this office will co-sample with DOE representatives selected sampling events concerning drinking water for QA and QC purposes as outlined in Tennessee Oversight Agreement deliverable A.2.2. Also by December 31, 1994, this office will make suggestions to modify current sampling requirements based on the evaluation of data previously described to DOE. Cross connections of public and private water systems are also investigated on a per occurrence basis.

Environmental Restoration (ER)

The ER program provides cross media monitoring of DOE's ER program for the Oak Ridge Reservation (ORR) and a National Priorities List (NPL) site. Monitoring activities include the review, analysis, and oversight of data from all contaminated media associated with the site (i.e., soil, air, sediment, surface and groundwater). Any monitoring revealing contaminants which threaten drinking water will be communicated to the appropriate officials immediately.

Radiological Monitoring and Oversight (RM/O)

RM/O program considers drinking water the most significant pathway for radiological contaminants to impact the public health. In the last year, RM/O's water section (RM/O-W) has focused its activities on the review of DOE/MMES' Off-site Residential Drinking Water Monitoring Program and will continue evaluation in the forthcoming months. Also, RM/O has initiated evaluation of potential impacts of radiological contaminants on area public water systems and associated precautions (radiological monitoring and alarms) and is attempting to acquire EPA's ERAMS program. While samples are to be taken for radiological analysis with above efforts, specific locals and analytes will have to be determined based on potential public impact, hydrologic/geologic considerations, the cooperation of parties involved, and resources. To date samples have been obtained from Bacon Springs and Poplar Springs Valley.

Waste Management (WM)

The WM program does sampling for NPDES permitting to protect waters of the state, as previously discussed. If contaminants are found which potentially threaten drinking water, notification will be made pursuant the NPDES permit for each site.

Safe Dams

Environmental Monitoring and Compliance (EM/C)

TDEC/DOE-O does not recognize any direct TOA or FFA commitments in the area of dam safety. However, the assurance of safe drinking water and water quality on the ORR necessitates state involvement in dam safety issues since most dams on the ORR are used as retention structures for hazardous materials. The Safe Drinking Water/Safe Dam subsection will continue to serve in a general advisory role, reviewing reports, auditing, and accompanying inspectors on site visits to assess such factors as dam stability.

4. BIOLOGICAL/FISH AND WILDLIFE MONITORING

Environmental Monitoring and Compliance (EM/C)

The Biological/Fish and Wildlife Monitoring section has several objectives. One objective is the review of current and historical data to gain an understanding of the biological monitoring that has been done on the ORR, where, by whom, and the results. This includes review of the Biological Monitoring and Abatement Programs (BMAPs) from all three sites (i.e., K-25, Y-12, Oak Ridge National Laboratory (ORNL)), the ORR Environmental Monitoring Plan (EMP), Annual Site Environmental Report (ASER), and the Long Range Environmental Protection Plan (LREPP).

The Biological Monitoring section will design and implement a program supplemental to the existing ORR biological monitoring program to provide a more complete assessment. Ecological characterizations will be used to document ecological impacts of past and current operations and identify contaminant sources that adversely affect stream biota. Fish population and community studies and benthic macroinvertebrate community characterizations will be used to assess effects of water quality and habitat degradation. Initially, two indices of stream health will be implemented, the Ephemeroptera, Plecoptera, and Trichoptera (EPT) richness index and the index of biotic integrity (IBI). The EPT richness index is based on the number of benthic macroinvertebrate species in the orders Ephemeroptera, Plecoptera, and Trichoptera a site contains. These orders contain many pollution intolerant species. The index of biotic integrity (IBI) is a measure of a stream's capacity to support and maintain a "balanced, integrated, and adaptive community of organisms" similar in its structural and functional components to that of the natural habitat of the region. The index consists of twelve metrics that provide measures of species richness and composition, trophic composition, and fish abundance and condition. The index scores a stream on a scale of twelve to sixty which equates to a rating of very poor to excellent respectively.

Bioaccumulation and contaminant monitoring (major concerns on the ORR) which are also tracked by the Biological Monitoring section. The primary objectives of contaminant monitoring are to identify substances that accumulate to levels exceeding those observed in biota from nearby uncontaminated reference sites and evaluate the extent and significance of contamination by those substances. The primary objectives of bioaccumulation monitoring are to determine what materials accumulate to unacceptable levels in biota, identify specific sources of any observed contamination, and to compare water quality monitoring data against contaminant levels in biota. In order to meet these objectives, water, sediments, and fish flesh samples will be taken from various sites on and off the ORR for evaluation.

The Biological Monitoring section will support the NEPA/Audits section in its use of biological monitoring data. The biological monitoring data will be used to determine the biodiversity on the ORR, including identification and assessment of the threatened and endangered (T&E) species and unique and sensitive habitats. The National Environmental Policy Act (NEPA) requires the federal government to consider all reasonable and foreseeable environmental effects of their actions. To the extent possible, an attempt will be made to anticipate and evaluate the effects of a proposed action on the local biodiversity and to assess the adequacy of the environmental assessments (EA) and environmental impact statements (EIS) submitted by the Department of Energy (DOE) to the State of Tennessee as required by NEPA.

In addition to the above described biological monitoring, the Department of Energy Oversight (DOE-O) Division has contracted with the Tennessee Wildlife Resource Agency (TWRA) for fish and wildlife monitoring activity. The assignment of biomonitoring is a listed subsection of the (A.2) Surface Water Monitoring section of the Tennessee Oversight Agreement (TOA). The 1994 activities for TWRA include mussel sampling at three stations in the Clinch River proximate to the ORR. Full analyte lists will be applied to the soft and hard tissue samples as practical. Sediment samples will be collected at mussel sampling stations. The data will be correlated against tissue and mussel community and habitat information, if tissue analysis shows significant amounts of contaminants.

Radiological Monitoring and Oversight (RM/O)

The RM/O program is involved in several aspects of biological/ fish and wildlife monitoring. They work with TWRA on the deer and goose monitoring program, and the Clinch River mussel survey, scanning samples to ensure safety of the public as well as the staff involved. The Environmental Restoration (ER) section (RM/O) will conduct monitoring of deer and geese kills in conjunction with TWRA and ORNL personnel during the hunting season.

5. GROUNDWATER MONITORING

Environmental Monitoring and Compliance (EM/C)

This section will baseline the groundwater monitoring program necessary to accomplish the fulfillment of specific sections of the TOA and Federal Facilities Agreement (FFA) and the TDEC mission and/or deliverables. Objectives are as follows:

- + Assurance of compliance at the ORR and areas related to activities at the ORR.
- + Evaluation and assessment of the DOE groundwater monitoring activities for quality, quantity and effectiveness.
- + Co-tracking and oversight of releases and/or potential impacts on health and/or environment.
- + Augment current DOE programs through independent monitoring pertinent hydrogeologic regime(s).
- + Analyze data that can be utilized in integration of groundwater and other environmental monitoring data to determine future needs.
- + Document results to be used in the annual report specific to the TOA A.7.2.2.

- + Supplement information to the FFA section XXVIII b.
- + Generally enhance decision making, planning, enforcing regulations, and understanding groundwater systems.

The groundwater monitoring program, as a necessity, will grow in phases until full operation. Initially the program will identify and document sampling locations, protocols and any considerations applicable in executing the objectives of this plan. Proficiencies in this first phase have been made. Familiarization and orientation to the DOE's ORR sampling program will proceed by accompanying ORR personnel on sampling trips. Upon completion of orientation, DOE-O staff will replicate samples taken on a regular basis at a sufficient number of locations to meet the stated objectives.

Exit pathways will be of prime focus during the initial phase and likely continue until priorities change. Off-site monitoring will be conducted to benefit the public in their concerns and investigate potential migration of contaminants in the active karst system(s). Springs along Scarboro Creek are currently under investigation and preliminary planning to trace to these springs is underway. The balance of monitoring will involve special projects connected to the facilities; their operation, waste generation (past and present), restoration, decontamination & decommission and investigation of the hydrogeologic regime(s). This balance includes the RCRA regulated sites, CERCLA sites, and UST locations.

Schedules, sample locations and parameters will generally mirror or parallel those of DOE. DOE will have the opportunity to replicate any samples taken under this program consistent with TOA language.

Selected wells of the 42 wells identified as exit pathways and/or convergent points in Table 4 will be evaluated and/or replicate-sampled with ORR personnel. Convergent points are explained in detail in DOE's Environmental Monitoring Plan. TDEC/DOE-O intends to co-monitor these locations with DOE. The current frequency for sampling the wells is annual and wells will be evaluated or sampled by the DOE-O on the same cycle. Deviation may occur from this cycle as conditions warrant. The off-site wells identified in Table 5 will be evaluated and/or monitored in like manner as the exit pathways. A portion of the wells on the ORR, sampled and analyzed in connection with RCRA, CERCLA, UST's, and any

TABLE 5
DOE GROUNDWATER MONITORING

Convergent Point Exit Pathway	Surveillance Wells (from DOE EMP 1992)	Parameters
<hr/> K-25 <hr/>		
Mitchell Branch	UNW-107 BRW-83	VOCs ⁹⁹ Tc
K-1007-B Pond	UNW-108 BRW-84	Gross alpha Gross beta Total uranium Fluoride
K-901-A Pond	UNW-56 BRW-35 UNW-67 BRW-68	
<hr/> ORNL <hr/>		
WOC/Melton Valley	0859 0860 1236 0857 0858 1239 1189 1190 1191 1192	VOCs Tritium ⁹⁰ Sr Gross Alpha Gross Beta ⁶⁰ Co ¹³⁷ Cs
West Bethel Valley	1247 1448 0990	
East Bethel Valley	1196 1197 1198 1199	
White Wing Scrapyard	1136 1143 1146	

TABLE 5 cont.

Y-12

Bear Creek Regime	1 new UNW well up to 7 new BRW's	VOCs ⁹⁹ Tc
UEFPC Regime		Gross alpha
-Pine Ridge Gap	GW-206, GW-207, GW-208	Gross beta
-Scarboro Road	GW-733, GW-735, Westbay system, GW-722	Total uranium Nitrate

TABLE 6

DOE Off-Site Wells
(from DOE EMP 1992)

Well	Parameters
RWA 01 to RWA 07	VOCs
RWA 09 to RWA 11	Gamma Scan
RWA 13 to RWA 15	Gross Alpha
RWA 17 and RWA 21	Gross Beta
	⁹⁹ Tc
	Total radioactive Sr
	Tritium
	AA Metals
	ICP Metals
	Anions
	Total Uranium

other wells used in compliance activities will be evaluated and/or sampled on a basis specific to individual rationale and design criteria.

Several groundwater wells from the ORR and vicinity will be evaluated or replicate-sampled during the initial phase of Environmental Monitoring. This number will increase as statistical and public exposure considerations are taken into account. Random or "spot checks" will be performed in the later stages of the initial phase and continue forward to aid in verification and identification of concerns not apparent in routine monitoring.

PETROLEUM UNDERGROUND STORAGE TANK MONITORING

Environmental Monitoring and Compliance (EM/C)

There are numerous underground storage tanks (UST) on the ORR used to store petroleum products. Under the TDEC Division of Underground Storage Tanks Regulations, there are specific sampling requirements to close a petroleum UST, as well as for a UST where a release has been confirmed. Several of the ORR UST's are in the process of being closed and/or have released petroleum to the environment.

During routine tank closure and at leaking UST sites, soil and groundwater samples will be taken to: 1) determine if contamination is present; 2) delineate the extent of contamination; 3) monitor the effectiveness of implemented corrective actions and 4) monitor contamination to determine if additional action is necessary. Analytical parameters will include total petroleum hydrocarbons (TPH), and benzene, toluene, and xylene (BTX). Additional analytical parameters may be analyzed if there is potential for commingled plumes from adjoining impacting sites.

DOE-O will closely review all soil and groundwater sampling activities associated with UST's. Replicate samples will be taken to verify DOE's analytical results. In selecting sampling points, DOE-O will consider: 1) where contamination is most likely to be present; 2) potential for contaminant migration; 3) areas of visual contamination (fuel saturated soil, free product, or groundwater) and 4) data gaps. Analytical parameters include BTX and TPH, unless additional parameters are required. The number of replicate samples and analytical parameters will be site specific and depend upon the environmental impact of the site and how thoroughly it is investigated and remediated.

HAZARDOUS WASTE/HAZARDOUS SUBSTANCE UNDERGROUND STORAGE TANK MONITORING

Environmental Monitoring and Compliance (EM/C)

USTs are used on the ORR to store hazardous waste and hazardous substances. These USTs are regulated under the Resource Conservation Recovery Act (RCRA), Subtitle C and Subtitle I. Specific sampling requirements are given in these regulations for tank closure and to delineate the extent of contamination, if substances are released to the environment. DOE-O will collect replicate soil and groundwater samples when deemed appropriate. The section on petroleum UST monitoring contains information on sampling point selection, number of samples, and justification to collect samples. Analytical parameters will depend upon substances stored in the UST. Additional parameters may be analyzed if co-mingled plumes have been identified at the site.

6. AIR QUALITY MONITORING

Air quality monitoring is performed primarily by three of the program areas in DOE-O:

- A. Radiological Monitoring - Radiological parameters
- B. Environmental Monitoring and Compliance -
Nonradiological environmental parameters, (Hazardous
Air Pollutants, HAPS, Hazardous Organic NESHAPS, HONS)
- C. Waste Management - Permits and waste parameters

These program areas each have specific, yet overlapping, responsibilities. The cooperation within DOE-O is enhanced by the in-house air quality circle. It has been through this quality circle that this plan has been developed.

The primary goal of air quality monitoring is to help insure the safety of the citizens and environment in the state of Tennessee. This goal will be met by the oversight of air emissions, both source and fugitive, and the oversight of the ambient air quality on the Oak Ridge Reservation and surrounding areas.

Radiological Monitoring and Oversight (RM/O)

During 1994, DOE-O will provide oversight of ambient air monitoring for radiological contaminants. Existing ambient air data will be reviewed to help identify any problems or trends. Oversight of DOE/MMES ambient air monitoring will be performed by reviewing DOE/MMES' sampling methods, techniques, and operations. DOE-O will also co-sample and create a supplemental sampling program for QA/QC purposes and to help identify incompleteness in the existing system. Changes will be recommended as problems are identified. There will be an effort to acquire one or more ERAMS sampling stations for the ORR. The site selection criteria and applicability will be reviewed for the present monitoring site locations. A review of the equipment applicability and calibration will also be performed. The analytical methods and parameters will be reviewed. There will be a review of air models such as CAP88, CAP88PC, COMPLY, RASCAL, ISC, etc. to evaluate their usefulness in DOE-O's oversight responsibilities. Catastrophic release scenarios will be reviewed. A review of the ORR meteorological system, including data and operations, will be performed in relation to topographical data. The DOE-O will provide oversight of stack sampling and monitoring which produce data for radiological NESHAP compliance. This oversight of stack sampling and monitoring will include the review of data, methods, technologies, and operations. Changes will then be recommended if it is necessary. In addition, DOE-O will participate in any DOE or EPA audits concerned with radiological air monitoring.

Waste Management Section (WM)

DOE-O will perform annual inspections of all sources permitted by TDEC/APC Division (See Table 7). These inspections will include visible emission evaluations where applicable, "walk thru" inspections of the processes, and a review of the emissions data when available. As a supplement to these inspections, DOE-O will review DOE's stack sampling system and in-line monitoring system. The data produced by the stack sampling system and in-line monitors will also be reviewed. DOE-O will inspect sources which are being constructed, modified, or removed from service. Occasionally, DOE-O will observe some of the open burn projects and review the burn plans associated with these projects. DOE-O will perform oversight of the major asbestos removal activities performed on the ORR. In addition, DOE-O representatives attend the monthly TSCA incinerator operations meeting.

Environmental Monitoring and Compliance Section (EM/C)

DOE-O will review ambient air monitoring results for mercury, polychlorinated biphenyls (PCB), total suspended particulates (TSP), particulate matter (PM₁₀), hydrogen fluoride (HF) and various metals in addition to radionuclides. DOE-O will also audit the ambient air monitoring system which is in place for the monitoring of the parameters mentioned directly above. In the event of any gaps observed in the data or the identification of unmonitored pollutants of concern, DOE will be notified and the DOE-O monitoring network may be adjusted as necessary. For additional support, current DOE and NOAA meteorological data will be evaluated. DOE-O will also review reports resulting from various DOE environmental audits. DOE-O will attend any of these audits which are concerned with non-radiological air monitoring. DOE-O will review data resulting from ambient air monitoring performed around D&D projects. Information concerning fugitive air emissions will also be reviewed. An effort will be made to obtain a list of sites which produce fugitive emissions of hazardous air pollutants (HAPs). Source emissions data for the criteria pollutants and the HAPs will be reviewed to help evaluate the need for ambient monitoring of these pollutants. DOE-O will perform TSP analysis on any 24hr, particulate, in-house samples which are taken for radiological parameters on an 8"X10" filter.

Table 7

ACTIVE PERMITTED SOURCES ON THE ORR

K-25

Permit #	Building
732346P	K-1200
032930P	K-1401
734461P	K-1095
934193P	K-1401
016309P	K-25
016312P	K-1501
029902F	K-1501
035063P	K-1414
037113P	K-1414
937114F	K-1501
025655P	K-1024
024105P	K-1435-C
029895P	K-1425
032449I	K-1435
033203P	K-1202
034392P	K-1202
034619P	K-1420

ORNL

030284P	2519
024114P	2522
030835P	2525
027257P	2525
024151P	2525
031062P	2525
024949P	2525
028439P	2547
035494P	3039
036689P	3500
030881P	3502
027194P	3502
023808P	3502
023807P	3502
036053P	3502
730468P	3544
029830P	3587
730489P	3608
732645P	4508
024306P	4508
025282P	6010
030980P	7002
024118P	7005
030824P	7007

Permit #	Building
024307P	7021
030101P	7057
730836P	7069
017930P	7600
027090P	7602
035134F	7603
731010P	7830
034381P	7911
024912P	7934
027393P	7935
029660P	ORNL
034960P	Bulb crusher

Y-12

Over 100 active permits exist at the Y-12 facility. The permit list has not been validated at this time, but will be validated during the 1994 annual inspection.

7. WASTE MANAGEMENT SECTION

The Waste Management Section will be involved in varying degrees with the Environmental Monitoring Plan for all DOE Oak Ridge facilities which produce, handle, or store solid, hazardous, radioactive, and/or mixed waste.

The scope of Waste Management's efforts will involve monitoring and review of data and information related to various design, construction, operations, and D&D activities. The scope of this work will be accomplished by:

- Providing engineering reviews and evaluations of various design packages to assure adequate design parameters.
- Conduct various field trips to inspect and observe construction activities to assure proper construction methods and quality control.
- Participate in meetings and discussions, review various documents, and provide comments regarding, performance evaluations, radiological controls of solid waste, solid radiological waste disposal practices, waste acceptance criteria, various DOE Orders, etc.
- Inspect various facilities to observe operation procedures related to storage and cleanup operations.
- Participate in D&D activities including building surveys, review of updated D&D inventory lists and schedules, and review of evaluations ongoing to determine need to accelerate D&D activities.

8. RADIOACTIVITY SURVEILLANCE

In contrast to most environmental and public health legislation, the Atomic Energy Act (AEA), enacted in 1954, exempts DOE from certain regulations pertaining to radiation and delegates to DOE the authority to manage radiological materials generated at its facilities. The Tennessee Oversight Agreement (TOA) is intended to assure the health, safety, and environment of the State are protected and that DOE complies with all applicable laws, regulations, and orders. The radiological section of the Environmental Monitoring Plan is derived primarily from the TOA and reflects commitments originating from this document. The goals and objectives of this plan demonstrate the need for a comprehensive radiological monitoring/surveillance oversight strategy.

The goals of DOE-O's radiological monitoring/surveillance activities are:

- + To evaluate and affect compliance with applicable laws (SDWA, RCRA, CERCLA, AEA, CAA, NESHAPS, CWA, etc.), regulations, DOE Orders (5400 Series), agreements (TOA, FFCA), administrative policies (BDAT, ALARA), EPA approved procedures and guidelines (Environmental Regulatory Guide for Radiological Monitoring and Environmental Surveillance - DOE/EH-0173T-January 1991);
- + To assess the effectiveness of radiological controls implemented on the ORR by DOE and its contractors;
- + To characterize radiological contaminants and determine the impact and/or potential impact of DOE activities on the health of the environment and the citizens of the State; and
- + To facilitate corrective measures necessary to provide a healthful environment for the citizens of the State of Tennessee.

It is the Division's intent as prescribed by the TOA (A.6 and C.3): to review all DOE-OR radiological surveillance programs and make recommendations where appropriate; to participate with DOE in sampling and analysis of pathway indicators (crops, milk, wildlife) as necessary to characterize and evaluate onsite control measures; to develop radiological monitoring programs addressing all media (soil, air, and water) that will compliment and verify DOE radiological monitoring activities; to assess hazards associated with DOE operations (past and present); to identify potential risks posed by decontamination and decommissioning (D&D) of contaminated facilities and environmental remediation (ER); and to facilitate the development of programs to warn of and respond to emergency conditions.

The above requires the application of a variety of disciplines (e.g., Health Physics, Geology, Hydrology, Meteorology, Biology, Waste Management, Engineering) and the contribution of all DOE-O Programs. The Radiological Monitoring and Oversight Program has been designated as radiological support for the remaining DOE-O programs and its organization reflects that of the Division. RM/O program activities are developed in concert with WM, EM/C, and ER and integrated with these programs. Where activities have previously been addressed in this EMP, they will not be reiterated here except where necessary for clarity.

Radiological Materials Management

WM will continue to provide expertise and oversight in the generation, handling, storage, disposal, treatment, and monitoring of radioactive materials and mixed/radioactive wastes. Activities include the review/comment on numerous documents (e.g., plans, hydrological data, performance evaluations, waste disposal practices, waste acceptance criteria, etc.) and the inspection of waste handling facilities. In conjunction with WM, RM/O-Materials Management Section has initiated investigations into the environmental impact of the storage, disposal, treatment, and transport of low level waste, spent nuclear fuel, high level waste, transuranic wastes, plutonium, and surplus enriched uranium.

WM's Engineering Support (WM-ES) section and RM/O's Site and Facility Evaluation (RM/O-SAFE) section will initiate waste management and radiological facility surveys that will include building evaluations, radiological assessments, spill/leak investigations, and personnel inquiries. The primary focus of these activities are to assure that DOE's surveillance and maintenance (S&M) programs along with their decontamination and decommissioning (D&D) programs are being managed sufficiently to satisfy the requirements of the TOA with an emphasis on radiological monitoring, D&D, and waste management. The accompanying flow chart (Figure 2) illustrates Division coordination and cooperation in this effort. DOE-O's goal is to survey the buildings listed in Table 8 by January 1, 1995.

Additionally, past waste disposal practices and cessation of operations at ORR have resulted in a large inventory of surplus contaminated facilities which may pose a risk to health and environment. DOE is to evaluate these facilities to determine if accelerated D&D is warranted. WM-ES with RM/O support will review and evaluate associated feasibility studies, engineering reports, and plans (characterization, sampling, waste management, stormwater pollution prevention, health and safety, etc.). DOE-O activities will include oversight of decontamination practices, construction management, site preparation, demolition materials management (characterization, removal, storage/disposal), final site readings, and cap maintenance.

Water & Air

RM/O Water & Air Section's activities are developed in collaboration with EM/C and WM Programs and are addressed in the Drinking, Ground, and Surface Water chapters and Air Monitoring chapter of this EMP, respectively.

SURVEILLANCE AND MAINTENANCE SURVEY FLOW CHART

Table 8
Building Selection List for Building Survey

K-25

D&D	1.	K-1024, Office area, 4800 ft ² , Access Control Level 4
D&D	2.	K-1031, Storage Bldg. 2660 ft ² , Access Control Level 2
D&D	3.	K-1233A, Drum Cleaning Facility, 900 ft ² , Access Control Level 2
Standby	4.	K-1302, Fluorine Storage, Access Control Level 2
Standby	5.	K-892, Recirculating Water Pumphouse, 23,000 ft ² , Access Control Level 2

X-10

D&D	1.	Bldg. 3506 (Bethel Valley), 616 ft ² , Waste Evaporator Facility
D&D	2.	Bldg. 3001 (Bethel Valley), Graphite Reactor
Standby	3.	Bldg. 3004, Water Demineralizer, 3690 ft ²
Standby	4.	7819 Interim Decon Bldg. 2200 ft ²
Standby	5.	3085 ORR Pumphouse 800 ft ²

Y-12

	1.	9203 Metrology, Calibration, Electronics Lab, 30,800 ft ²
Standby	2.	9720-5 Warehouse
Standby	3.	9620-2 Z-Oil Filter and Pumphouse
Standby	4.	9407-7 PCB Storage
Standby	5.	9404-3 Pumphouse (Southside Piping System)

Nuclear Spent Fuel Facilities

(Note: The following facilities are all at X-10)

1.	3019-B High Level Analytical Lab, 3,787 ft ²
2.	3525 High Level Radiation Level Examination Lab, 26,543 ft ²
3.	7823 or 7823-A Underground Storage Building for 7802 (SWSA 5), 4,000 ft ²
4.	7827 High Level Alpha Waste Storage, 1,152 ft ²
5.	7829 Peach Bottom Storage Wells, 200 ft ²

Soil, Vegetation, and Milk

RM/O-SAM intends to review DOE soil, vegetation, and milk sampling methods, technologies, and practices; review sampling data; access site selection criteria; recommend changes where appropriate; and implement independent sampling with locations yet to be determined.

Terrestrial and Aquatic Biota

RM/O Environmental Restoration (RM/O-ER) provides radiological support to EM/C and TWRA as addressed in the Biological/Fish and Wildlife monitoring chapter of this EMP.

External Gamma Radiation

At several locations on the Oak Ridge Reservation and off-site, external gamma radiation exceeds background levels. The on-site areas are accessible to members of the public on a restricted basis (drive-through traffic or visiting the facilities), while those off-site are unrestricted. DOE-Oversight will monitor selected areas periodically to ensure that the public and the environment are protected.

The objectives of this activity are to verify and complement DOE's radiological monitoring program which is designed to assess the actual or potential radiation dose to persons: 1) living near the Oak Ridge Reservation; 2) visiting facilities on the Oak Ridge Reservation or passing through the Oak Ridge Reservation; and 3) fishing or boating in creeks or rivers near the Oak Ridge Reservation.

Members of the public can be exposed directly to gamma radiation from radionuclides released into the environment; from previously-released radionuclides deposited on soil and vegetation, or in sediments; from radiation-generating facilities, and from the storage of radioactive materials.

Several areas have been identified on the Oak Ridge Reservation that have external gamma radiation levels significantly above ambient background.

Because the sources of public exposure to external radiation are different (airborne emissions, soil and sediments, cylinder storage), the design criteria are also different. A primary factor in selecting the monitoring locations for gamma radionuclides will be the potential for public exposure. RM/O is considering the use of environmental thermoluminescent dosimeters for this program.

Continuous gamma monitoring will require location of monitoring equipment at selected ambient air stations. These may be co-located with DOE monitors depending on source evaluation. Locations may be based on existing Department of Energy models, or other acceptable models, using the average meteorological conditions and existing population distributions to predict the

transport of contamination. External gamma radiation levels will be monitored, depending on DOE-O resources, at ambient air stations using a pressurized ionization chamber gross gamma monitor.

Environmental Restoration (ER)

RM/O's Environmental Restoration (RM/O-ER) Section is designated as radiological support for the Environmental Restoration Program and has initiated a review of radionuclides associated with specific operable units (decay schemes, equilibrium states and nuclide half life comparisons in relation to institutional controls).

Emergency Response

The Tennessee Emergency Management Agency (TEMA) has been contracted to manage development of programs that will enable state and local governments to respond to protect the citizens of Tennessee from emergencies that could develop on the ORR (e.g., accidental radiological releases). RM/O-SAFE (Site and Facility Evaluation) will continue to interface with TEMA in the development of activities related to DOE-O responsibilities in the event of catastrophic scenarios, and necessary precautions to protect the public welfare and the environment.

9. ENVIRONMENTAL RESTORATION

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) provides the ultimate legislative initiative in facilitating the environmental restoration of the ORR.

The Environmental Restoration (ER) Program within the DOE Oversight Division provides cross media monitoring of DOE's ER program for the Oak Ridge Reservation (ORR) as a National Priorities List (NPL) site. Monitoring activities include the review, analysis, and oversight of data from all contaminated media associated with the site (i.e., soil, air, sediment, surface and groundwater). The NPL site has been subdivided into smaller units for investigation purposes. Through the Federal Facilities Agreement (FFA), which is a tri-party agreement between Tennessee, DOE, and the Environmental Protection Agency (EPA); specific units are scheduled for deliverables as shown in ER-Table 9. The ER Program has a joint responsibility with EPA to review, comment, and approve the deliverables in ER-Table 9.

In addition to the monitoring/oversight associated with those deliverables, the ER Program is working intensively with DOE to complete data quality objective (DQO) workshops on all units that are currently in the remedial investigation phase. ER-Table 10 list units where a DQO workshop is planned to occur between June - Dec. 1994.

FY 1994 FFA MILESTONES

OU Deliverable		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
WAG 6 Monitoring Plan	10/01/93	X											
WAG 7 Treatability Study	10/01/93	X											
K-1070 SW-31 Spring Ph. II RD	11/24/93		X										
WAG 5 Seeps Removal EE/CA	12/01/93			X									
WAG 1 Groundwater Ph. II RIWP	01/31/94				X								
Active LLLW Tanks D/I Assessment for FFA Compliance Work, Bldg. 3019A	01/31/94				X								
UEFPC FS/EIS	02/21/94					X							
UEFPC OU 2 RI Report	02/22/94					X							
WAG 13 Postconstruction Report	02/28/94					X				X			
WAG 5 Seeps Removal Action Memo	03/18/94						X						
M.&B. VG RI Work Plan	03/31/94						X						
Active LLLW Tanks Second. Contain. Design Cat. B Pipelines	03/31/94						X						
UEFPC OU 2 Proposed Plan	04/21/94							X					
K-1070 SW-31 Spring Ph. I Postconstruction Notification	04/29/94							X					
WAG 1 G&AT RI/FS Report	05/02/94								X				
WAG 11 Postconstruction Report	05/31/94									X			
Active LLLW Tanks D/I Assessment for Melton Valley LLLW-CAT Line Item	05/31/94									X			
Active LLLW Tanks Plans and Schedules Document	06/30/94										X		

FY 1994 FFA MILESTONES

OU Deliverable	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
UEFPC OU 2 ROD										X		
IEFPC Proposed Plan										X		
K-1070 SW-31 Spring Ph. II RA Work Plan											X	
Lower Watts Bar Reservoir RI/FS/EA											X	
Lower Watts Bar Reservoir Proposed Plan											X	
Bear Creek OU 02 RI Report											X	
Chestnut Ridge OU 02 RI/FS Report											X	
ORR Ecological Risk Assessment											X	
South Campus Facility RI/FS Report												X
Active LLLW Tanks Annual Compliance Status Report												X
WAG 2 Site Sampling & Analysis Plan (Addendum)												X
WAG 2 Annual Monitoring (ERMA Report)												X
WAG 1 Core Hole 8 Plume EE/CA												X

January 27, 1994
TTA PM/94-001

ER-Table 10	
ORR Units Scheduled for DQO Workshop	
Unit	Date
K-25/K-901	June 6, 1994
X-10/Corehole 8	June 20, 1994
X-10/WAG 2	June 20, 1994
X-10/Groundwater	June 22-23, 1994
Y-12/Bear Creek OU 4	June 28-30, 1994
Y-12/East Fork Poplar Creek OU 1	- to be determined

The DQO process is iterative throughout the investigation and remediation phase of the CERCLA which is implemented through the FFA at ORR. The ER Program is, at a minimum, involved in four meetings per month where the FFA parties meet to evaluate data and review progress on units. Officials at the three facilities, X-10, Y-12, K-25, as well as the offsite areas and the FFA project managers schedule field trips, data review sessions, working group meetings, and sampling events as needed throughout the year.

9. LABORATORY PROCEDURES

The Tennessee Department of Health, Environmental Laboratory and Microbiological Laboratory Organization (Laboratory Services) has expertise in a broad scope of services and analysis available to DOE-O and other TDEC Divisions statewide. With a history of producing legally defensible data, the Tennessee Laboratory Services Divisions Standard Operating Procedures (SOP) serve as development guides to the DOE-O EMP laboratory procedures. Data quality objectives will be consistent with those successfully involved in similar regulatory activities statewide. General sampling and analysis methods are to follow EPA guidelines as listed in appropriate parts of 40 Code of Federal Regulations (CFR). Advice will also be solicited from EPA, Region IV personnel for clarification and procedural questions that may arise. Certain analyses and QC samples may be subcontracted out by Laboratory Services to independent laboratories. Bench level QA/QC records and chain-of-custody records are maintained at the Tennessee Environmental Laboratory as are QA records on subcontracted samples.

DOE-O will primarily use the Knoxville branch of Laboratory Services. Wet chemistry and metals samples will generally be analyzed in Knoxville while organics, toxicity and radiological samples will be sent on to the Central Laboratory at Nashville. Under some circumstances, samples may also be analyzed at the Jackson Branch of Laboratory Services. DOE-O sample analysis will be prioritized along with those from other divisions statewide. Some biological sample analysis may be done by DOE-O. All laboratory analysis will follow appropriate methods as documented in the Laboratory Services Inorganic Chemistry SOP (1994), Organic Chemistry SOP (1994) and Aquatic Biology SOP (1994).

Appropriate QA/QC practices will be followed to ensure quality and appropriateness of:

- + Sampling design objectives
- + Sample container preparation - organization
- + Paperwork preparation - organization
- + Sampling procedures
- + Preservation and transportation - holding times
- + Health physics education and evaluation
- + Chain of custody
- + Field QC - duplicates - replicates, blanks, etc.
- + Lab QC - duplicates - standards - spikes, etc.
- + Analytic methods
- + Units of measure
- + Accuracy
- + Precision
- + Detection Limits
- + Others

The level of effort involved in QA/QC will depend on the study objectives. Screening level samples for toxicity may not satisfy all QA/QC requirements if, for example, the samples were intended for a full follow-up chronic toxicity test.

Specific analytical methods are covered in the Standard Operating Procedures manuals for the Tennessee Laboratory Services Division. The SOP's refer analysts to proper EPA or other methods. In order to assess methods used by the ORR, DOE-O and Tennessee Laboratories should communicate with their sampling and analytical counterparts within the ORR on a basis that facilitates technical exchange and openness.

Samples of the following state forms are attached to this laboratory section. They are not all inclusive, but represent some of the primary environmental samples to be collected by DOE-O:

- + Organic Analysis, Purgeables, and Petroleum Hydrocarbons.
- + Organic Analysis, Base/Neutral/Acid Extractibles.
- + Inorganic Analysis, Liquids
- + Inorganic Analysis, Solids
- + Radiochemical Analysis
- + Ambient Monitoring and Biological Analyses
- + Chain of Custody Form

ca0228.99

Sample Source _____ I.D./Site No. _____ County _____ Field No. _____ Stream Mile _____ Depth _____ Collected: Date _____ Time _____ By _____ Contact Hazard _____ Signature of sampler _____ Send Report to _____ _____ _____	Sampling Agency ___ APC ___ DOT ___ DWS ___ GW ___ SWM ___ UST ___ EEP ___ PASI ___ SF ___ WPC ___ other (specify): _____ _____ Billing Code (required) _____ _____	Sample Type ___ Soil ___ Sediment ___ Water ___ Other _____ _____	Sample Priority ___ Emergency ___ Legal ___ Routine ___ Ambient Date Priority needed: _____ _____
Field Comments: _____ _____ _____			

For lab use only

Laboratory Number _____

Date received _____

Time received _____ by _____

Date reported _____ by _____

Reviewed by _____

	*	Halogenated
32104		bromoform
32101		bromodichloromethane
34413		bromomethane
32102		carbon tetrachloride
34301		chlorobenzene
34311		chloroethane
34576		2-chloroethylvinyl ether
32106		chloroform
34418		chloromethane
32105		dibromochloromethane
34536		1,2-dichlorobenzene
34566		1,3-dichlorobenzene
34571		1,4-dichlorobenzene
34668		dichlorodifluoromethane
34496		1,1-dichloroethane
34531		1,2-dichloroethane
34501		1,1-dichloroethene
		cis-1,2-dichloroethene
34546		trans-1,2-dichloroethene
34541		1,2-dichloropropane
34045		cis-1,3-dichloropropene
34699		trans-1,3-dichloropropene
34423		methylene chloride
34516		1,1,2,2-tetrachloroethane

[illegible][illegible]

* Petroleum Hydrocarbons
Gasoline Range Organics
Diesel Range Organics
Additives:
Methyl tert-butyl ether
diisopropyl ether

* please check desired parameters

Lab Comments:

Sample Source _____ I.D./Site No. _____ County _____ Field No. _____ Stream Mile _____ Depth _____ Collected: Date _____ Time _____ By _____ Contact Hazard _____ Signature of sampler _____ Send Report to _____ _____ _____	Sampling Agency ___ APC ___ DOT ___ DWS ___ GW ___ SWM ___ UST ___ EEP ___ PASI ___ SF ___ WPC ___ other (specify): _____ _____ Billing Code (required) _____ _____	Sample Type ___ Sediment ___ Soil ___ Tissue ___ Water ___ Air ___ sludge Other _____	Sample Priority ___ Emergency ___ Legal ___ Routine ___ Ambient Date Priority needed: _____
--	---	---	---

For lab use only

Laboratory Number _____

Date received _____

Time received _____ by _____

Date reported _____ by _____

Reviewed by _____

	*	Base/Neutral
34273		bis(2-chloroethyl) ether
34278		bis(2-chloroethoxy)methane
34283		bis(2-chloroisopropyl) ether
34636		4-bromophenylphenyl ether
34641		4-chlorophenylphenyl ether
34386		hexachlorocyclopentadiene
34391		hexachlorobutadiene
39700		hexachlorobenzene
34396		hexachlorocyclohexane
34551		1,2,4-trichlorobenzene
34581		2-chloronaphthalene
39330		aldrin
39337		a-BHC
39338		b-BHC
34259		d-BHC
39340		g-BHC (lindane)
39350		chlordane
38310		4,4'-DDD
39320		4,4'-DDE
39300		4,4'-DDT
39380		dieldrin
34361		endosulfan I
34356		endosulfan II
34351		endosulfan sulfate
39390		endrin
34366		endrin aldehyde
39410		heptachlor
39420		heptachlor epoxide
39400		toxaphene

[illegible][illegible]

* please check desired parameter

Lab Comments: _____

STATE OF TENNESSEE - ENVIRONMENTAL LABORATORIES

INORGANIC ANALYSIS, LIQUIDS

For lab use only

Laboratory Number _____

Date received _____

Time received _____ by _____

Date reported _____ by _____

Reviewed by _____

Reviewed by _____

Sample Source _____
 I.D./Site No. _____
 County _____ Field No. _____
 Stream Mile _____ Depth _____
 Collected: Date _____ Time _____ By _____
 Contact Hazard _____
 Signature of Sampler _____
 Send Report to _____

Sampling Agency

___ APC ___ DOT
 ___ DWS ___ GW
 ___ SWM ___ UST
 ___ EEP ___ PASI
 ___ SF ___ WPC
 ___ other (specify): _____

Billing Code (required) _____

Sample Type

___ Water
 ___ Wastewater
 ___ Air

Other _____

Sample Priority

___ Emergency
 ___ Legal
 ___ Routine
 ___ Ambient

Date Priority needed: _____

Field Comments: _____

Code *	Field Tests Only	Units	Value
00094	conductivity	µmho	
00300	dissolved oxygen	mg/L	
00061	flow	CFS	
00400	pH	Units	
00545	residue, settleable	ml/L	
00077	Secchi disc	M	
00010	temperature	°C	
50060	chlorine, residual	mg/L	

Microbiology

01616	coliform, fecal	cfu /100 ml.	
31501	coliform, total	cfu /100 ml.	
31679	streptococci, fecal	cfu /100 ml.	

Physical Characteristics

00081	color, apparent	PtCoU	
00080	color, true	PtCoU	
	flash point	°C	
00403	pH, lab	Units	
00515	residue, dissolved	mg/L	
00545	residue, settleable	ml/L	
00530	residue, suspended	mg/L	
00500	residue, total	mg/L	
00095	specific cond. 25°C	µmho	
00070	turbidity	NTU	

Organics

00310	BOD, 5-day, 20°C	mg/L	
00335	COD (low)	mg/L	
00340	COD (high)	mg/L	
	formaldehyde	µg	

Code *	Organics	Units	Value
38260	MBAS	mg/L	
00550	oil and grease	mg/L	
	Hydrocarbons, total	mg/L	
32730	phenols	µg/L	
00690	TOC	mg/L	

Non-metallic inorganics

70508	acidity, as CaCO ₃	mg/L	
00110	alkalinity, total, as CaCO ₃	mg/L	
00115	alkalinity, phen., as CaCO ₃	mg/L	
01022	boron	ug/L	
00940	chloride	mg/L	
50060	chlorine, residual	mg/L	
01032	chromium, hexavalent	ug/L	
00720	cyanide	mg/L	
00290	dissolved oxygen	mg/L	
00950	fluoride	mg/L	
00900	hardness, total, as CaCO ₃	mg/L	
82395	hardness, Ca, as CaCO ₃	mg/L	
00635	nitrogen, total kjeldahl	mg/L	
00610	nitrogen, ammonia	mg/L	
00605	nitrogen, total organic	mg/L	
00630	nitrogen, NO ₃ & NO ₂	mg/L	
00615	nitrogen, nitrite	mg/L	
00620	nitrogen, nitrate	mg/L	
70507	orthophosphate, total	mg/L	
00666	phosphate, dissolved	mg/L	
00665	phosphate, total	mg/L	
00955	silica	mg/L	
00945	sulfate	mg/L	
00745	sulfide, total	mg/L	

Code *	Metals	Unit	Value
01105	aluminum, Al	µg/L	
01097	antimony, Sb	µg/L	
01002	arsenic, As	µg/L	
01007	barium, Ba	µg/L	
01012	beryllium, Be	µg/L	
01027	cadmium, Cd	µg/L	
00910	calcium, Ca	mg/L	
01034	chromium, Cr	µg/L	
01037	cobalt, Co	µg/L	
01042	copper, Cu	µg/L	
01045	iron, Fe	µg/L	
01051	lead, Pb	µg/L	
00927	magnesium, Mg	mg/L	
01055	manganese, Mn	µg/L	
71900	mercury, Hg	µg/L	
01067	nickel, Ni	µg/L	
00937	potassium, K	mg/L	
01147	selenium, Se	µg/L	
01077	silver, Ag	µg/L	
00929	sodium, Na	mg/L	
01059	thallium, Tl	µg/L	
01102	tin, Sn	µg/L	
01152	titanium, Ti	µg/L	
01092	zinc, Zn	µg/L	

Lab comments: _____

* please check tests desired

STATE OF TENNESSEE - ENVIRONMENTAL LABORATORIES

INORGANIC ANALYSIS, SOLIDS

Sample Source _____
 I.D./Site No. _____
 County _____ Field No. _____
 Stream Mile _____ Depth _____
 Collected: Date _____ Time _____ By _____
 Contact Hazard _____
 Signature of sampler _____
 Send Report to _____

Sampling Agency

___ APC ___ DOT
 ___ DWS ___ GW
 ___ SWM ___ UST
 ___ EEP ___ PASI
 ___ SF ___ WPC
 ___ other (specify): _____

Billing Code (required)

Sample Type

___ Sediment
 ___ Soil
 ___ sludge
 ___ Tissue
 Other _____

Sample Priority

___ Emergency
 ___ Legal
 ___ Routine
 ___ Ambient

Date Priority needed:
 _____Field Comments:

For lab use only

Laboratory Number _____

Date received _____

Time received _____ by _____

Date reported _____ by _____

Reviewed by _____

Reviewed by _____

code	*	Sediment	Unit	value	code	*	Tissue	Unit	value	code	*	TCLP	Unit	value
01108		aluminum, Al	mg/kg		01099		antimony, Sb	mg/Kg		01000		arsenic, As	µg/L	
01003		arsenic, As	mg/kg		01004		arsenic, As	mg/Kg		01005		barium, Ba	µg/L	
01008		barium, Ba	mg/kg		34252		beryllium, Be	mg/Kg		01025		cadmium, Cd	µg/L	
01028		cadmium, Cd	mg/kg		71940		cadmium, Cd	mg/Kg		01030		chromium, Cr	µg/L	
00917		calcium, Ca	mg/kg		71939		chromium, Cr	mg/Kg		01049		lead, Pb	µg/L	
01029		chromium, Cr	mg/kg		81659		cobalt, Co	mg/Kg		71890		mercury, Hg	µg/L	
01038		cobalt, Co	mg/kg		71937		copper, Cu	mg/kg		01065		nickel, Ni	µg/L	
01043		copper, Cu	mg/kg		81660		iron, Fe	mg/kg		01145		selenium, Se	µg/L	
01170		iron, Fe	mg/kg		71936		lead, Pb	mg/kg		01075		silver, Ag	µg/L	
01052		lead, Pb	mg/kg		81741		manganese, Mn	mg/kg		00723		cyanide, CN	µg/L	
00924		magnesium, Mg	mg/kg		71930		mercury, Hg	mg/kg						
01053		manganese, Mn	mg/kg		01069		nickel, Ni	mg/kg						
71921		mercury, Hg	mg/kg		01149		selenium, Se	mg/kg						
01068		nickel, Ni	mg/kg		81742		silver, Ag	mg/kg						
00938		potassium, K	mg/kg		01073		thallium, Tl	mg/Kg						
01148		selenium, Se	mg/kg		71938		zinc, Zn	mg/kg						
01078		silver, Ag	mg/kg											
00934		sodium, Na	mg/kg											
01093		zinc, Zn	mg/kg											
00721		cyanide, CN	mg/kg											
01023		boron, B	mg/kg											
		nitrogen, ammonia	mg/kg											
00633		nitrogen, NO ₂ & NO ₃	mg/kg											
		nitrogen, total kjeldahl	mg/kg											
00668		phosphate, total	mg/kg											
		oil and grease	mg/g											
		hydrocarbons, total	mg/g											
		percent solids	%											
32731		phenols	mg/kg											

Coal

ash %
 heat content BTU
 Moisture %
 sulfur %

* please check tests desired

Lab Comments _____

Other

RADIOCHEMICAL ANALYSIS

Field No. _____ Sample Source _____ I.D./Site No. _____ County _____ Stream Mile _____ Depth _____ Collected: Date _____ Time _____ By _____ Pick-up Date: _____ Contact Hazard _____ Signature of sampler _____ Send Report to _____		For field use only Sampling Agency __ DRH __ Other _____ Billing Code: _____ _____		Sample Type __ Water __ Swipe __ Sediment __ Air __ Tissue __ Milk __ Sludge __ Soil __ Vegetation Other _____		Sample Priority __ Emergency __ Inspection __ Legal __ Routine Date Priority needed: _____	
Field Comments: _____ _____							

For lab use only

Laboratory Number _____

Date received _____

Time received _____ by _____

Date reported _____ by _____

Reviewed by _____

[illegible]

* please check tests desired Lab Comments: _____

PH-3009 LAB (Rev. 7-91) _____

**** Unless otherwise indicated, reporting units are:**
Sludge, Water & milk = pCi/L Soil, Sediment & Tissue = pCi/g
Air filters (Gamma) and Iodine Cartridge = pCi/m³ Swipes = pCi/swipe
Air Filters (Gross Alpha & Beta, Sr 89-90) = pCi/m³ x 10⁻⁴

STATE OF TENNESSEE - ENVIRONMENTAL LABORATORIES

AMBIENT MONITORING BIOLOGICAL ANALYSES

Sample Source _____
 I.D./Site No. _____
 County _____ Field No. _____
 Stream Mile _____ Depth _____
 Collected: Date _____ Time _____ By _____
 Contact Hazard _____
 Signature of sampler _____
 Send Report to _____

Test type: ☐ Ambient monitoring ☐ Biological

Sampling agency: ☐ WPC ☐ Other: _____
 Budget Code: _____

Priority: ☐ Emergency ☐ Legal ☐ Routine

Field Comments: _____

For lab use only

Laboratory Number _____

Date received _____

Time received _____ by _____

Date reported _____ by _____

Reviewed by _____

Reviewed by _____

Code	*	Field Determinations	Units	Value
00300		dissolved oxygen	mg/L	
00400		pH	Units	
00094		specific conductance, 25°C	µmho	
00010		temperature	°C	
50060		chlorine, residual	mg/L	

		Lab Determinations		
00335		COD (low)	mg/L	
00900		hardness, total, as CaCO ₃	mg/L	
00610		nitrogen, ammonia	mg/L	
00630		nitrogen, nitrate-nitrite	mg/L	
00625		nitrogen, total Kjeldahl (TKN)	mg/L	
00665		phosphorus, total	mg/L	
00403		pH	Units	
00515		residue, dissolved	mg/L	
00530		residue, suspended	mg/L	
00095		specific cond. 25°C	µmho	
01002		arsenic, As	µg/L	
01027		cadmium, Cd	µg/L	
01034		chromium, Cr	µg/L	
01042		copper, Cu	µg/L	
01051		lead, Pb	µg/L	
71900		mercury, Hg	µg/L	
01067		nickel, Ni	µg/L	
01092		zinc, Zn	µg/L	
01616		coliform, fecal	# /100 mL	

	*	Biological Samples	Value
		Surber 3 sq. ft.	
		Surber 1 sq. ft.	
		selected pickings (qualitative)	
		selected pickings (by habitat)	
		Dendy	
		Chlorophyll	

		Bioassays **	Value
		Static screening - acute fish	
		Static screening - acute Ceriodaphnia	
		Static definitive - fish	
		Static definitive - Ceriodaphnia	
		Chronic - Ceriodaphnia	
		Chronic - fish larval growth	
		Chronic - fish embryo larval	

		Other (please specify)	Units	Value

* please check tests desired

** schedule must be arranged in advance

Lab comments: _____

PH-3010 LAB
Rev. 7-91

CHAIN OF CUSTODY AND SUPPLEMENTAL INFORMATION

Note for samplers: Only one chain of custody form is required per sample set or site (if all collected at the same time).

Sample Custody

1. Collected by _____ Date _____ time _____
Delivered to _____ Date _____ time _____
2. Received by _____ Date _____ time _____
Delivered to _____ Date _____ time _____
3. Received by _____ Date _____ time _____
Delivered to _____ Date _____ time _____
4. Received by _____ Date _____ time _____
Delivered to _____ Date _____ time _____
5. Received in Lab by _____ Date _____ time _____
6. Logged in by _____ Date _____ time _____

Additional Information

7. Nearest town or city _____
8. Names of others present at time sample collected _____
9. Approximate volume of sample _____
10. Number of other samples collected at same time at this point _____
11. Describe field collection procedure and special handling or preservation of this sample

12. Describe how sample transported to laboratory _____
13. Sample sealed by _____ Date sample sealed _____
14. Remarks _____