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Environmental Sciences Division

ACTIVE SITES ENVIRONMENTAL MONITORING PROGRAM

PROGRAM PLAN

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EXECUTIVE SUMMARY

DOE Order 5820.2A requires that low-level waste (LLW) disposal sites active on or after September 1988 and all transuranic (TRU) waste storage sites be monitored periodically to assure that radioactive contamination does not escape from the waste sites and pose a threat to the public or to the environment. This plan describes such a monitoring program for the active LLW disposal sites in SWSA 6 and the TRU waste storage sites in SWSA 5 North.

The approach presented here is based on the current understanding of the hydrologic regime in the two areas. Specifically, the monitoring program is designed to identify contaminants that may move rapidly toward surface streams through the shallow storm flow zone or through discrete pathways such as fractures. The monitoring program also recognizes the importance of temporary perched water in trenches (commonly referred to as bathtubbing trenches) as a mechanism for leaching contamination from waste containers.

Wells will be installed in all active silo trenches and in the disturbed soil around auger holes, fissile wells, and asbestos silos. These wells will be sampled periodically to determine if water standing in the trenches or disturbed soil has leached contaminants from the waste containers.

Groundwater elevations and water quality will be monitored around the Tumulus I and II pads, and the pad runoff and underpad drainage will be sampled after each rain event to ensure that no contamination is leaking from the waste vaults. Soil around the pads will be checked periodically to determine if pad loading operations have resulted in radionuclides being deposited on the soil surface.

Site characterization and preoperational and postoperational monitoring will be performed at the Interim Waste Management Facility (IWMF). Pad runoff and underpad drainage will be monitored similar to the Tumulus pads. Groundwater will be monitored both up and down gradient from the IWMF site. Discharge from the French drain, which controls groundwater elevation below the IWMF, will also be sampled periodically.

In SWSA 5 North, wells will be sampled quarterly for indications of TRU waste leakage. The surface drainages near the TRU waste sites will also be sampled to determine if TRU contamination is leaving the area.

In addition to the monitoring required by the order, this program also includes monitoring of the Interim Corrective Measures capped areas in SWSA 6. Surface drainages will be sampled quarterly to identify changes in contaminant levels possibly caused by the caps. Groundwater levels in trenches under the caps and in the shallow aquifer outside the caps will be monitored to determine what effect, if any, the caps are having on the hydrologic regime in SWSA 6.

The Hill Cut Disposal Test Facility in SWSA 6 is also included in this monitoring plan, although it was not an active disposal site in September 1988. This facility, which consists of LLW in concrete vaults on a concrete pad cut into the side of a hill and covered with dirt, was installed as a demonstration of a greater confinement disposal technology for LLW. Monitoring will consist of water level monitoring around the facility and sampling of water draining off the pad and the surrounding gravel base.

This plan does not include compliance monitoring to meet EPA regulations under the Resource Conservation and Recovery Act or the Clean Water Act. Such compliance monitoring is conducted under separate programs. This plan also does not include sampling of inactive sites as part of the Remedial Investigation/Feasibility Study (RI/FS). However, the RI/FS team will have access to data generated under this plan.

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

Chapter III of DOE Order 5820.2A (U.S. DOE 1988) sets forth requirements for environmental monitoring of operational low-level waste (LLW) disposal facilities. Two statements from this order are included here because they set the framework for the Oak Ridge National Laboratory (ORNL) Active Sites Environmental Monitoring Program (ASEMP).

> The environmental monitoring program shall be designed to measure: (a) operational effluent releases; (b) migration of radionuclides; (c) disposal unit subsidence; and (d) changes in disposal facility and disposal site parameters which may affect long-term site performance. [Sect. 3.k.2]

> The monitoring program shall be capable of detecting changing trends in performance sufficiently in advance to allow application of any necessary corrective action prior to exceeding performance objectives. The monitoring program shall be able to ascertain whether or not effluents from each . . . disposal facility or disposal site meet the requirements of applicable EH Orders. [Sect. 3.k.4]

The transuranic (TRU) waste storage areas in SWSA 5 North are covered in Chapter II of the order. Environmental monitoring is required as follows for temporary and interim storage.

> Transuranic wastes in storage areas shall be monitored periodically to ensure that the wastes are not releasing their radioactive and/or hazardous constituents. [Sect. 3.e(4)]

> An environmental monitoring system shall be provided to detect any release and migration of major radioactive and hazardous components. Background levels of primary radioactive and hazardous waste components shall be determined. [Sect. 3.g(2)(c)]

Site characterization work for the Interim Waste Management Facility (IWMF) site and performance monitoring associated with the Tumulus facilities is required under Chapter III, Sect. 3.b(3) of the order.

> Where practical, monitoring measurements to evaluate actual and prospective performance should be made at locations as required, within and outside each facility and disposal site. Monitoring should also be used to validate or modify the models used in performance assessments.

The scope of this program includes all ORNL waste disposal sites that were active on, or after, the date of the order (9/88). These active sites include the high-activity and low-activity silos, the high-activity auger holes, the fissile wells, the asbestos silos, the suspect waste landfill, the Tumulus Disposal Demonstration Project (Tumulus I), Tumulus II, the IWMF, and the TRU waste storage sites in SWSA 5 North (see Figs. 1 and 2). The biological trenches in SWSA 6 are not included because those trenches active since September 1988 have received only trivial amounts of radioactive materials (John Van Cleve, ORNL, personal communication, 1989).

This plan also addresses monitoring activities associated with the Hill Cut Disposal Test Facility (HCTF), although that facility does not meet the above definition of an active site, and with the Interim Corrective Measures Capped Areas in SWSA 6, although this monitoring is funded separately from the Active Sites tasks.

Compliance monitoring required under the Resource Conservation and Recovery Act or for National Pollutant Discharge Elimination System permits is not included in this program. No sampling specifically for the Remedial Investigation/Feasibility Study (RI/FS) is incorporated in this program, although the ASEMP and RI/FS teams are expected to share their data.

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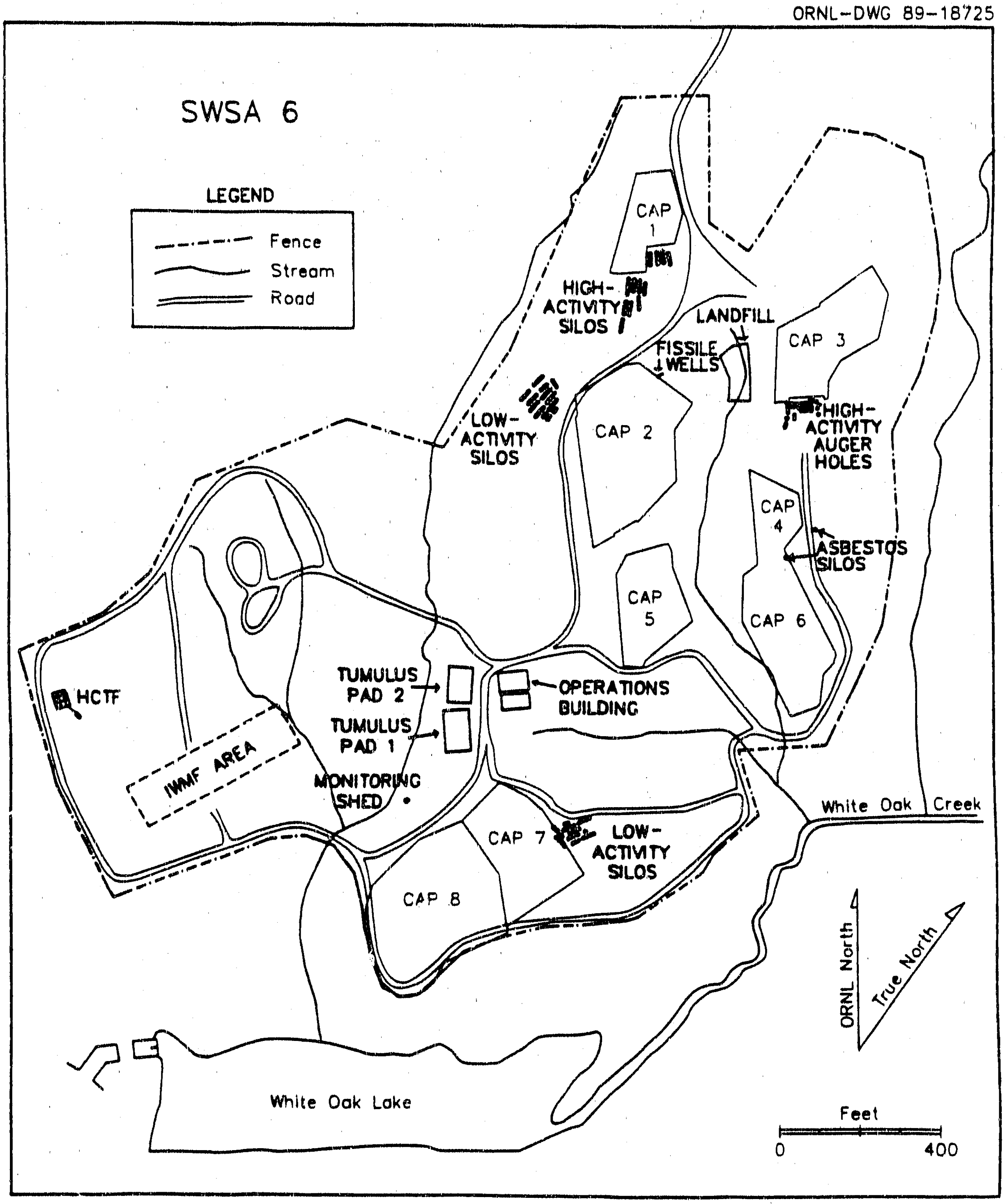

Fig. 1. Low-level radioactive waste sites in SWSA 6.

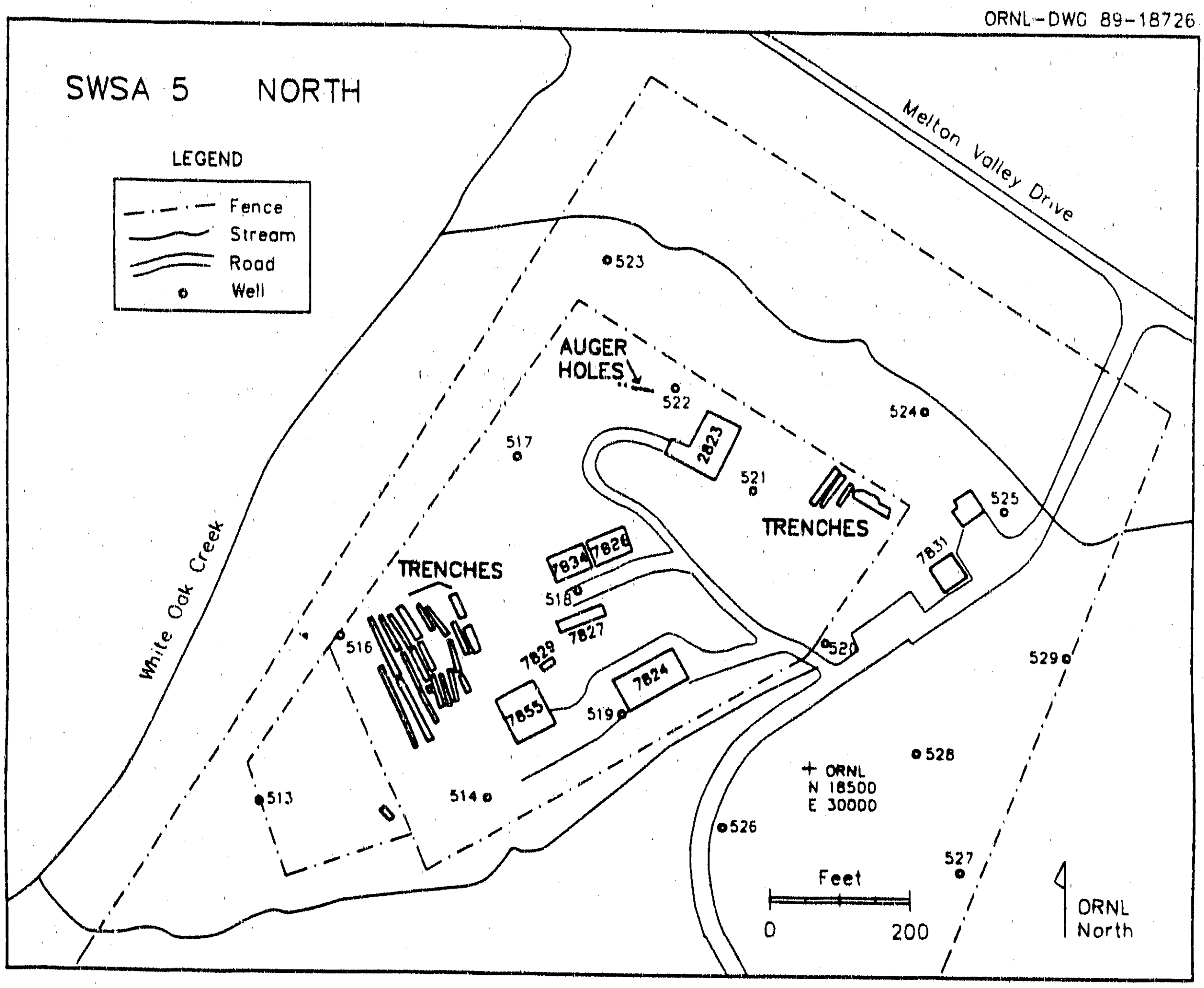

Fig. 2. Transuranic waste storage sites in SWSA 5 North.

1.2 ORGANIZATION

Implementation of this plan will be by staff and subcontractors of the Environmental Sciences Division as indicated in Fig. 3. Several key interfaces with other organizations are also identified in Fig. 3.

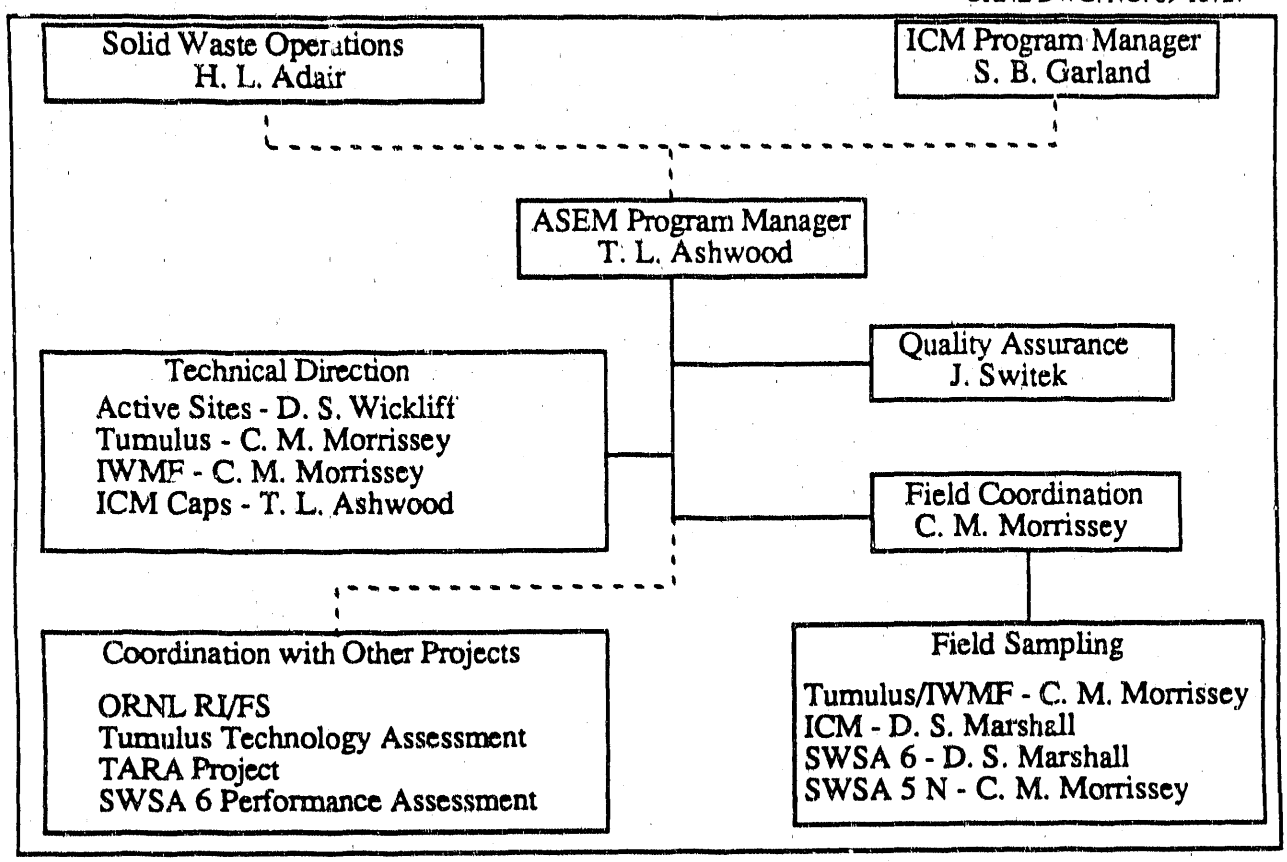

Fig. 3. Organization chart and key interfaces.

1.3 PROCEDURES

Groundwater sampling will generally be conducted in accordance with the ESP-302 series of procedures contained in the Martin Marietta Energy Systems Environmental Surveillance Quality Control Manual (Kimbrough et al. 1988), except where other procedures are referenced. Soil sampling will be conducted in accordance with the ESP-303 series of procedures (Kimbrough et al. 1988), except where other procedures are referenced. Surface water and sediment sampling will be conducted in accordance with procedures described in Appendix B of the ICM environmental monitoring plan (Miller and Craig 1988).

1.4 QUALITY ASSURANCE

This program will be conducted in accordance with the QA program of the Environmental Sciences Division (see Roberson and Logsdon, 1989), which is consistent with NQA-1. A separate QA plan has been prepared and will be updated as necessary.

1.5 HEALTH AND SAFETY

Separate project safety summaries have been prepared for different aspects of this plan. At this time, such safety summaries have been prepared for Tumulus monitoring, other monitoring in SWSA 6, monitoring in SWSA 5 North, and lab work for gross α and gross β screening analyses. As additional areas of safety concerns are identified, appropriate safety documentation will be prepared.

All field sampling personnel have had the full 40-h SARA/OSHA training and any needed annual updates. In addition, all field personnel have had or are scheduled for the 8-h radiation workers training.

1.6 CHANGES TO THE PROGRAM PLAN

Any changes, other than editorial, in this document must be approved by the original signatories or their successors. Editorial changes may be made with the approval of the program manager. The plan will be reviewed annually in the fourth quarter of each fiscal year.

2.0 MONITORING PLAN RATIONALE

2.1 HYDROLOGIC BASIS FOR THE MONITORING PLAN

2.1.1 Basic Concepts

2.1.1.1 Storm Flow Zone and Storm-Driven Contaminant Transport

Moore (1988, 1989) suggests that most of the groundwater flow around ORNL occurs laterally in a storm flow zone from the surface to a depth of up to 2 m. This zone typically has a hydraulic conductivity much greater than deeper zones and is active when infiltrating precipitation exceeds the soil moisture deficit (Moore 1988, 1989). Water in the storm flow zone moves rapidly to surface water drainages. As a result of this rapid lateral movement to the surface drainages, only a small fraction of the precipitation is available to recharge the shallow aquifer.

Radionuclide (^{3}H, ^{90}Sr, and ^{137}Cs) transport in SWSAs 4 and 5 is enhanced during and immediately following storms (D. S. Wickliff, S. M. Gregory, I. L. Larsen, and R. B. Clapp, ORNL, personal communication, 1989). The majority of contaminant transport from SWSA 5 to the Melton Branch watershed occurs along discrete pathways (D. K. Solomon, J. D. Marsh, D. S. Wickliff, I. L. Larsen, and R. B. Clapp, ORNL, personal communication, 1989). Where these pathways intercept streams, the contaminated groundwater is discharged as seeps.

2.1.1.2 Bathtubbing Trenches

Although waste trenches are typically installed at least 0.6 m (2 ft) above the highest recorded water table (Boegly 1984), the perched water table created during storms can introduce groundwater into the trenches. Because the disturbed soil in waste trenches has a higher porosity and hydraulic conductivity than the surrounding media, groundwater infiltrates into the trenches faster than it can flow out again. Trenches can thus have standing water for some time following storms. Solomon et al. (1988) summarized water level data collected from 1975 to 1988 from unlined waste trenches in SWSA 6. They estimated that 85% of the trenches had standing water during some part of that period.

2.1.2 Relevance to Environmental Monitoring

2.1.2.1 SWSA 6

The greater confinement silos are installed in trenches which, though clearly different from unlined waste trenches, are still subject to the bathtubbing effect when storm flow creates a perched water table. Davis et al. (1989) have demonstrated that some silos leak. In order to determine whether water from leaking silos may be contaminated, a series of intratrench wells will be installed and sampled. (Some intratrench wells have already been installed, but less than half of the silo trenches have such wells.) Auger holes, fissile wells, and asbestos silos (which are not in trenches) are surrounded by a small volume of backfilled soil. This backfill material is probably subject to the same perched water table effect as the trenches. Accordingly, monitoring wells will be installed where possible in the backfill around those auger holes, fissile wells, and asbestos silos that were active on or after September, 1988. If there is insufficient backfilled space to accommodate the wells, then monitoring wells will be installed downgradient from and immediately adjacent to these waste disposal areas.

The monitoring programs for Tumulus I and II and IWMF are designed to sample storm flow that runs on or under the concrete pads. In addition, these monitoring programs include sampling of monitoring wells around the sites to identify any contamination of the shallow aquifer. Water levels in these wells are continuously monitored to evaluate hydrologic performance of the sites.

Monitoring for the ICM capped areas takes advantage of the storm flow concept by focusing on sampling of the surface drainages around the caps. In addition, water levels in selected wells are measured periodically to evaluate the effect of the caps on water levels in the area. Water levels in wells in trenches under the caps are monitored periodically to determine if the caps are effective in reducing the standing water in these trenches.

2.1.2.2 SWSA 5 North

No data are available on the existence of bathtubbing trenches or a storm flow zone in SWSA 5 North. However, storm-driven contaminant transport is an important transport mechanism for radionuclides in the rest of SWSA 5 (D. S. Wickliff, S. M. Gregory, I. L. Larsen, R. B. Clapp, D. K. Solomon, and J. D. Marsh, ORNL, personal communication, 1989). The monitoring program for SWSA 5 North will initially focus on determining the extent of contaminant migration, if any. Groundwater wells in the SWSA 5 North area will be sampled and monitored for water levels. Surface water drainages will also be sampled to identify material transported through discrete pathways that might be missed by groundwater monitoring wells.

2.2 MONITORING PROGRAM OBJECTIVES AND ACTION LEVELS

As stated in Section 1.1, the objective of this monitoring program is to provide for early detection of radionuclides from storage or disposal facilities before such releases pose a threat to the public or the environment. In order to accomplish this objective, samples must be compared to some defined background level. Perhaps the most extensive data set on background levels for groundwater in SWSA 6 is the preoperational monitoring done at Tumulus I. This data set was used to establish the action levels for tumulus monitoring (Yager and Garland 1989) and will be used as the initial basis for monitoring under this program.

The action levels for this program will be 1.0 Bq/L for gross α and 5.0 Bq/L for gross β. These levels represent the mean groundwater concentration at Tumulus I plus four standard deviations (Yager and Garland 1989). Statistically, less than 0.1 % of the background population should exceed these values. These action levels are also well below levels that would cause any adverse health or environmental effects. At this time, no other action levels will be defined. Any groundwater samples that exceed the action levels will be reported as being in excess of background, and a plan will be established for further investigation.

As further data is obtained, it may be desirable to revise these action levels or to establish additional action levels (e.g., it may become desirable to establish an action level for ^3H). At a minimum, all action levels will be reviewed as part of the annual report (see Sect. 5.2).

3.0 SOLID WASTE STORAGE AREA 6

3.1 SILOS, FISSILE WELLS, AUGER HOLES, AND ASBESTOS SILOS

In June 1986 ORNL decided to abandon the use of unlined trenches and auger holes in favor of a greater confinement silo disposal concept for LLW (Davis et al. 1989). This concept involves cylindrical concrete silos placed below grade in an upright fashion. The silos are installed in groups of two to four within a single trench. The trench is backfilled with soil around the silos. After it was discovered that water leaked into the silos, three corrective actions were implemented: (1) changes in construction of the silos to form a concrete-to-concrete joint between the sidewalls and bottom, (2) recapping of the silos with a concrete cover, and (3) grouting of the waste within the silos, beginning with silo 567 (Davis et al. 1989).

Fissile materials and LLW with higher activity are generally disposed of in steel-lined wells approximately 20 ft deep with a concrete bottom and concrete cap. Radioactively contaminated asbestos waste is disposed of in cylindrical concrete silos similar to the greater confinement silos used for LLW.

3.1.1 Installation of Wells

All new silos currently have an internal monitoring well installed before the waste is grouted. There is serious question as to the utility of this in-silo well; however, the cost of installation is not large. In FY 1990, internal wells will continue to be installed as at present. At the end of the year, a decision (based on data obtained in Sect. 3.1.2) will be made as to whether internal wells will be installed in succeeding years.

Some trenches have from one to three intratrench monitoring wells. These wells extend from the bottom of the trench to the surface and are slotted in the bottom 5-ft increment. In FY 1990, two wells will be installed in each newly completed trench. ASEMP staff will provide advice on the location of wells, as needed.

Over half of the silo trenches have no intratrench wells. This leaves no way to monitor these trenches for perched water contamination. In addition, there are currently no monitoring wells near the active fissile wells, auger holes, or asbestos silos. Approximately 45 new wells will be installed in trenches and in the disturbed soil around the fissile wells, auger holes, and asbestos silos in SWSA 6 (see Figs. 4-7).

3.1.2 Monitoring Plan

Intratrench wells and wells near fissile wells, auger holes, and asbestos silos will be sampled quarterly. A water collection device will be left in each well to collect water between sampling periods. Samples will be analyzed for gross α, gross β, and gamma activity. Wells installed in silos will only be monitored if the intratrench well(s) show contamination.

During the quarterly sampling periods, trenches and the areas surrounding the other sites will be visually checked for subsidence. Any subsidence noted will be reported to the burial ground operator for remediation.

3.2 SUSPECT WASTE LANDFILL

The stream water and sediment will be sampled quarterly during water flow periods and analyzed for gross α and gross β activity and gamma activity. This sampling will be conducted near the Interim Corrective Measures monitoring site 104 (Miller and Craig 1988). If activity above the action level (Sect. 2.2) is detected, an action plan will be developed to identify the cause of the contamination, and a remedial action will be proposed, if necessary.

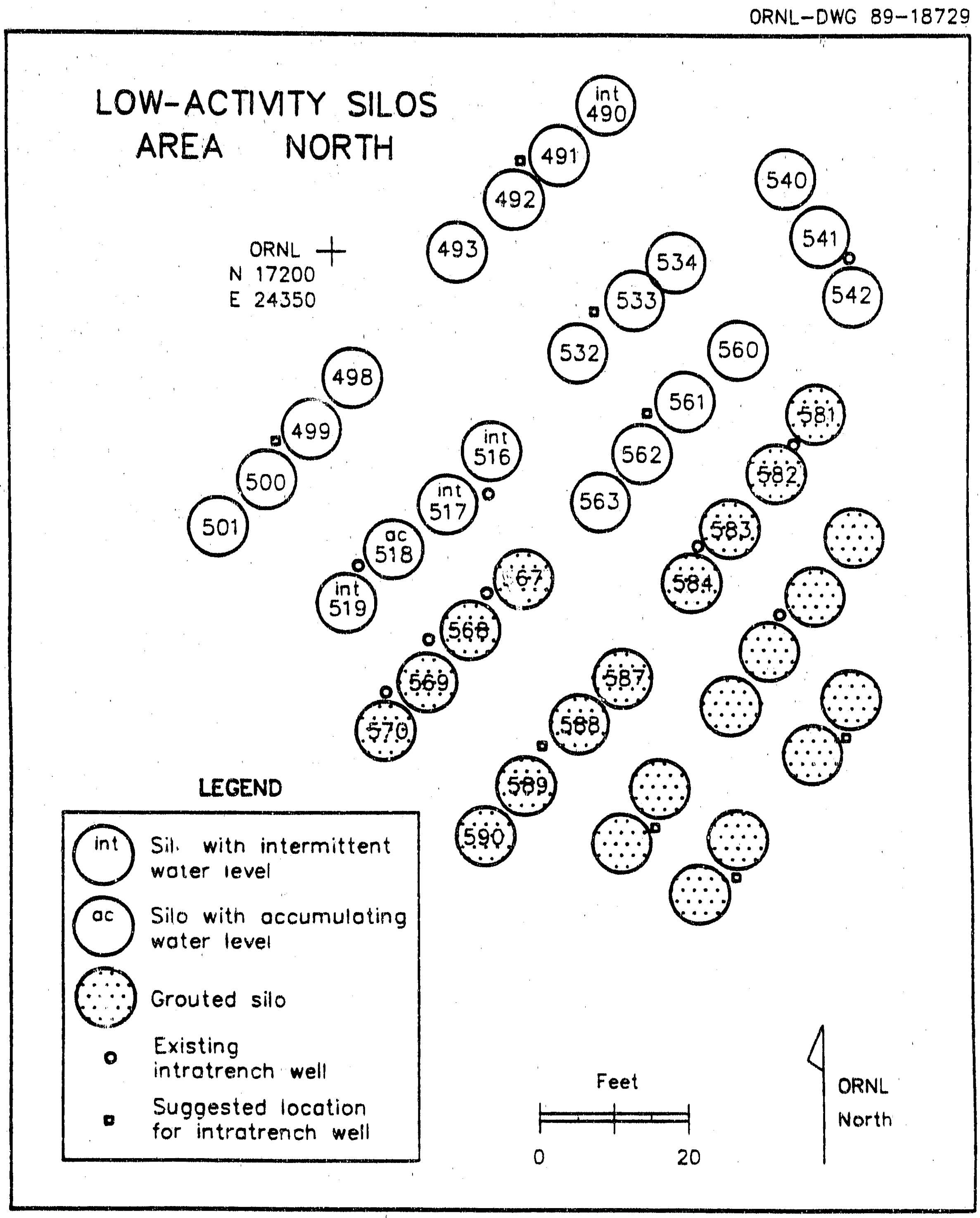

Fig. 4. Locations of intratrench wells in SWSA 6 Low-Activity Silos Area north.

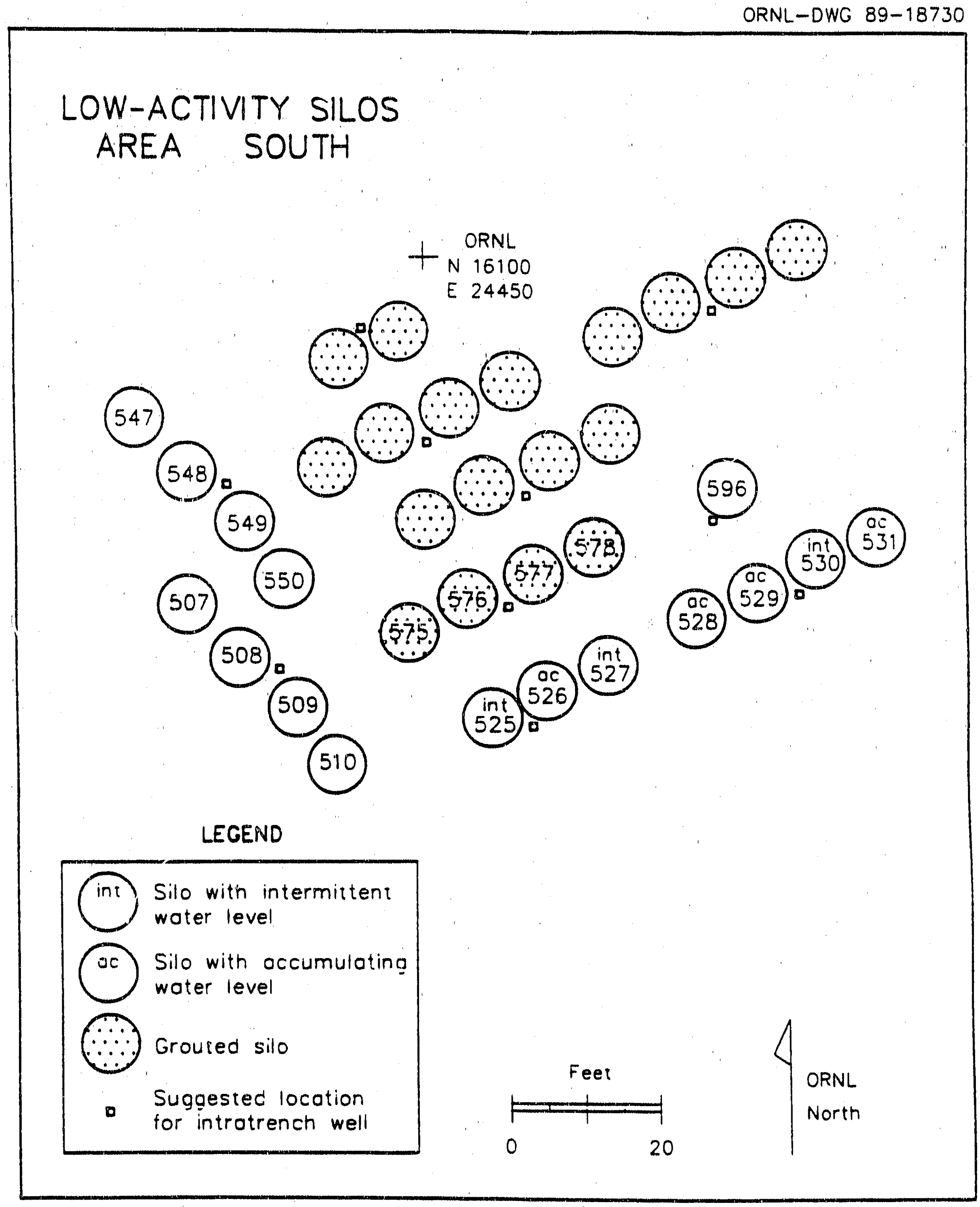

Fig. 5. Locations of intratrench wells in SWSA 6 Low-Activity Silos Area South.

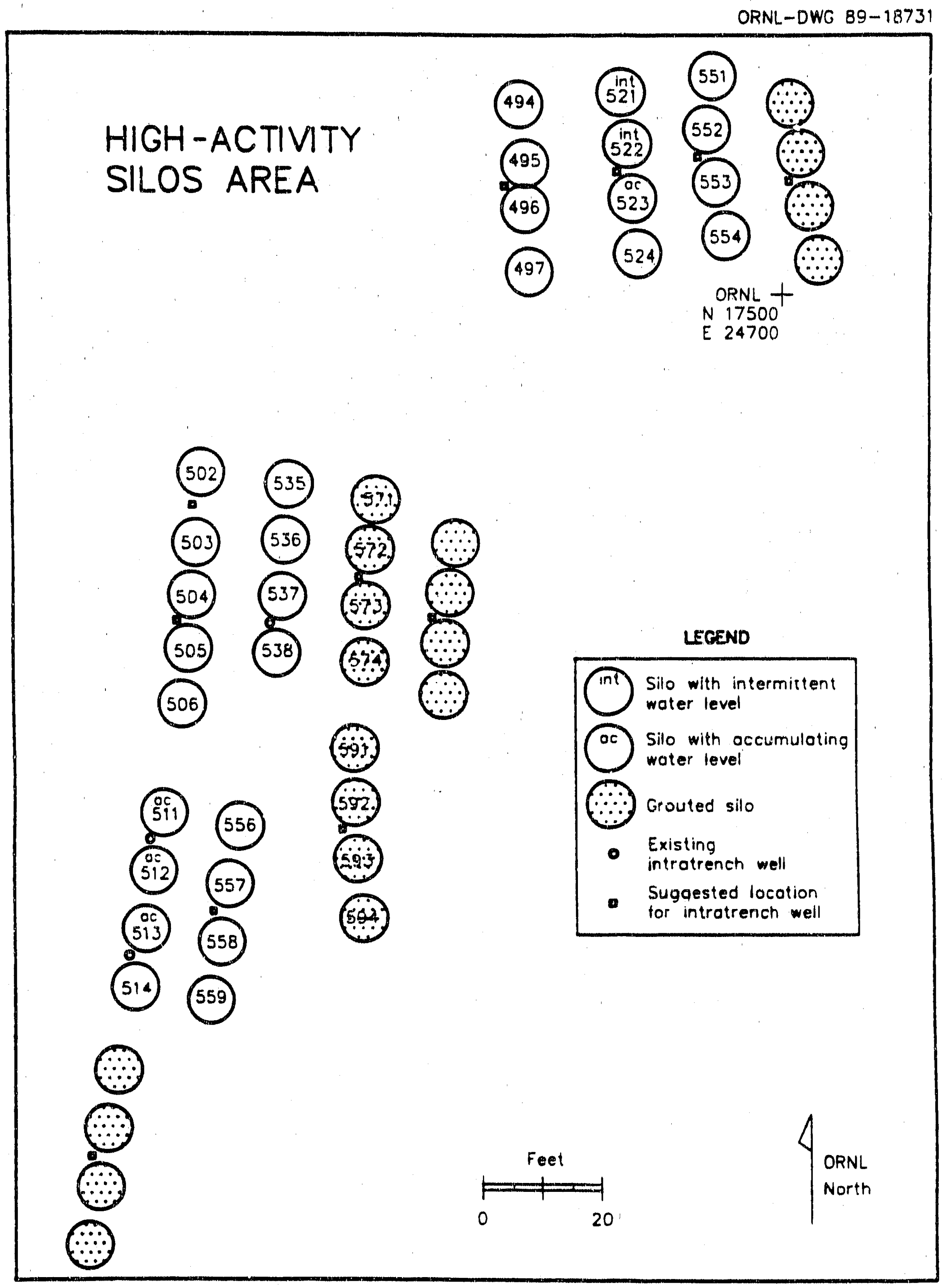

Fig. 6. Locations of intratrench wells in SWSA 6 High-Activity Silos Area.

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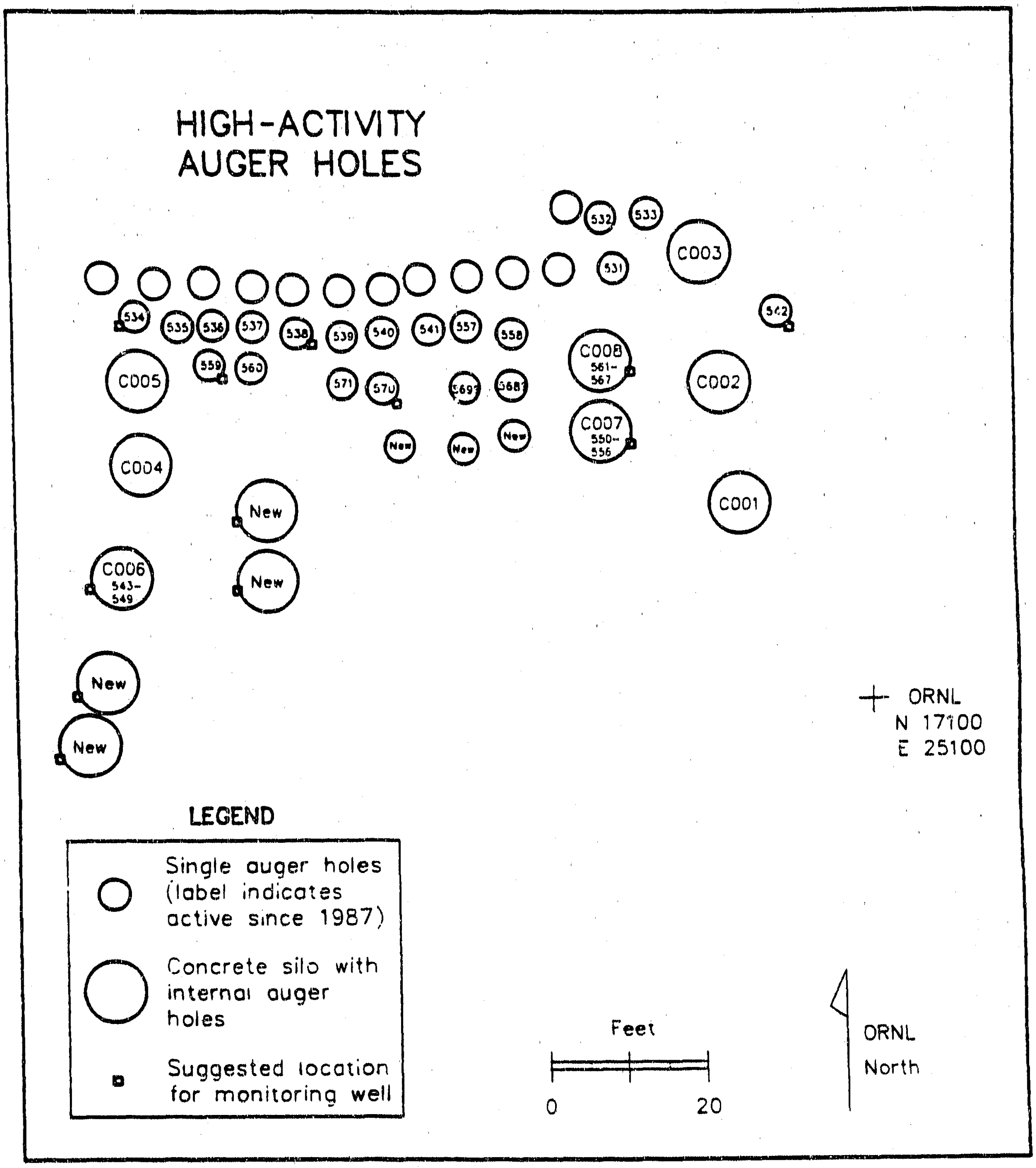

Fig. 7. Locations of wells near SWSA 6 High-Activity Auger Holes.

3.3 TUMULUS I AND II

Craig et al. (1989) developed the monitoring plan for Tumulus I. A contingency plan that identifies action levels and responses has also been prepared (Yager and Garland 1989). More recently, a revised Tumulus monitoring plan was prepared (Craig et al. 1990) to incorporate monitoring for the Tumulus II pad. This revised plan is summarized below.

3.3.1 Groundwater

Water levels in 12 wells surrounding the 2 pads will be monitored continuously. Water samples will be taken quarterly from 11 of these wells and analyzed for gross α, gross β, gamma activity and ^3H. Once a year, half of the wells will be sampled and analyzed for cations, anions, and selected indicator organic compounds.

3.3.2 Pad Runoff

Only one tumulus pad will discharge through the monitoring station at a time. Once loading operations at Tumulus I are complete, the pad will be covered. At that time, runoff from Tumulus II will be routed to the monitoring station.

Pad runoff flow will be monitored continuously. Each storm event will be sampled and analyzed for gross α, gross β, gamma activity, and total organic carbon (TOC),.

3.3.3 Underpad Drainage

When operations at Tumulus I are completed and the pad is covered to prevent the collection of rainfall, there will be no vector for contamination from the pad to reach the underpad area. During construction of the Tumulus II pad, the source of the water leaking into the Tumulus I underpad area from the surrounding perched water table will be corrected. It is expected that no water will accumulate in the underpad drainage area after these operations are completed, and the underpad drain line will be directed to the surface drainage.

When loading operations begin on the Tumulus II pad, the underpad drainage from the Tumulus II pad will be routed through the monitoring station. Because the Tumulus II underpad area is open to the surrounding perched water table, there will be flow through the underpad drain more-or-less continuously, depending upon precipitation. The underpad drain flow will not be measured, but a sample will be taken after every storm when the pad runoff is sampled. The sample will be analyzed for gross α, gross β, gamma activity, and total organic carbon (TOC).

Until such time as loading on the Tumulus I pad is completed, sampling of the Tumulus I underpad drain will proceed as described in Craig et al. (1989). The sump will be visually checked during routine visits for any signs of water. If water is noted, the volume will be estimated and a sample taken for gross α, gross β, gamma activity, and TOC.

3.3.4 Perched Water Table at Tumulus I

During construction of the Tumulus II pad, a drain line will be installed to remove perched water from around the Tumulus I pad. This drain line will discharge directly to the surface drainage. Because it is draining water that has not come in contact with the Tumulus I area, this drain is not expected to be contaminated above background. Nevertheless, quarterly water samples will be taken and analyzed for gross α, gross β, and gamma activity.

3.3.5 Soil Sampling

Soil sampling has been conducted quarterly, as originally planned (Craig et al. 1989), at eight locations around the Tumulus I pad (Yager et al. 1989). No significant differences between preoperational and postoperational sampling have been detected. In FY 1990, quarterly soil sampling will be replaced by quarterly scintillometer walkover surveys of the area immediately surrounding both Tumulus pads. During each of the quarterly walkovers, a single soil sample will be taken at one location to ensure that the walkover surveys are not missing any significant contamination.

3.4 INTERIM WASTE MANAGEMENT FACILITY (IWMF)

Construction on the IWMF is expected to begin in March 1990 and continue through December 1990, although all major site grading and road work will be completed by June 1990. Operation will begin in September 1991.

3.4.1 Preconstruction Monitoring

Ten wells have already been installed, developed, slug tested, and sampled for gross α, gross β, gamma activity, ^{3}H, ^{90}Sr, TOC, TSS, and major cations and anions. Temperature, pH, specific conductance, turbidity, dissolved O_2, and oxidation-reduction potential were measured in the field. Water levels in five wells were continuously monitored, and water levels in the other five wells were monitored monthly for a period of several months. Results of these analyses have been documented in a letter report and will be formally documented in an ORNL/TM report.

The ten wells will be plugged and abandoned prior to construction.

3.4.2 Preoperational Monitoring

Wells will be installed after all major site and road work is completed. The exact number and location of wells will be determined pending results of the pre-construction monitoring; however, the maximum number will be nine. These wells will be designed and installed similar to those for Tumulus I and II. The wells will be equipped with pressure transducers and continuous data loggers.

Prior to the start of operations, two complete rounds of samples will be taken. The samples will be analyzed for gross α, gross β, gamma activity, ^{3}H, ^{90}Sr, TOC, TSS, and major cations and anions. Water levels in all wells will be monitored continuously.

Discharge from the French drain will be sampled monthly and analyzed for gross α, gross β, gamma activity, ^{3}H, ^{90}Sr, TOC, and TSS. Pad runoff and underpad drainage will be monitored and sampled as for Tumulus II.

3.4.3 Operational Monitoring

3.4.3.1 Pad Runoff

Flow will be monitored continuously. Each storm event will be sampled and analyzed for gross α, gross β, gamma activity, and TOC.

3.4.3.2 Underpad Drainage

Drainage from the underpad layer will be collected in a sump and sampled before being discharged. Samples will be analyzed for gross α, gross β, gamma activity, and TOC.

3.4.3.3 French Drain Discharge

The French drain discharge will be sampled monthly and analyzed for gross α, gross β, gamma activity, ^{3}H, ^{90}Sr, TOC, and TSS.

3.4.3.4 Groundwater Monitoring

Water levels in the wells surrounding the IWMF will be monitored continuously. Water samples will be taken from these wells quarterly and analyzed for gross α, gross β, gamma activity and ^3H. Once a year, half of the wells will be sampled and analyzed for cations, anions, and selected indicator organic compounds.

3.4.3.5 Soil Sampling

The area surrounding the IWMF will be surveyed quarterly using a gamma scintillometer. Surface soil from two randomly selected locations and from any locations identified by the scintillometer survey as being above background will be sampled and analyzed for gross α, gross β, and gamma activity.

3.5 INTERIM CORRECTIVE MEASURES (ICM) CAPPED AREAS

Miller and Craig (1988) developed the monitoring plan for the ICM capped areas. This plan initially involved extensive sediment sampling and water sampling in the surface drainages of SWSA 6 as well as water level monitoring in the vicinity of the capped areas. As recommended in the FY 1989 summary report (Miller et al. 1989), this sampling program can be scaled back considerably. In a separate project, ESD staff have been measuring water levels in approximately 35 wells installed in trenches under the caps (B. P. Spalding, ORNL, personal communication, 1989). This intratrench monitoring will be combined with the other ICM monitoring in this program. The combined program is described below, and this plan supercedes the previous monitoring plan by Miller and Craig (1988).

3.5.1 Groundwater

Water levels in 22 piezometers outside but adjacent to the ICM caps will be measured manually on a monthly basis as previously described (Miller and Craig 1988). In addition, water levels in wells installed in trenches under the caps will also be monitored manually at the same time that external wells are monitored. Four wells that have been equipped with pressure transducers will be monitored continuously.

3.5.2 Surface Water and Sediments

The extensive sampling originally planned has served its purpose, which was to identify sites where the caps had caused increased erosion and transport of contaminants outside SWSA 6. At this time sampling will be restricted to those points in the surface drainage where the streams leave SWSA 6. Three points (one on each stream above the area influenced by White Oak Lake) will be sampled quarterly. Both water and sediment samples will be obtained. Water samples will be analyzed for gross α, gross β, gamma activity, ^3H, TOC and TSS. Sediment samples will be analyzed for gross α, gross β, and gamma activity (including ^7Be). Beryllium-7 (53.3-d half-life) will be used as an indication of recently deposited material.

3.6 HILL CUT DISPOSAL TEST FACILITY (HCTF)

The Hill Cut Disposal Test Facility is a demonstration project that was started in 1981 but discontinued the following year before any wastes were emplaced (see Fig. 1 for location). In 1985, the project was reactivated as a joint venture between the Operations Division and the Low-Level Waste Disposal Development and Demonstration (LLWDDD) project. The HCTF provided Operations with a method for disposing of high-activity LLW because no suitable greater-confinement burial method was available at the time. The HCTF demonstration provided LLWDDD with a means to evaluate the use of hillslope cuts as possible sites for future engineered disposal facilities. The objective of the demonstration was to assess the degree of hydrologic isolation afforded by this type of design.

The HCTF consists of a concrete pad (4.6 m x 4.6 m) constructed in a cut from the side slope of a hill (Fig. 8). The pad was installed above the expected high water table in the area. Twenty-seven concrete boxes (1.1 m x 1.1 m x 1.4 m) of high-activity LLW were placed on the pad and covered with soil. The lids of the boxes were sealed with a bitumen mastic, and the boxes were banded. A runoff collection system was installed to drain both the pad and the gravel area surrounding the pad. Runoff from the pad and the gravel drain are collected separately in two above-grade 500-gal tanks. Two monitoring wells were installed, one on the pad and one in the gravel drain.

3.6.1 Runoff Monitoring

Measurements of the volume in each tank will be made and recorded weekly. When water in either tank reaches 65% of tank volume, that tank will be sampled and analyzed for gross α, gross β, and gamma activity. If radioactivity levels are below the action level, tank contents will be drained locally, after the Environmental Compliance Monitoring personnel have been notified and have given their concurrence. If radioactivity levels are above the action levels, Waste Management Operations personnel will be notified, and an action plan will be developed to identify the source of the contamination and dispose of the water.

3.6.2 Groundwater Monitoring

3.6.2.1 Pad and Gravel Drain Wells

These wells will be monitored weekly for water levels. Samples will be obtained whenever the water levels indicate that water in the drain is over the top of the curb around the pad. Samples will be analyzed for gross α, gross β, and gamma activity.

3.6.2.2 Groundwater Wells

Four wells will be installed surrounding the HCTF on all sides. These wells will be installed to the depth of auger refusal and screened over a 10-ft interval at the bottom. Well design will conform with RCRA water quality well requirements.

These wells will be monitored for water levels on a weekly basis for the first year and monthly thereafter. Samples will be taken quarterly and analyzed for gross α, gross β, and gamma activity.

4.0 SOLID WASTE STORAGE AREA 5 NORTH

4.1 FACILITY MONITORING

Samples from the water which collects in the sumps draining retrievable storage facilities 7855, 7834, and 7826 are currently collected quarterly by Solid Waste Operations personnel and analyzed for gross α, gross β, and gamma activity.

4.2 GROUNDWATER

Manual water level measurements will be taken monthly, and water samples will be taken quarterly, from approximately 12 wells located in and around SWSA 5 North (Fig. 2). Samples will be analyzed for gross α, gross β, and gamma activity. If gross α activity above the action level is detected, samples will be analyzed for the specific α-emitting isotope. If this further analysis indicates

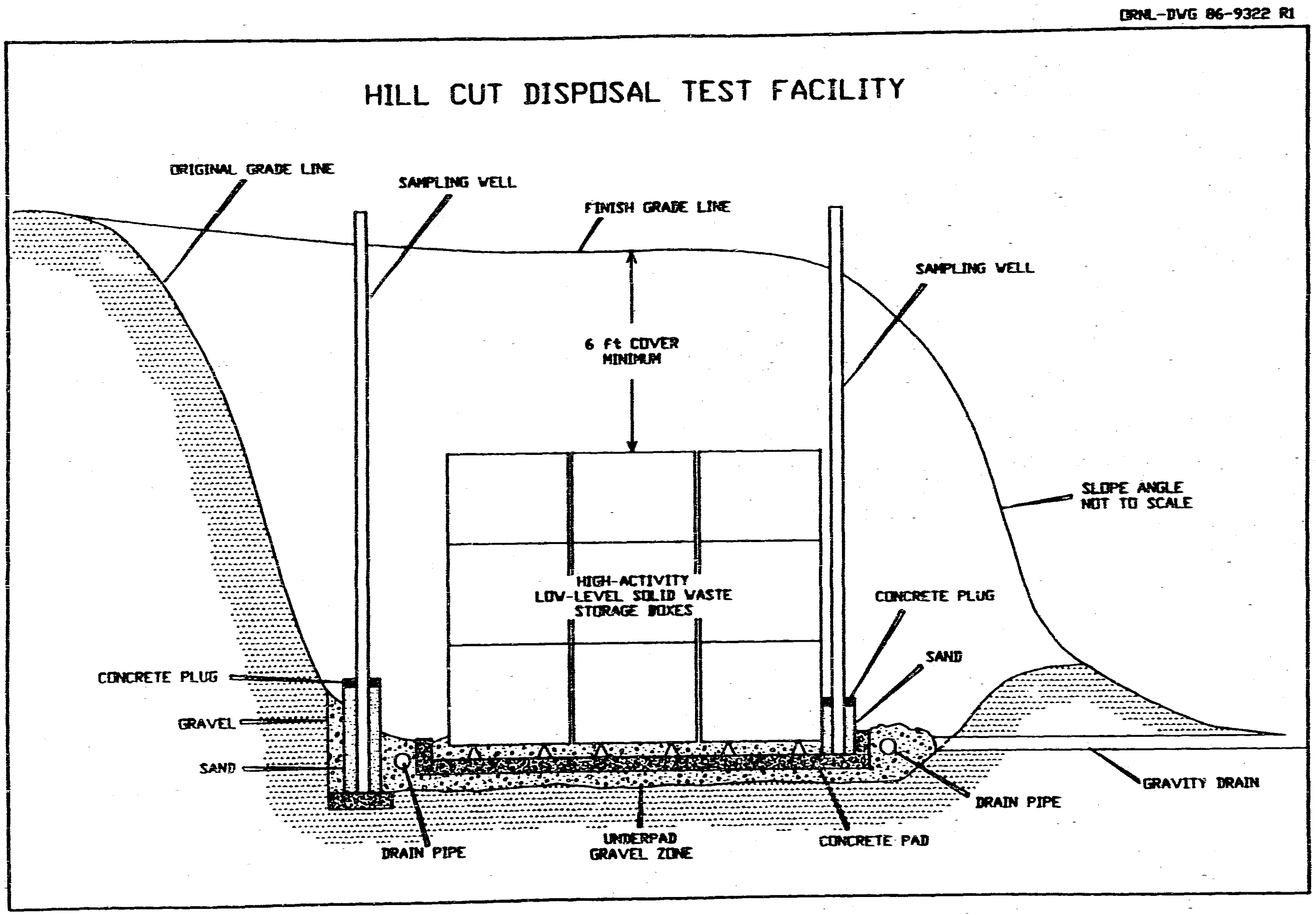

Fig. 8. Schematic of Hill Cut Disposal Test Facility in SWSA 6.

the presence of TRU elements, an action plan will be developed to determine the extent of the contamination.

4.3 SURFACE WATER AND SEDIMENTS

Water and sediment samples will be obtained quarterly from one location on each of the two small White Oak Creek tributaries that drain SWSA 5 North. The sites will be selected to be out of the range of influence of White Oak Creek. Water samples will be analyzed for gross α, gross β, ^3H, and gamma activity. Sediment samples will be analyzed for gross α, gross β, gamma activity (including ^7Be), and heavy metals (using inductively coupled plasma spectroscopy).

5.0 REPORTING AND MILESTONES

5.1 MONTHLY PROGRESS REPORTS

Activities conducted each month, together with any analyses received, will be summarized in a letter report which will be issued by the seventh calendar day of the following month. This letter report will also include a cost summary and a schedule of the next month's activities.

5.2 SEMIANNUAL REPORTS

Two detailed reports with the results of all Active Sites Environmental Monitoring activities will be issued semiannually. One report will address the Interim Corrective Measures monitoring activities, and the second report will address all other activities. These reports will include cost projections for the remainder of the current year, or the following year, as appropriate. Draft copies of the reports will be issued by the fifteenth working day of the month following the close of the six-month reporting period (i.e., the FY 1990 reports will be issued on April 23 and October 19). After review by Solid Waste Operations and ESD staff, these reports will be issued as ORNL/M reports.

5.3 EXCEPTION REPORTS/ACTION PLANS

Samples that exceed an established action level (see Sect. 2.2) or that otherwise indicate a problem will trigger a written exception report. These reports are meant solely to identify a problem. Depending upon the nature of the problem, an action plan may be prepared describing those actions to further investigate and/or remedy the problem, including any follow-up documentation. Exception reports and action plans will be issued as needed in letter report format.

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RECORD OF CHANGES

Revision No.	Date	Purpose of Revision
0	April 1990	Original Issue of the Plan.

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DATE FILMED

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