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ENVIRONMENTAL RESTORATION
DIVISION DMC

**Functional Requirements for the
Support Facilities to Plug and
Abandon Wells at SWSA 6,
Oak Ridge National Laboratory,
Oak Ridge, Tennessee**

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MARTIN MARIETTA ENERGY SYSTEMS, INC.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

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Environmental Restoration Division
ORNL Environmental Restoration Program

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Abandon Wells at SWSA 6, Oak Ridge National Laboratory,
Oak Ridge, Tennessee**

Date Issued—July 1991

Prepared by
Gilbert/Commonwealth, Inc.
Knoxville, Tennessee
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Functional Requirements for the Support Facilities to Plug and Abandon
Wells at SWSA 6, Oak Ridge National Laboratory,
Oak Ridge, Tennessee

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EXECUTIVE SUMMARY

Throughout the operational history of Solid Waste Storage Area 6 (SWSA 6) at Oak Ridge National Laboratory (ORNL), numerous wells have been drilled for a variety of research and monitoring purposes. The plugging and abandonment (P&A) of unneeded wells and boreholes is an integral part of the maintenance and closure process for waste area groupings at ORNL. Wells requiring abandonment in and near SWSA 6 are currently being identified by an ORNL interorganizational group. The ORNL report *Corrective Action Plan in Response to Tiger Team Assessment* (report ORNL-6657, 1990) states that a number of wells will be plugged because they will be covered by the capping of the waste areas. Still more will be plugged to reduce the potential for surface water and groundwater communication, leaving only the wells necessary for detecting the presence or movement of contamination.

There is a need for facilities to support the removal of unused wells and boreholes located in SWSA 6. The purpose of this project is to construct facilities that will support personnel and equipment employed to plug and abandon the inactive wells. Additionally, the purpose of this project is to upgrade selected roads and facilities in SWSA 6 necessary to commence closure activities.

Three new facilities will be constructed: the Personnel Contamination Control Facility, the Equipment Cleaning and Waste Storage Facility, and a Vehicle Parking/Staging Area. In general, these new facilities must control the contamination of personnel; clean equipment; decontaminate personnel and equipment as necessary; store contaminated solids and liquids; and provide for employee needs such as clothing change rooms, equipment storage, office space, and vehicle parking. The facilities must ensure that all wastewater is contained and there is no runoff to adjacent areas including existing wells.

Various upgrades will also be constructed. Selected roadways will be improved, a new entrance to SWSA 6 will be constructed, and utilities and fire alarms will be upgraded as appropriate.

1. INTRODUCTION AND PURPOSE

1.1 BACKGROUND

Throughout the operational history of Solid Waste Storage Area 6 (SWSA 6) at Oak Ridge National Laboratory (ORNL), numerous wells have been drilled for a variety of research and monitoring purposes. Since the beginning of full-scale operation in 1973, research wells ranging from open bore holes to metal- or PVC-lined wells were installed in SWSA 6. Prior to installing regulatory compliance groundwater quality monitoring wells, a number of less expensive piezometers were also installed throughout SWSA 6.

Beginning in February 1987, a network of regulatory compliance groundwater quality monitoring wells was installed. The wells were placed as compliance boundary wells to intersect possible plumes of contaminants. Locations of the water quality monitoring wells were based on (1) siting wells upgradient of the site to monitor background water quality, (2) siting wells downgradient from the site to monitor the quality of water being discharged to White Oak Lake, and (3) siting wells downgradient of individual trench and auger hole areas. The first samples were collected from SWSA 6 wells in the second quarter of CY 1988 by the ORNL Department of Environmental Monitoring and Compliance (EMC); thereafter, they have been sampled quarterly. These wells will likely be kept in operation to provide groundwater quality data for the foreseeable future.

The plugging and abandonment (P&A) of unneeded wells and boreholes is an integral part of the maintenance and closure process for Waste Area Groupings (WAGs) at ORNL. Wells requiring abandonment in and near SWSA 6 are currently being identified by an ORNL interorganizational group. The ORNL report *Corrective Action Plan in Response to Tiger Team Assessment* (ORNL 1990) states that a number of wells will be plugged because they will be covered by the capping of the waste areas. Still more will be plugged to reduce the potential for surface water and groundwater communication, leaving only the wells necessary for detecting the presence or movement of contamination.

1.2 PURPOSE

There is a need for facilities to support the removal of unused wells and boreholes located in SWSA 6. The purpose of this project is to construct facilities that will support personnel and equipment employed to plug and abandon the inactive wells. Additionally, the purpose of this project is to upgrade selected roads and facilities in SWSA 6 necessary to commence closure activities.

Three new facilities will be constructed: the Personnel Contamination Control Facility, the Equipment Cleaning and Waste Storage Facility, and a Vehicle Parking/Staging Area (Fig. 1). In general, these new facilities must control the contamination of personnel; clean equipment; decontaminate personnel and equipment as necessary; store contaminated solids and liquids; and provide for employee needs such as clothing change rooms, equipment storage, office space, and vehicle parking. The facilities must ensure that all wastewater is contained and there is no runoff to adjacent areas including existing wells.

Fig. 1 Locations of P&A Support Facilities at SWSA 6.

Various upgrades will also be constructed. Selected roadways will be improved, a new entrance to SWSA 6 will be constructed, and utilities and fire alarms will be upgraded as appropriate.

2. PROJECT DEFINITION

This project consists of three new support facilities and upgrades to existing facilities. A personnel contamination control facility will be constructed on a site straddling the fence along the northern edge of SWSA 6. A vehicle parking/staging area will be constructed adjacent to the portion of the personnel facility located outside of the SWSA 6 fence. The project will include an equipment cleaning and waste storage facility to be constructed on a site inside SWSA 6.

This project also consists of upgrading and paving the existing northern exterior perimeter roadway, installing a new slide gate for use as the new entrance, and connecting the SWSA 6 buildings to the ORNL Fire Department alarm system.

The utilities required to support operation of both the new and the upgraded facilities will be provided.

3. MISSION

The mission of the project is to provide facilities necessary to safely and efficiently support the P&A of unused wells and boreholes located in SWSA 6. The new facilities and upgrades to existing roads and facilities will be designed to provide long-range support in connection with the closure of WAG 6. The organization of the Project Team is provided in Fig. 2.

Fig. 2. Organization of the WAG 6 project team.

4. REQUIREMENTS AND SPECIAL ISSUES

4.1 REQUIREMENTS AND SPECIAL CONSTRAINTS

4.1.1 General Functional Requirements

The Personnel Contamination Control Facility shall be capable of securely controlling the flow of personnel entering and leaving the WAG 6 area. The facility must accommodate both male and female workers. Provisions for monitoring personnel and for emergency showering and decontamination of personnel are also required. The facility must also provide restrooms, locker rooms, work clothing storage and collection, and an eating area.

The Equipment Cleaning and Waste Storage Facility shall be capable of cleaning any tool or piece of equipment engaged in well P&A activities in SWSA 6. The facility shall provide for the safe collection, storage, and removal of contaminated wastewater, and the demolition, collection, packaging, and removal of the waste materials from the P&A process.

Consideration should be made to design the two facilities discussed in the preceding paragraphs as portable and mobile as possible. This feature will allow their relocation to other waste area groupings requiring future well P&A, with minimal construction of new structures.

Additionally, the design will require that the facilities be readily capable of being decontaminated. Based on the anticipated operations of the Equipment Cleaning and Waste Storage Facility, provisions and procedures as applicable will be incorporated to ensure that no residual materials become airborne. Because contaminated dry particles are unlikely to be present, high efficiency particulate air (HEPA) filters should not be required in this facility.

The Vehicle Parking/Staging Area shall provide two trailers, each with four offices, for use by engineering groups from both Martin Marietta Energy Systems, Inc., and M-K Ferguson, and construction personnel and space for up to six additional trailers. The area shall also be capable of accommodating parking for vehicles of the workers conducting well P&A activities and future closure activities. The parking area shall drain away from SWSA 6 whenever possible. The parking lot should provide for the safe and orderly flow of personnel to and from the personnel facility at any time of the day. Access shall be maintained to the Waste Operations entrance located along the northwest fence. The existing Vehicle Contamination Monitoring Facility shall be relocated to facilitate site access and vehicular movements.

All facilities shall be capable of providing 10 years of continuous service. Each should provide means to communicate the presence of hazardous materials to personnel in accordance with 29 CFR 1926.59 requirements and should be adequately heated, ventilated, air conditioned, and illuminated for expected operations.

4.1.2 Personnel Contamination Control Facility

The Personnel Contamination Control Facility shall be capable of securely controlling the flow of personnel entering and leaving the enclosed area. An estimated maximum of

50 people will occupy the building(s) at any given time, based on one shift per day but staggered hours for arrival and departure. The facility must have the capability of identifying badges of all personnel entering and exiting the facility at the maximum rate of one badge every 15 s. The badge identification system need only be capable of reading one badge at a time and must be compatible with the existing plant badge reader system. Telecommunications shall be provided.

The facility must be capable of ensuring all personnel entering or leaving the enclosed area are free of radioactive contamination. Contamination levels in and around many of the wells are unknown. Known radiation readings in SWSA 6 trenches and auger holes are in the 100- to 200-mR/h range. Acceptable radiation limits shall be in accordance with DOE Order 5480.11 and applicable Energy Systems Standard Practice Procedures. Protective measures for personnel shall be in accordance with Report ORNL/M-116/R1 (ORNL 1988). The facility must provide contaminant-free areas in which both male and female workers can change clothing. The separate areas must accommodate up to 45 male and 5 female workers respectively. The change areas shall provide for secure storage of protective clothing and personal effects, as well as secure storage of uncontaminated boots, masks, coveralls, and related equipment. Because there is a high probability that workers will encounter radioactive contamination, the facility must accommodate workers wearing Level C protection and should provide an area for fitting respirator masks. The change area must be capable of providing heat, air conditioning, ventilation, and ac power.

The facility must provide restrooms for both men and women which can be accessed only from decontaminated controlled areas. The restrooms must be capable of providing water, heat, ventilation, and ac power. The facility must provide a means of holding and removing 500 gal/d of sewage, based on an average generation rate of 10 gal/d per person.

The Personnel Contamination Control Facility must have instruments capable of detecting contaminated personnel and equipment entering or leaving the enclosed area. The decontamination area must accommodate up to eight men and women (approximately one crew) and must provide for the disposal and removal of contaminated items such as boots, clothing, or items not capable of being decontaminated within the facility. Acceptable radiation limits shall be in accordance with DOE Order 5480.1A. An estimated two showers must be provided for decontaminating personnel with provisions for the collection, storage, and disposal of 100 gal/d of contaminated water. The decontamination area must be capable of providing 100 gal/d of water by means of storage tanks replenished by tanker trucks. The facility must also provide heat, ventilation, ac power, and alarms for fire and radiation. This facility shall provide adequate separation of noncontaminated areas from potentially contaminated areas.

The facility must provide an eating area with heat, air conditioning, ventilation, and ac power, capable of accommodating 30 people. The eating area shall be constructed in accordance with applicable standards and regulations of the American National Standards Institute, the Occupational Safety and Health Administration, the U.S. Department of Energy, and the National Sanitation Foundation.

The facility site shall be developed to provide space for two additional personnel contamination control facilities.

4.1.3 Equipment Cleaning and Waste Storage Facility

The Equipment Cleaning and Waste Storage Facility shall be capable of cleaning any tool or piece of equipment engaged in well P&A activities in SWSA 6. The facility shall be capable of cleaning a maximum of four drill rigs each day approximately 8 ft wide, 10 ft high, and 6 ft long. A gravel area shall be provided for parking drill rigs and other portable equipment once they have been cleaned.

The facility must furnish both steam and process water and must have the dual capability of washing noncontaminated equipment. The water shall be furnished from tanker trucks. The facility shall provide for the safe drainage, collection, storage, and removal of 600–700 gal/d of contaminated process water per rig and 150 gal/d of contaminated groundwater per rig. The equipment cleaning facility must provide shelter from rainwater. Pumps shall be provided to transfer wastewater to tanker trucks for removal. The facility shall contain all wastewater and ensure that no runoff enters existing wells.

During P&A activities, contaminated soil, grout, water, and well casings will be generated. A segregated, diked storage area capable of holding containers of contaminated solids shall be provided. An estimated 100 ft³/d of solid waste will be generated based on each of four rigs removing 25 linear ft/d of well. Contaminated solids will primarily consist of pieces of steel and PVC well casings, steel screen, grout, and small amounts of sand and soil.

The facility shall provide for adequate holding time for analysis of liquid wastes prior to shipment and for segregation of varying contaminant levels and types. The liquid holding capability may be via tanker trucks or storage tanks, whichever provides the optimum management of waste concentrations, waste analysis, and tanker truck transfer.

4.1.4 Vehicle Parking/Staging Area

The Vehicle Parking/Staging Area shall be capable of accommodating vehicle parking for the estimated 50–200 workers conducting well P&A activities and future closure activities. The number of parking spaces required will range from 40 up to a maximum of 100 once closure activities begin. Whenever possible, the water from the parking/staging area shall drain away from SWSA-6.

The parking area shall be located adjacent to the Personnel Contamination Control Facility and should provide for the safe and orderly flow of personnel to and from the facility. Access shall be maintained to the Waste Operations entrance located along the northwest fence. An access road shall be provided to accommodate two-way, heavy truck traffic between the paved road and the parking lot. Adequate lighting shall be provided for pedestrian traffic.

The existing Vehicle Contamination Checking Facility shall be relocated so that all vehicles (government and personal) leaving the WAG 6 area are checked.

A staging area shall be provided where deliveries can be processed in such a manner that delivery personnel can conduct their business without requiring radiation/hazardous protection training. An area for contractor trailers shall also be provided.

Two trailers and associated utilities shall be provided. Space shall also be provided for an additional six trailers.

4.1.5 Roadway Improvements

The road work shall consist of grading, straightening, and paving approximately one-fourth mile of existing interior roadway running west for future use as the SWSA 6 entrance road. The road shall provide access from the new gate to buildings and trailers inside SWSA 6.

The road shall be capable of handling fully loaded tanker trucks, tractor trailers, and drill rigs traveling at a maximum speed of 15 mph. The road shall make a smooth transition from interior SWSA 6 roads and shall permit the runoff of storm water away from the road.

4.1.6 SWSA 6 Entrance

A new slide gate shall be installed west of the office facility where the new road cuts through the existing perimeter fence. The gate shall provide a new entrance into SWSA 6 and should be capable of securely handling the type of vehicular traffic described in Sect. 4.1.5 as well as fire trucks. The gate shall be able to be locally operated from a push button station and should open and close in less than 15 s. Electrical service shall be provided.

4.1.7 Fire Alarm Improvements

A Fire Department alarm system for SWSA 6 shall be capable of connecting facilities supporting the P&A activities to the ORNL system. The services shall be connected from the closest possible connection and shall be comparable to fire alarms in SWSA 5.

4.2 UNCERTAINTIES

The preferred location for the personnel facility is along the northern edge of SWSA 6. As far as is known, the site has not been designated for another purpose. This can be verified prior to beginning design criteria.

Although the project includes provisions for both male and female workers, the percentage of female workers has been estimated at no more than 10% of the actual workforce. Further confirmation of this assumption can be obtained by examining P&A activities at the Y-12 Plant and the Paducah Gaseous Diffusion Plant.

The actual size of the drill rigs requiring decontamination is unknown at this time. It is assumed that the wash facility should accommodate a vehicle approximately 8 ft wide, 10 ft high, and 12 ft long. In most cases only the portion of the vehicle including the drill would be subject to contamination.

The amount of waste and the waste generation rate can only be approximated at this time. An estimated 25 linear ft/d of well per rig can be expected to be removed. Well casings, including a grout sleeve, will range from 20 to 35 lb per linear foot. Surface casings, including a grout sleeve, will range from 45 to 50 lb per linear foot. Examination of P&A

activities at the Y-12 Plant will provide additional information regarding the amount of waste and its generation rate.

The need for HEPA filtration in either the change area of the personnel contamination control facility or the equipment cleaning facility is unknown at this time. Should HEPA filtration be required, the capability for using portable facilities will be greatly reduced.

4.3 INTERFACES AND INTERFACE REQUIREMENTS

The electrical power, potable water, and telecommunications requirements that are necessary to support operation of the support facilities are discussed in Sect. 4.1.

An interface exists between this task and the overall Environmental Restoration (ER) Program. This task will support the ER Program.

Interfaces also exist between the P&A task and the ORNL Ground Water Manager and ORNL Waste Operations.

4.4 SPECIAL ANALYSES

Martin Marietta Energy Systems, Inc., will prepare for this project a safety assessment, a risk assessment plan, a quality assurance plan, a project waste management plan, and an internal environmental assessment.

4.5 HUMAN FACTORS

Standard design practice for facilities of this type will be adequate. Storage bins for personnel equipment and clothing shall be accessible without the use of ladders or similar devices. Electrical outlets near the decontamination shower or other water sources shall be furnished with ground fault interrupters.

The use of the decontamination showers is anticipated to be infrequent. A means of screening the shower area for privacy is adequate to accommodate both male and female personnel.

4.6 MAINTENANCE ISSUES

Equipment requiring operator actions or maintenance shall be accessible within the enclosed area for those purposes. Equipment requiring maintenance outside SWSA 6 shall be cleaned and decontaminated prior to leaving the enclosed area.

4.7 CRITICAL SYSTEMS

No critical systems are associated with this project.

4.8 TESTING REQUIREMENTS

Engineering shall functionally test the telecommunications, electrical power, HVAC, lighting, alarms, and potable water systems (including the showers) in the facilities prior to operation or occupancy. The equipment/item cleaning facility shall be tested to demonstrate operability of the steam supply. All testing and test results shall be documented and provided to the Environmental Restoration Division for review. All problems and deficiencies encountered during testing shall be corrected by Engineering. Retesting shall be performed and documented by Engineering to verify correction.

5. CONFIGURATION CONTROL PLAN

All changes to the approved design shall be reviewed and approved by the Program Project Manager and reviewed by the Environmental Restoration Division to ensure that the proposed changes do not conflict with the requirements of this document.

REFERENCES

Mortimore, J. 1988. *Groundwater Quality Monitoring Well Installation—WAG 6*. ORNL/RAP-44. Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Oak Ridge National Laboratory (ORNL). 1988. *Health, Safety, and Environmental Protection Procedure for Excavating Operations*. ORNL/M-116/R1. Oak Ridge National Laboratory, Oak Ridge, Tennessee.

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