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Y-12

OAK RIDGE Y-12 PLANT

LOCKHEED MARTIN

MONITORING WELL INSTALLATION PLAN FOR THE DEPARTMENT OF ENERGY Y-12 PLANT, OAK RIDGE, TENNESSEE

September 1997

Prepared by
Science Applications International Corporation
under Purchase Order 78B-99069C-Y27

for the
Water Compliance Department
Environmental Compliance Organization

Oak Ridge Y-12 Plant
Oak Ridge, Tennessee 37831
Managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY
Under Contract No. DE-AC05-84OR21400

MANAGED BY
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY
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ACRONYMS AND ABBREVIATIONS

API	American Petroleum Institute
ASTM	American Society for Testing and Materials
CPR	cardiopulmonary resuscitation
DOE	U.S. Department of Energy
Energy Systems	Lockheed Martin Energy Systems, Inc.
EPA	U.S. Environmental Protection Agency
ESP	Environmental Surveillance Procedure
ETTP	East Tennessee Technology Park
ft	feet/foot
gal	gallon
GWPP	Ground Water Protection Program
hr	hour
ID	Inside Diameter
in.	inches
open interval	open hole monitoring interval
NEPA	National Environmental Policy Act
NSF	National Sanitation Foundation
PVC	polyvinyl chloride
PSS	Plant Shift Superintendent
QA/QC	quality assurance/quality control
SHSO	Site Health and Safety Officer
TDEC	Tennessee Department of Environment and Conservation

1.0 INTRODUCTION

The installation and development of groundwater monitoring wells is a primary element of the Y-12 Plant Groundwater Protection Program (GWPP), which monitors groundwater quality and hydrologic conditions at the Oak Ridge Y-12 Plant (AJA Technical Services, Inc. 1996). This document is a groundwater monitoring well installation and development plan for the U.S. Department of Energy (DOE) Y-12 Plant located in Oak Ridge, Tennessee (Fig. 1.1). This plan formalizes well installation and construction methods, well development methods, and core drilling methods that are currently implemented at the Y-12 Plant under the auspices of the GWPP.

Administration of this plan will be the responsibility of the Y-12 Plant GWPP Manager or authorized designee. Responsibilities include:

- initiating and completing the required well installation permits/documentation,
- approving all well installation and development activities,
- scheduling and coordinating activities of subcontractor and oversight personnel involved in the well installation program,
- supervising subcontractor performance,
- ensuring compliance with appropriate well installation and development procedures/guidance,
- approving any deviations from or modifications to the accepted well installation and development procedures,
- documenting all well installation and development activities, and
- reporting well installation and development activities to regulatory and DOE staff as required.

The Y-12 Plant GWPP Manager or authorized designee will also be responsible for modifications to this plan. Every three years, this plan will undergo a review, during which revisions necessitated by changes in regulatory requirements or GWPP objectives may be made.

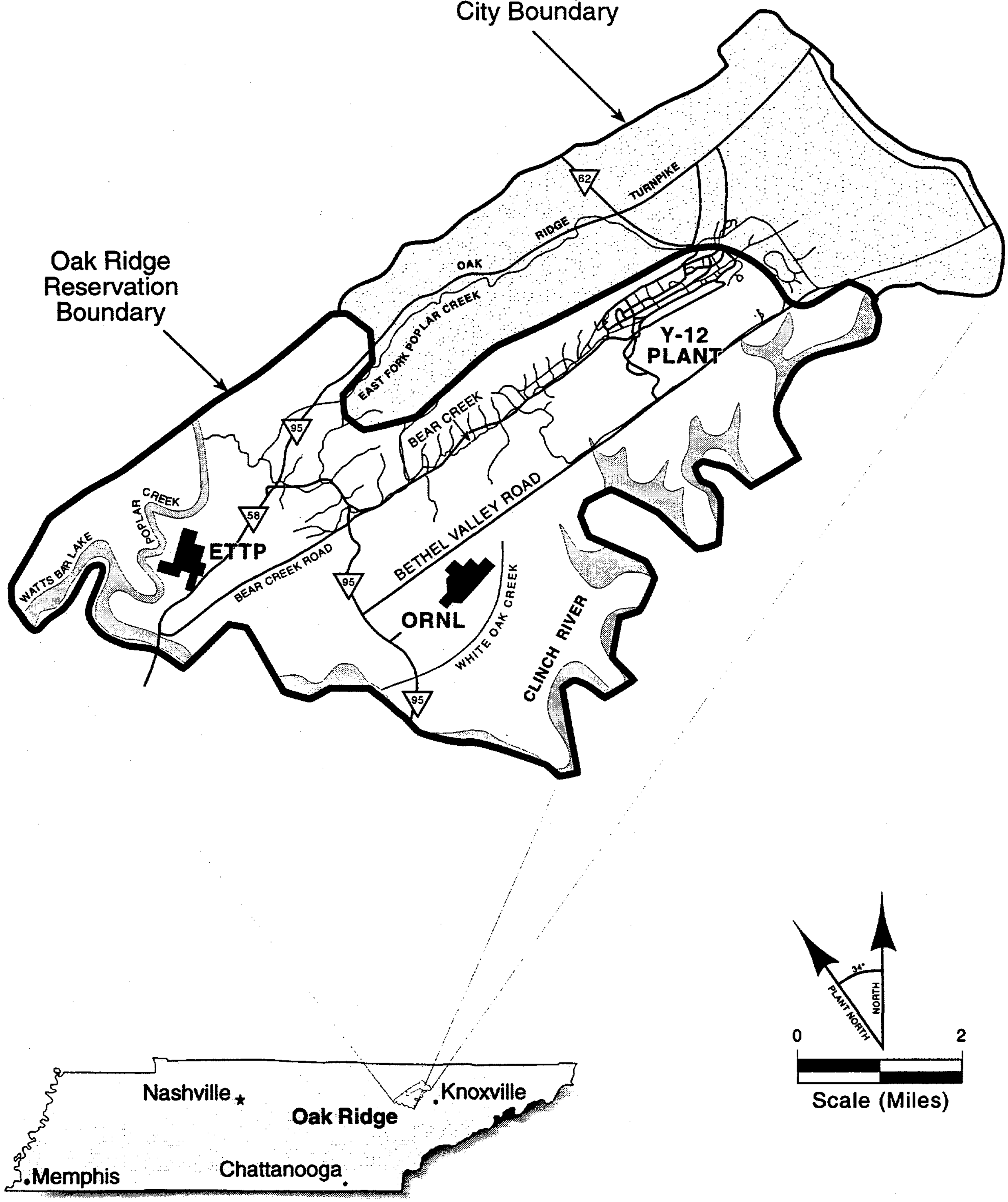

Fig. 1-1. Regional Location of the Oak Ridge Reservation

1.1 PURPOSE AND OBJECTIVES

The purpose of the GWPP is to characterize the hydrogeology and monitor the groundwater quality at the Y-12 Plant and surrounding area and to ensure protection of local groundwater resources in accordance with federal, state, and local regulations, DOE orders, and Lockheed Martin Energy Systems, Inc. (Energy Systems) corporate policies. Monitoring wells are critical to the completion of this primary objective.

The objectives of this well installation plan are:

- to present procedures and guidelines for consistent well installation and development;
- to summarize the types of well construction available, presenting advantages and disadvantages of each type and selection criteria;
- to summarize the drilling methods available, stating the conditions where each is most suitable;
- to summarize the available well construction materials and selection criteria;
- to summarize well development methods and selection criteria;
- to review the documentation requirements for well installation; and
- to review accepted waste management, quality assurance/quality control (QA/QC), and health and safety practices to be applied during well installation and development activities.

1.2 GENERAL RATIONALE FOR WELL INSTALLATION

The use of monitoring wells to obtain data on groundwater has been ongoing since the inception of the Y-12 Plant GWPP. Monitoring well installations, either for compliance or characterization, have been driven by regulatory requirements, DOE Orders, technical studies, and/or best-management practices.

Compliance wells can be constructed with either a 4-inch (in.) diameter screened monitoring interval or open-hole monitoring interval (open-interval), but specific well designs or well components may be required by regulations or permits. For characterization, more liberty may be taken in well design and construction. In these cases, well design and materials are determined by monitoring requirements and site conditions.

2.0 GENERAL TECHNICAL APPROACH

The GWPP monitors groundwater quality and hydrologic conditions at the Oak Ridge Y-12 Plant in support of a variety of geotechnical investigations, site geological and hydrological studies, and groundwater monitoring programs. A network of groundwater monitoring wells has been installed at the Y-12 Plant and vicinity during its operational history. To effectively characterize the subsurface geology and hydrogeology, a variety of well types is being utilized. The following sections describe the types of wells available for installation, the drilling methods employed, and methods of development. They also provide a list of the specific well construction materials and the preferred method for installation. Appendix A contains a procedure detailing the steps for construction of each type of well.

2.1 WELL CONSTRUCTION CONFIGURATIONS

2.1.1 Screened Wells

Screened wells are perhaps the most common type of monitoring well installed at the Y-12 Plant (Fig. 2.1). Screened wells are primarily used to monitor specific target intervals in the unconsolidated zone or in shallow bedrock horizons. In the unconsolidated zone, a wellbore with a diameter of at least 4 in. larger than the well casing diameter is drilled (EPA 1992) and the well screen, well casing (with centralizers attached at appropriate locations), sand filter pack, and bentonite seal installed. Cement grout fills the remaining annulus to the ground surface. A standard wellhead completion (pad, traffic posts, and locking cap) is employed. In shallow bedrock horizons (Fig. 2.2) a pilot bore is drilled and then reamed to a diameter that will allow for the placement and adequate cementation of a permanent surface casing. The remainder of the well is constructed as discussed above. The technical specifications of certain projects may eliminate the need for a pilot bore. In this case, a large-diameter borehole, sufficient for the installation of surface casing, is drilled initially. Screened wells are the preferred option for groundwater monitoring in turbid environments and where the bedrock may not be able to support an open interval. Various screen length and casing dimensions may be employed, depending on well site conditions, well site location, monitoring requirements, or regulatory drivers.

2.1.2 Open-Interval Wells

Open-interval wells are used to monitor groundwater within bedrock, generally at depths greater than 150 feet (ft) below the ground surface (Fig. 2.3). Open-interval wells usually

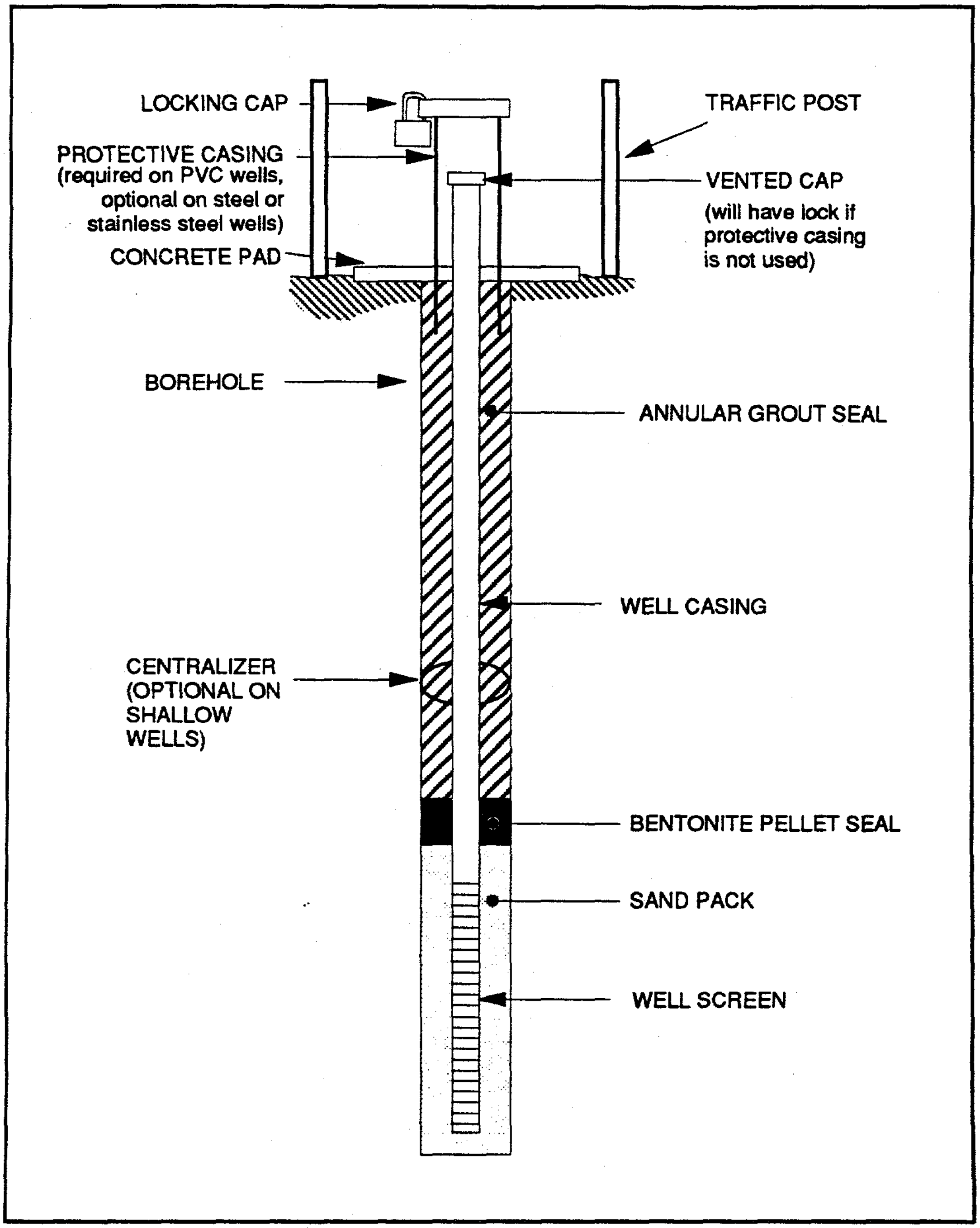

Fig. 2-1. Schematic of a typical unconsolidated zone screened well.

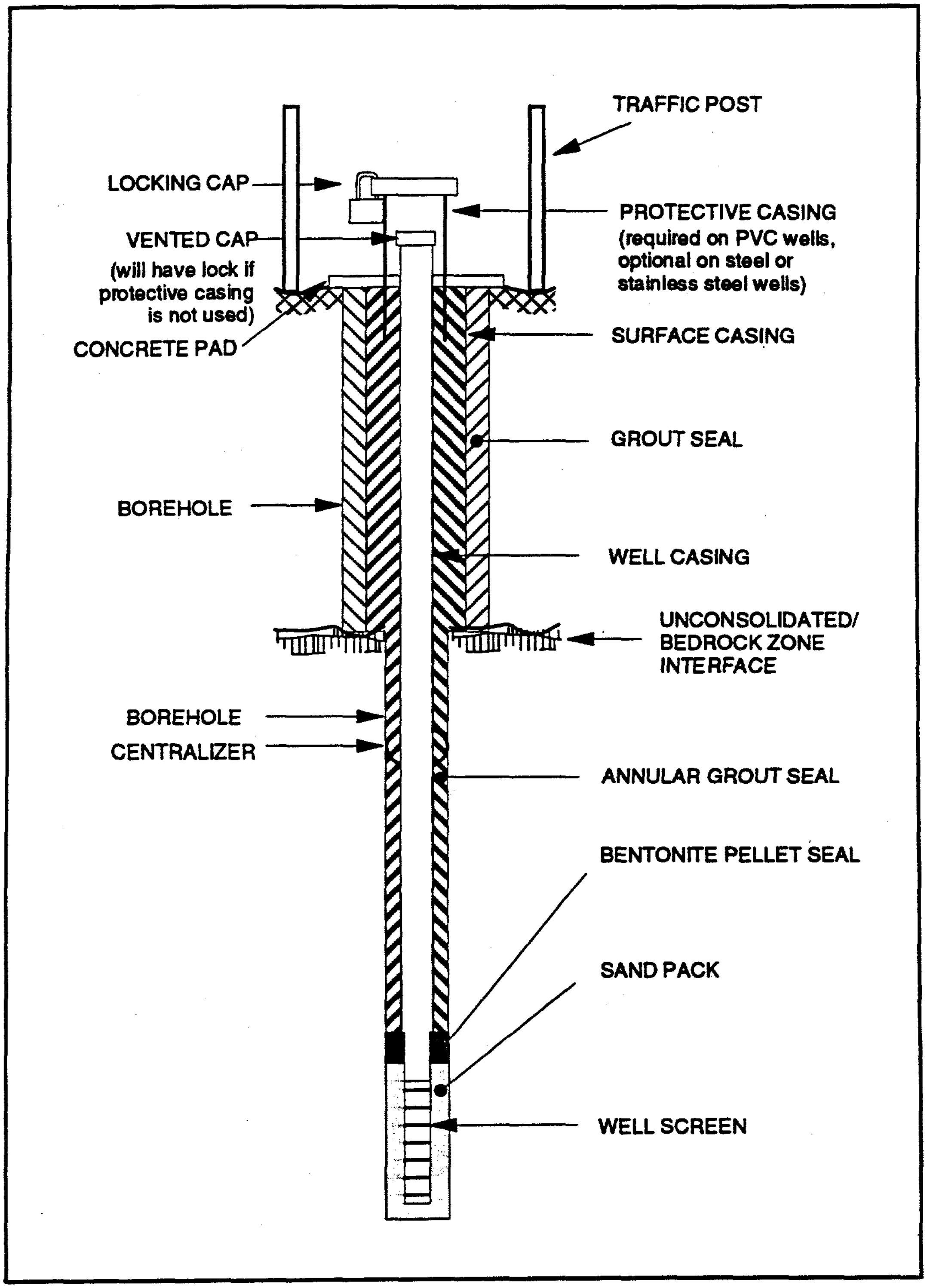

Fig. 2-2. Schematic of a typical shallow bedrock zone screened well utilizing surface casing.

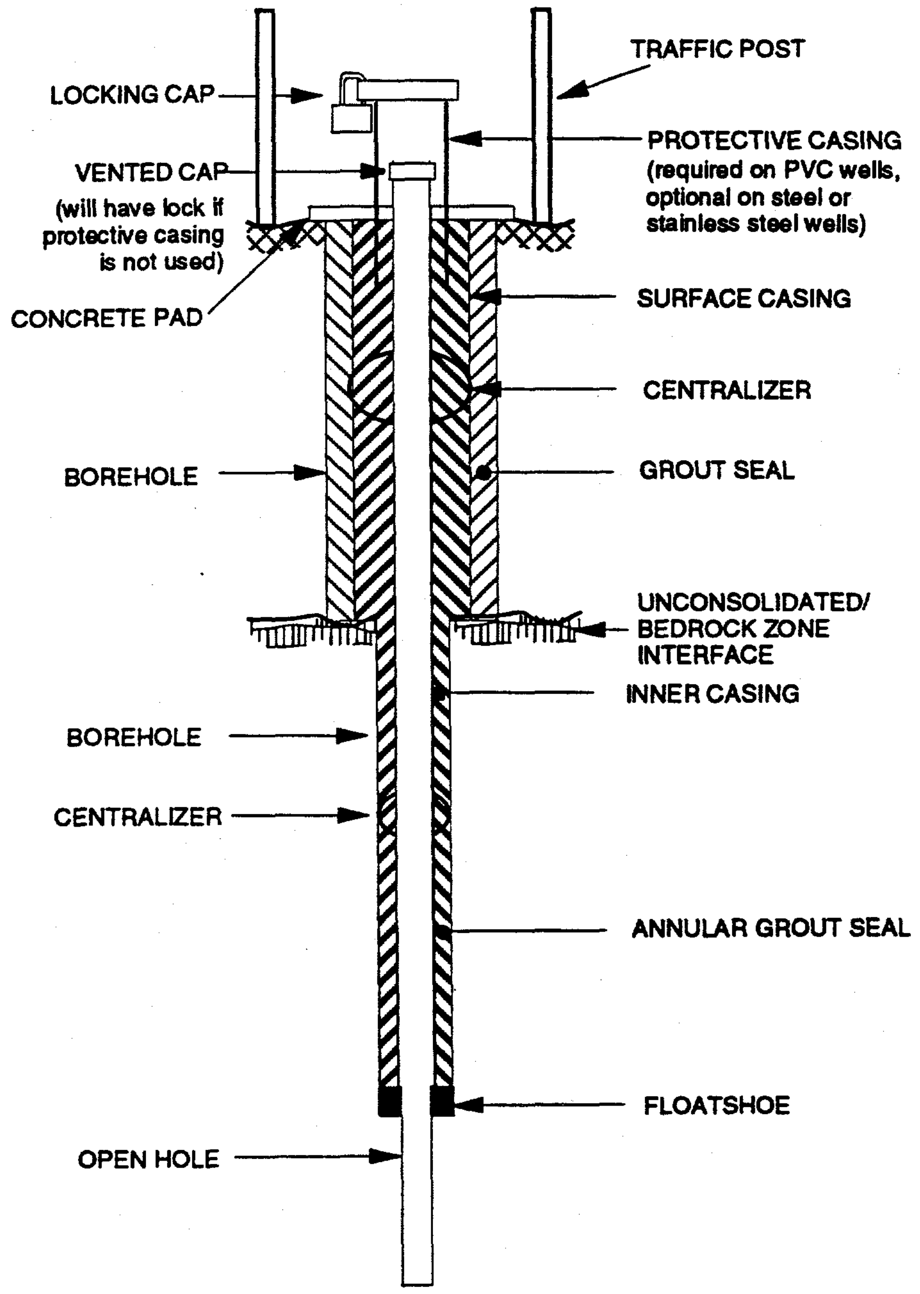

Fig. 2-3. Schematic of a typical open-hole completion well.

incorporate a long monitoring interval (50-ft typical) and, therefore, may be used to span an entire lithologic or hydrologic unit. Due to the depth of open-interval wells, surface casing is almost always used in the installation of these wells. An inner casing is installed to the top of the monitoring interval of interest and grouted in place. Due to the depth and the need for a high quality annular seal, the inner casing is often pressure grouted. While an open interval does not usually exceed 50 ft in length, greater lengths may be necessary to achieve monitoring objectives or obtain sufficient groundwater for sampling purposes.

2.1.3 Core Holes

Core drilling is an exploratory drilling method often used when conducting geologic/stratigraphic characterizations. Core drilling produces rock cores that are continuous cylindrical samples of the rock units that are drilled through. Core drilling is ideal for fracture studies, detailed structural or lithologic investigations, or when rock samples are required. Core holes are generally of smaller diameter and much greater depth than screened or even open-interval wells. At the Y-12 Plant core holes are utilized for the installation of multiple zone monitoring systems (e.g., Westbay Multiport Monitoring System™). If the core hole is to be fitted with a multiport monitoring system, the core hole must be drilled within strict tolerances (the hole should be straight and as close to vertical as possible).

In drilling a core hole, surface casing is installed into bedrock in the same manner as a screened well in a shallow bedrock horizon or open-interval well. The core pieces are retrieved from the core barrel, when full, as the core hole is advanced to the target depth. Since the bulk of the cored hole is preserved in the form of retrieved core samples, very little waste is generated.

2.1.4 Piezometers

Piezometers are similar in construction to screened-interval monitoring wells and are used mainly for water level measurements and for groundwater flow direction determinations. Therefore, piezometers have less stringent installation requirements in terms of construction materials and screen lengths and generally have lower costs. Piezometer construction requirements are usually evaluated on a case by case basis, dependent on the project requirements and site conditions.

Typically, piezometers are used only if a temporary monitoring station is required by a project. Construction materials are normally polyvinyl chloride (PVC). However, 2-in. diameter stainless steel can also be used. Screen lengths vary according to requirements; however, 2- to 5-ft lengths are most often used. Cost and installation logistics are normally much lower for piezometers than for standard screened or open-hole wells.

2.1.5 Flush-Mounted Wells or Piezometers

Flush-mounted wells are used in areas where a standard wellhead completion would interfere with above-ground activities (Fig. 2.4). Such areas include high-traffic areas and areas subject to frequent mowing. The wellhead is completed within an enclosure below ground. The below ground portion of the well is completed as usual. Precautions regarding rain water infiltration into the flush-mounted well enclosure must be taken when using this well design. These precautions include selecting a well location that is not prone to flooding or inundation. Also, the grout seal for the flush-mounted well enclosure should be sloped, if possible, to direct rainfall away from the well.

2.2 DRILLING METHODS

The drilling method for the installation of a monitoring well is selected based on the site location and lithologic conditions. Three primary methods are used at the Y-12 Plant: auger drilling, rotary drilling, and core drilling. With auger drilling, the auger flytes can be either hollow- or solid-stem. Rotary drilling involves the use of circulating fluids (i.e., air, water, or mud) to remove the cuttings and maintain an open hole. Core drilling with hollow, diamond-impregnated bits creates a smooth-walled borehole and provides a continuous lithologic record of the hole through the retrieved core pieces.

2.2.1 Hollow-Stem Auger Drilling

Hollow-stem auger drilling is among the most frequently used methods in drilling boreholes for well installations in unconsolidated materials and is normally used when undisturbed continuous sampling (i.e., split-spoon sampling, shelby tube sampling) of the unconsolidated material is needed. Drilling fluids are not typically used with this method; therefore, impact to the aquifer of concern is less than that of rotary methods. Auger drilling is usually limited to depths of approximately 150 ft. In formations where the borehole will not stand open, the well can be constructed inside the augers before they are removed from the ground. Because waste generation is minimal, auger drilling is also particularly suitable for drilling potentially contaminated areas.

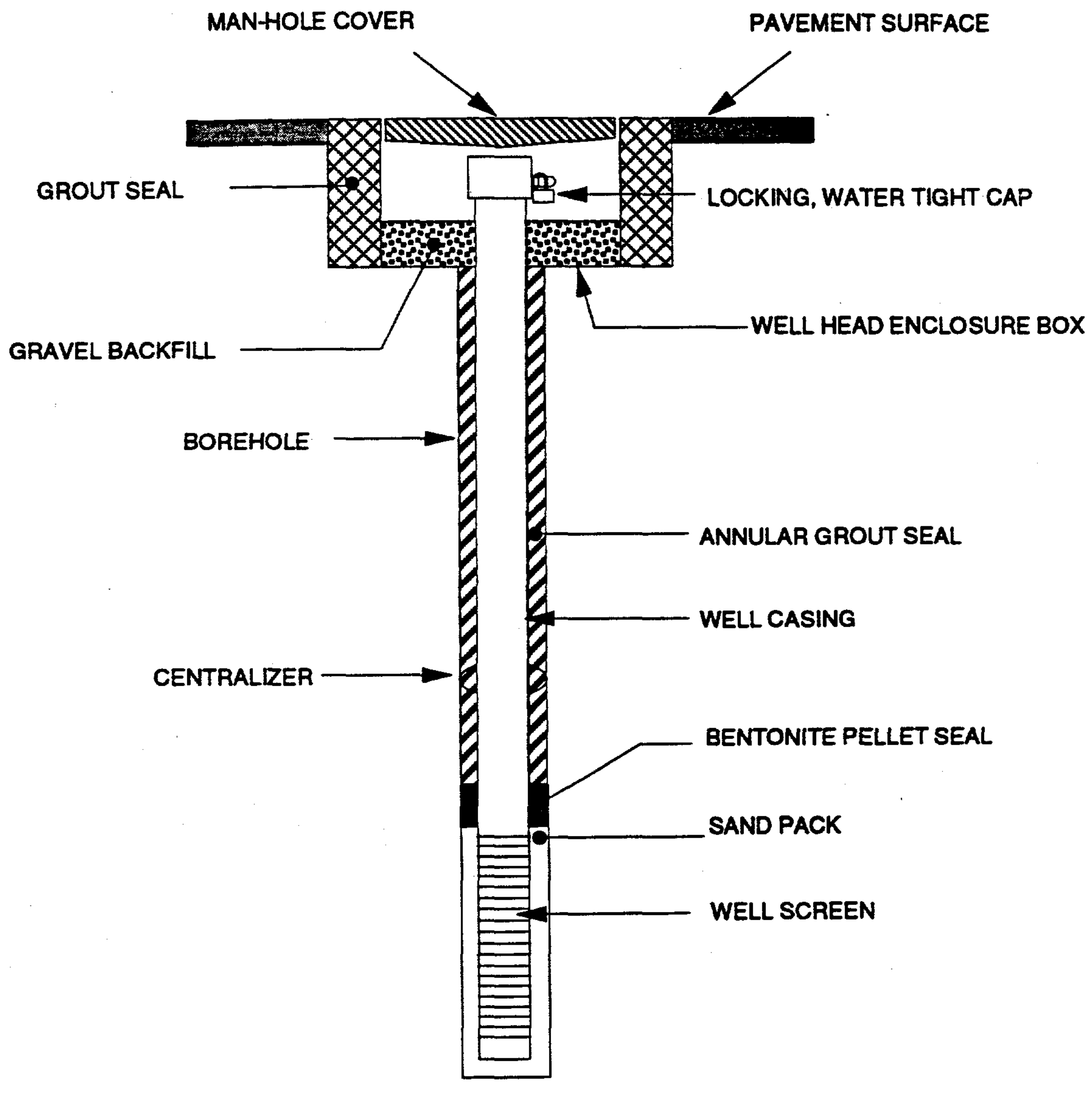

Fig. 2-4. Schematic of a typical flush-mounted, screened well.

2.2.2 Solid-Stem Auger Drilling

Solid-stem auger drilling can be utilized for nearly every application of hollow-stem auger drilling; however, with solid-stem augers, undisturbed sampling of the unconsolidated material and installation of a well is impossible without removal of the augers. Thus, this drilling method is best used where borehole collapse is not a concern, such as in clay-rich materials, and when sampling of the unconsolidated interval is not required.

2.2.3 Air Rotary Drilling

Air rotary drilling method is ideally suited for boring holes in bedrock, but can also be used in cohesive, unconsolidated materials. Air rotary drilling uses compressed air passing through the hollow drill rods and out the bit to cool the bit and remove the cuttings through the annulus of the borehole to the ground surface. Of the rotary drilling methods, air rotary drilling has the fewest chemical and physical impacts to the surrounding groundwater and bedrock. Containment of potentially contaminated cuttings and fluids, however, becomes a consideration since large volumes of drilling effluents can be generated with this method. Also, this method should not be used in loosely consolidated sediments because the risks of borehole collapse or washouts of the borehole are high.

2.2.4 Water Rotary Drilling

Water rotary drilling involves using water as a circulating fluid to remove cuttings and lubricate the bit. This method has many of the same benefits and disadvantages as air rotary drilling. One obvious disadvantage is that use of water rotary drilling in loosely consolidated sediments can result in the destabilization of the borehole wall leading to hole collapse and undesirable borehole enlargement. The use of water in rotary drilling of cohesive soils or bedrock results in a more thorough cleaning of the borehole. However, use of this method also increases volumes of drilling effluents and in contaminated environments will produce large quantities of potentially contaminated fluids that must be managed.

2.2.5 Mud Rotary Drilling

Mud rotary drilling involves circulating a drilling mud through the drill stem and bit to remove the cuttings and lubricate the drill bit. This method has similar benefits as the previously mentioned rotary drilling methods and provides the additional benefit of stabilizing the borehole.

However, drilling muds have an adverse effect on groundwater chemistry and hydraulics of the surrounding bedrock. In addition, large quantities of drilling effluents are generated and must be managed appropriately. Mud-rotary methods should be used only if borehole collapse potential is extremely high.

2.2.6 Core Drilling

Core drilling is used in rock formations to obtain a continuous lithologic record of the formations. This method involves drilling rock using a hollow core bit and repeatedly filling and emptying a core barrel to retrieve the rock core. Core drilling is very labor-intensive and is the most time consuming and costly of all drilling methods. Core drilling typically uses water as a circulating fluid to both cool the bit and raise cuttings to the ground surface; thus, waste generation and management issues must be taken into consideration prior to selection of this method. Core drilling is used when multiple-port monitoring systems are to be installed.

2.3 WELL CONSTRUCTION MATERIALS/REQUIREMENTS

2.3.1 Borehole Requirements

The borehole slated for well installation should be drilled of sufficient diameter to meet well construction requirements. A minimum 2-in. annular space is required between the casing or screen and borehole wall to allow sufficient room for the filter pack, the bentonite seal, and/or the annular grout (EPA 1992). A 2-in. minimum annular space also provides easy access for tremie pipe of up to 1 1/2-in. diameter for the placement of the filter pack and annular grout. If the well is installed through hollow-stem augers, the inside diameter (ID) of the augers should be considered when determining the 2-in. minimum annulus.

In geologic formations prone to borehole collapse or in areas where groundwater is naturally turbid, it may be necessary to drill the borehole several feet beyond the proposed total depth. The additional borehole depth provides room for the installation of additional filter pack or the installation of a silt trap below the screen to obtain suitable groundwater samples.

2.3.2 Well Screen and Casing

The well screen and casing for a well should be of high quality materials that will not contribute foreign constituents to the monitored interval. The standard screen and casing materials for a permanent monitoring well at the Y-12 Plant are: Schedule 80, No. 304 or 316 stainless steel; carbon steel; or rigid, Schedule 40 PVC conforming to National Sanitation Foundation (NSF) Standard 14 (EPA 1986; EPA 1992). The screen slot size should be such as to retain 90%, and preferably 99%, of the filter pack (ASTM D 5092 1995) The length of the screen should be adequate for the zone of interest. Typical screen lengths are 5 and 10 ft, but desired well performance and regulatory requirements should be considered prior to installation. Surface casing used in the construction of all wells, and the inner casing of open-hole wells, should be of F-25 or J-55 American Petroleum Institute (API) grade or equivalent. Schedule 40 PVC pipe may also be used as a substitute for steel surface casing. The diameter of surface casing and/or inner casing should be sufficient to contain the well casing, maintaining a minimum 2-in. annular space (EPA 1992). Any lubricating material or adhesive used to aid in connecting the casing sections together should be of a noncontaminating nature, and used only with the approval of the Y-12 Plant GWPP Manager or authorized designee.

2.3.3 Filter Pack

Filter pack material should be clean, well-rounded, hard silica sand of relatively uniform grain size. The grain size should also be such that the grains will not pass through the screen gaps (see well screen selection criteria above). Placement of the filter pack into the annulus is generally accomplished through the tremie method; however, direct pouring of the sand into the annulus may be acceptable under certain circumstances. Up to 1 ft of sand should be placed in the bottom of the borehole first to provide a firm foundation on which to set the screen, as well as to allow for unrestricted circulation of groundwater at the bottom of the screen. The height of the filter pack is variable but should extend a minimum of 1 ft and not more than 2 ft above the top of the screen. The Y-12 GWPP Manager or authorized designee will determine the filter pack requirements if they deviate from normally accepted criteria. The depth of the top of the filter pack should be verified using a weighted measuring tape.

2.3.4 Bentonite Pellet Seal

A hydrated bentonite pellet seal is placed on top of the filter pack to prevent the invasion of grout into the filter and to provide a firm foundation while the annular grout is curing. A high solids (more than 20% solids) bentonite should be used to seal the top of the filter pack (EPA 1992). The bentonite pellet seal may be placed into the borehole annulus using the tremie method or by direct pouring, as long as the pouring is accompanied by continuous tamping with a weighted tape to prevent bridging. Aggregate bentonite may be poured into the borehole through relatively long annular water columns because it begins hydrating more slowly than processed bentonite pellets. The thickness of the bentonite pellet seal is variable, although a minimum of 2 ft is necessary to provide an adequate seal. The bentonite should be allowed to hydrate as per manufacturer's specifications. It may be necessary to add potable water to hydrate the bentonite after installation. The depths to the top of the dry and hydrated bentonite seal should be verified using a weighted tape.

2.3.5 Annular Grout

Only Class A cement with 2% bentonite (by weight) additive should be used when cementing the remaining annulus. Other cement additives (i.e., calcium chloride, pozzolans, etc.) may be used if required to obtain an adequate seal. The cement should be thoroughly mixed. The tremie method is preferred when placing the annular grout. This ensures a uniform grout placement from the bottom of the remaining annulus to the ground surface. The tremie method also displaces any water that may remain in the annulus, which might dilute the grout mix. The bottom of the tremie pipe should be fitted with a deflector when cementing to prevent damage to the bentonite seal. Grout may be poured directly into the annulus on top of the bentonite seal under certain circumstances where the annular space is above the water table. The annulus is normally grouted to the ground surface, although this may not be possible due to thief zones or volume reduction during curing.

2.3.6 Standard Well Head Completion

A standard well head completion consists of a concrete protective pad; protective posts; a cap, hasp, and lock; and identification tag. Protective casings are used on PVC wells.

A concrete pad is installed on each completed well with casing stick-up. The pad should be of dimensions and thickness determined by the project scope of work or technical specifications. The top of the pad should slope away from the well casing to divert any drainage, and the bottom of the pad should be at least 3 in. below grade to prevent washout and undermining.

Protective posts are positioned around the finished well to prevent collision damage to the above-ground wellhead. The posts are steel and of a sufficient height so that they are visible to vehicle operators. The posts are painted high-traffic yellow. Specifications for traffic posts are contained in the project scope of work or technical specifications.

Well security is assured by a metal locking cap or lid. Lock hasps should be welded or permanently affixed to the well casing and/or cap. Weather resistant padlocks should be used to secure the well. Lubrication of the security padlocks is not permitted. Well identification is engraved on a stainless steel tag attached to the well casing; well numbers may also be painted on the casing stick-up.

Steel protective casing, with a minimum ID of 2 in. (preferably 4 in.) larger than the nominal diameter of the well casing (ASTM D 5092), is placed over PVC wells to add additional security to the well. The protective casing is embedded in the concrete pad and fitted with a locking cap and hasp. A weep hole in the protective casing at the top of the concrete pad is required to allow discharge of condensate or water.

2.3.7 Flush-Mounted Well Head Completion

A flush-mounted well head completion consists of a below-ground wellhead enclosure, gravel drain, watertight cap, lock, and identification. The flush-mounted well enclosure is installed in a shallow excavation around the wellhead and cemented in place. The bottom of the flush-mounted well enclosure is backfilled with gravel to allow any rainwater that may leak inside the box to infiltrate to the subsurface. The enclosure box typically has a traffic cover to allow access to the wellhead after installation. The well and flush-mounted well enclosure should be constructed so that the traffic cover does not rest directly on top of the wellhead. The well cap, in addition to providing security to the well, must be watertight to prevent water that may pool inside the flush-mounted well enclosure from entering the well. Well identification tags attach to the well casing inside the enclosure box.

2.4 WELL DEVELOPMENT

The well is developed upon completion of well construction activities. Development helps restore the natural hydrologic characteristics to the monitored aquifer and removes foreign sediment to ensure turbid-free groundwater samples. To be effective, well development should reverse the flow through the filter pack, into the aquifer. This process cleans out the filter pack pore spaces and sorts the particles. Removal of a minimum of three well volumes is generally necessary for effective well development. Development should continue until the water quality measurements have stabilized, the water is free of turbidity, or until terminated by the Y-12 Plant GWPP Manager or authorized designee. Swabbing through steel tubing (with a check valve on bottom) inserted into the well, using a submersible pump, air jetting, and using a bailer, or using a surge block in combination with any one of these water removal methods, are acceptable development methods. Development using multiple zone monitoring systems, such as those installed in a core hole, is a highly specialized activity. Well development in multiple zone wells should be in accordance with the monitoring system manufacturer's requirements.

2.4.1 Swab Method

The swab method of well development involves the running of tubing (with a check valve on the bottom end) into the well and moving a swab tool attached to a wire line up and down to evacuate water out the tubing outlet. The swab method is most commonly used on wells greater than 50 ft deep.

2.4.2 Bailing

Bailing involves repeatedly lowering a bailer into the well and removing the bailer full of water from the well. Bailing is usually the development method of preference in wells less than 50 ft deep.

2.4.3 Submersible Pump

When developing a well using a submersible pump, the pump is placed at or near the bottom of the well and the water pumped to the surface through tubing attached to the pump. Well depth should not be a factor in the use of a submersible pump for well development, but rather water turbidity. Highly turbid water subjects the pump to abrasion, excessive water loss, and loss of efficiency.

2.4.4 Jetting

Jetting employs a jetting tool with nozzles and a high-pressure pump to push water outward through the well screen and the filter pack into the formation to dislodge fine sediment. An air-lift pump is often used in conjunction with a jetting tool to remove water during this method of development. Well depth is not normally a factor in the use of jetting for well development.

2.4.5 Surge Block

The surge block is a plunger-like device used to reverse the groundwater flow through the screen and filter pack through a series of in and out plunging actions. Surging can be effective in wells less than 50 ft deep. If used for well development, surging must also be accompanied by one of the aforementioned water removal methods.

2.5 UNIQUE INSTALLATIONS/DEVIATIONS

During well installation and development, certain conditions may arise that make it necessary to deviate from the standard operating procedures. Alternately, project requirements may specify a unique type of monitoring well design. For example, cavities and voids in the subsurface may require nested well casings to restore circulation, use of pre-packed well screens, or the use of grout baskets. Grout additives (such as Flocele™ and Calseal ™) and special annular materials (such as concrete and pea gravel) may be necessary to bridge the large voids encountered down-hole. The introduction of potable water or foaming agents into the well may be necessary during drilling to break up accumulated sediment or to assist in bringing the sediments to the surface. Casing diameter and screen lengths may have to be adjusted based on project needs and costs. Deviations to standard procedures must be pre-approved by the Y-12 Plant GWPP Manager or authorized designee and denoted in the well activity/progress report (see Sect. 3.2.3).

3.0 DOCUMENTATION/PROCEDURAL PROCESS

Descriptions of the administration, recordkeeping, and reporting activities associated with the monitoring well installation program at the Y-12 Plant are provided in the following sections.

The Y-12 Plant GWPP Manager or authorized designee is responsible for administration of the monitoring well installation program. Administrative responsibilities include

- approving all well installation activities;
- scheduling and coordinating activities of subcontractors involved in the well installation program;
- supervising subcontractor performance;
- ensuring that appropriate well installation procedures are followed;
- approving any deviations from, or modifications to, the specified well installation methods; and
- maintaining central documentation of well installation activities.

3.1 RELEVANT GUIDANCE/PROCEDURES

Numerous documents and procedures are available to provide guidance for well installation and development. The Lockheed Martin Energy Systems Environmental Surveillance Procedures (ESPs) numbers ESP-303-6 and ESP-601 provide general guidance for well installations (Energy Systems 1988).

The Y-12 Plant GWPP Monitoring Well Installation and Development Procedure (G-004) offers detailed direction for the drilling, installation, and development of monitoring wells at the Y-12 Plant (Appendix A). No state or federal regulations have been promulgated to date regarding well installation methods. However, the U.S. Environmental Protection Agency (EPA) and American Society for Testing and Materials (ASTM) have published guidance documents and technical standards; these are included as use references in the procedure included in Appendix A.

3.2 DOCUMENTATION

Detailed records of each well installation are maintained as part of the GWPP Administrative Record. These records include:

- a well installation oversight checklist,
- a well installation diagram,
- an activity/progress report,
- a well log,
- a well cuttings field screening/disposal form,
- well development progress and summary forms,
- a well water field screening/disposal form, and
- an equipment decontamination inspection summary.

Core drilling, core lithology, and core structure logs are completed for core drilling activities. All documentation is completed by the oversight geologist or site health and safety officer and reviewed by the Y-12 Plant GWPP Manager or authorized designee. These records are maintained as a permanent record of the installation. Examples of all of the documentation forms used during well installation, well development, and core drilling are included in Appendices B and C.

3.2.1 Well Installation Oversight Checklist

This form is used to initiate well installation operations by outlining the scope of the project and detailing the monitoring requirements and construction specifications (Appendix C.1). The form is completed by the Y-12 Plant GWPP Manager or authorized designee. When the installation is scheduled, the completed form is transmitted to the Y-12 Plant personnel responsible for monitoring well installation, or to an appropriate subcontractor.

3.2.2 Well Installation Diagrams

Well Installation Diagrams are completed by the field personnel overseeing the installation activities. The particular diagram used will depend on the type of well construction employed in the field (Appendices C.2-C.5).

3.2.3 Well Installation Activity/Progress Report

The Well Installation Activity/Progress Report is completed by the field personnel who supervise the installation activities (Appendices C.6 and C.7). This form is used to document the daily activities performed during the well installation operation, as well as any deviations from the standard well installation procedure.

3.2.4 Well Log

A Well Log is completed by the field personnel overseeing the installation activities (Appendices C.8 and C.9). The well log is used to record lithologic descriptions of the various unconsolidated and/or bedrock formations encountered during the installation. Observations on fractures, cavities, water production, samples, and field monitoring results may also be recorded on the well log. The Monitoring Well Installation Procedure (G-004, Appendix A) specifies the classification systems by which rock/soil cuttings are to be logged.

3.2.5 Well Cuttings Field Screening/Disposal Form

A Well Cuttings Field Screening/Disposal Form is completed by the field personnel overseeing the installation activities (Appendix B.2). The monitoring instruments used, the background and highest observed values, and the disposition of the cuttings are recorded on the form.

3.2.6 Monitoring Well Development Progress Form

A Monitoring Well Development Progress Form is completed by the field personnel who oversee the well development phase of the installation (Appendix C.10). Daily purge water volumes, turbidity observations, and selected water quality values are recorded on this form.

3.2.7 Monitoring Well Development Summary Form

A Monitoring Well Development Summary Form is completed by the field personnel who oversee the well development phase of the installation (Appendix C.11). Well development details, including well volume, total volume of development water produced, beginning and ending water quality values, and disposition of the development water are recorded on the form.

3.2.8 Well Water Field Screening/Disposal Form

A Well Water Field Screening/Disposal Form is completed by the field personnel overseeing the well development phase of the installation (Appendix B.3). The monitoring/measuring instruments used, the water quality values, and the disposition of the development water are recorded on the form.

3.2.9 Equipment Decontamination Inspection Summary

An Equipment Decontamination Inspection Summary is completed by the field personnel overseeing the installation activities (Appendix C.12). This form is completed following an inspection of all well installation and development equipment and materials prior to each installation activity.

3.2.10 Core Drilling Log

A Core Drilling Log is completed by the field personnel overseeing core drilling activities (Appendix C.13). The start and end times and top and bottom depths of each core run and the percent recovery are recorded on the log.

3.2.11 Core Lithology Log

A Core Lithology Log is completed by the field personnel overseeing core drilling activities (Appendix C.14). The top and bottom depths and a description of each lithologic unit encountered while core drilling are recorded on the log. The Monitoring Well Installation Procedure (Appendix A) specifies the classification systems by which rock cores are to be logged.

3.2.12 Core Structure Log

A Core Structure Log is completed by the field personnel who oversee core drilling activities (Appendix C.15). The depths, identities, and infilling characteristics of all discontinuities encountered while core drilling, as well as bedding dip values, are recorded on the log.

3.3 REPORTING

An annual well installation report will be issued by the Y-12 Plant GWPP to formally document the installation program. The annual report will compile the monitoring well diagrams, monitoring well activity/progress reports, well logs, cuttings field screening/disposal forms, monitoring well development progress forms, monitoring well development summary sheets, development water screening/disposal forms, equipment decontamination inspection summary sheets, core drilling logs, core lithologic logs, and core structure logs issued in each fiscal year.

A record copy of this plan will be kept on file by the Y-12 Plant GWPP Manager or authorized designee. This plan will be reviewed on an annual basis for obsolescence, and the appendices will be revised as needed to reflect new guidance or requirements. A triennial review of the well installation plan will be documented by a memorandum denoting any changes in business practices.

As required, the Y-12 Plant GWPP Manager or authorized designee will update and reissue this plan with the information from the triennial reviews. Revisions to the plan will involve incorporation of new material to reflect changing business practices or to update obsolete information.

3.4 WASTE MANAGEMENT

It is the goal of the Y-12 GWPP to handle drill cuttings and fluids generated by well installation and development in a manner that is consistent with applicable Energy Systems procedures and regulations and that is safe for human health and the environment. Guidelines for handling drilling effluents are contained in Appendix B. A well installation waste management plan for each well installation is prepared by the Y-12 Plant GWPP Manager or authorized designee for direction in handling well installation-generated wastes (Appendix B.1). The well installation waste management plan is completed by the Y-12 Plant GWPP Manager or authorized designee for each well installation project. This plan includes: (1) the estimated volume of cuttings and fluids that will be generated during the well installation and development, (2) the types and concentrations of contaminants (if any) known to be present at the well site, (3) the appropriate waste containment method required during the well installation operations , (4) an estimate of the number and types of samples to be collected during well installation and the required analysis of the samples prior to disposal or treatment, and (5) the proposed disposition or treatment of any containerized material.

Field personnel provide regular screenings of drill cuttings and development water during installation activities. Drill cuttings and development water are screened for radioactivity, volatile organics, specific conductance, and pH. In the event that drill cuttings and/or development water exceed acceptable disposal limits, the Y-12 Plant GWPP Manager or authorized designee will direct the field personnel in the proper disposal techniques.

3.5 QUALITY ASSURANCE/QUALITY CONTROL

QA/QC for well installation activities will conform with applicable provisions outlined in the Y–12 Plant GWPP Quality Program Plan (SAIC 1994) and Energy Systems Environmental Surveillance Quality Control Program (Energy Systems 1988). A geologist registered in the state of Tennessee will serve as well installation oversight personnel and will direct well installation subcontractor staff. Deviations to standard operating procedures will be documented on the well installation activity/progress report and approved in advance by the Y-12 Plant GWPP Manager or authorized designee. In accordance with the Y-12 Plant Quality Program Plan, an annual self-assessment of well installation activities will be conducted if activity schedules allow. External audits or assessments of well installation activities may be conducted by Energy Systems Quality or Central Compliance Organizations, DOE, or Tennessee Department of Environment and Conservation (TDEC) staff.

3.6 HEALTH AND SAFETY

It is the goal of Energy Systems to conduct well installation and development activities in a manner that ensures maximum safety and health for Energy Systems and subcontractor personnel. All installation activities adhere to the *Health and Safety Plan for Well Installation and Plugging and Abandonment Activities, Y-12 Plant Oak Ridge, Tennessee* (SAIC 1992). It is the responsibility of all site personnel to ensure adherence to this plan. All personnel working at a well-site are required to have completed the 40-hr Hazardous Waste Site Operations training in accordance with 29 CFR 1910.120 and applicable annual refresher requirements, have had a respirator fit test within the previous year, and be enrolled in a medical monitoring program. In addition, the oversight geologist and/or site health & safety officer (SHSO) is required to have been Red Cross-certified in first aid and cardio-pulmonary resuscitation (CPR) techniques. Prior to any well installation activities, an excavation/penetration permit and a site-specific health and safety checklist must be completed. Also prior to well installation activities, a site-specific health and safety briefing is conducted for all site personnel.

In addition to the site-specific health and safety checklist, other health and safety review documentation may be required based on site conditions. This documentation may include radiological work permits, safety work permits, task hazard analyses, or Energy Systems National Environmental Protection Act (NEPA) review forms. The need for these types of task reviews and documentation will be determined during preparation of the site-specific health and safety checklist. These reviews and documentation will be completed using resources from Industrial Safety, Radiological Control, and Facility Safety Organizations as required. Welding/Burning/ Hotwork permits are required if such activities are necessary at any point during the well installation task. These forms are included in Appendices C.16-C.22

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APPENDIX A

WELL INSTALLATION AND DEVELOPMENT PROCEDURE

Oak Ridge Y-12 Plant
Groundwater Protection Program
Standard Practice Procedure

Monitoring Well Installation and Development Procedure

G-004
Rev. 0, September 1997

Approved by:____________ **Date:**__________

Effective Date:_____________

Change No.	Affected Pages	Approved Date	Expiratio n Date	Change No.	Affected Pages	Approved Date	Expiratio n Date

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1.0 PURPOSE

This procedure contains specific direction for monitoring well installation and development at the Oak Ridge Y-12 Plant. Wells are used to monitor the physical and chemical characteristics of groundwater. A variety of monitoring well construction methods are used based on site conditions, monitoring requirements, and/or regulatory demands. The well development method chosen will be influenced by the well construction: type, depth, etc. This procedure addresses the different well drilling methods, well construction types, and development methods that are used at the Oak Ridge Y-12 Plant.

2.0 APPLICABILITY

This procedure applies to all monitoring well and piezometer installations, and core drilling that takes place in support of environmental investigations conducted at the Oak Ridge Y-12 Plant.

3.0 DEFINITIONS

Activity/Progress Report - The portion of the Well Installation Report that describes the daily activities during well installation and development.

Air Hammer Drilling - A drilling technique that uses a pneumatic hammer at the bottom of the rotating drill pipe to provide a percussion effect.

Air Rotary Drilling - A drilling technique in which compressed air is circulated down the rotating drill rods and up the annulus between the drill rods and the borehole wall. The air simultaneously cools the drill rods and removes the cuttings from the borehole.

Alpha Meter - A radiological instrument used to detect alpha radiation.

Annular Seal - Material (grout or cement) that prevents fluid migration through the space between the well casing and the borehole wall or outer casing (annulus).

Annular Space or Annulus - The space between the borehole wall and the well casing or the space between the well casing and outer casing.

Aquifer - A geologic formation, group of formations, or part of a formation that is saturated and is sufficiently permeable to conduct significant quantities of groundwater under ordinary hydraulic gradients.

Auger Drilling - A drilling technique used in unconsolidated materials in which the cuttings are mechanically and continuously removed from the borehole through the use of drill rods with welded spiral flanges (flytes).

Bentonite - Hydrous aluminum silicate available in powder, granular, or pellet form, which increases its volume with the addition of water. Granules and pellets are used to provide a tight seal between the well casing and borehole wall on top of the filter pack. Bentonite powder is often used as a cement additive to prevent shrinkage and cracking of grout.

Beta/Gamma Meter - A radiological instrument used to detect beta and/or gamma radiation.

Borehole - An uncased boring; produced by drilling.

Casing - Steel or polyvinyl chloride (PVC) pipe, installed into a borehole during or after drilling and cemented into place. It prevents the sides of the borehole from collapsing, prevents loss of drilling fluids into porous formations, and prevents unwanted fluids from entering the hole.

Casing Collar - The coupling between joints of casing.

Cavity - An opening in bedrock produced by dissolution of the rock by water.

Centralizer - A guide, affixed to the casing, used to center the well casing and screen in the borehole and ensure even placement of materials such as the sand filter pack, bentonite seal, and grout into the annular space.

Circulation - The movement of a drilling medium from a source, whether a compressor (compressed air) or a tank or pit (water or drilling mud), down through the drill pipe, up the annular space in the hole, and back to the ground surface. This process serves the purpose of cooling the bit and removing cuttings from the borehole.

Circulation Loss - The loss of drilling medium into a porous (or "thief") formation or a cavity to the extent that circulation does not return to the surface.

Competent Bedrock - The solid, unweathered bedrock that underlies the weathered bedrock horizon and the unconsolidated zone.

Conductivity Meter - An instrument that measures the specific conductance of a water sample in units of micromhos/centimeter. Used during well development.

Conductor Casing - An initial casing, typically steel or PVC, installed in the unconsolidated zone to support the borehole and provide drilling rig stability. This casing may be removed during completion of the well or cemented in place.

Containment System - Excavated pit, drums, tanks, or other containers used to collect and contain drill cuttings and fluids generated during well installation and development.

Core - A continuous, cylindrical sample of rock obtained by core drilling methods.

Core Run - A sequence of uninterrupted core drilling activity, which results in the drilling of an interval of hole and retrieval of a section of core. The length of a core-run is determined by the driller, based on the drilling equipment in use, and drilling conditions.

Cuttings - Soil or rock chips cut by a drilling bit during the process of well drilling and removed from the borehole by the drilling/circulation medium (drilling mud, water, or compressed air) or auger flytes.

Decontamination - The process of removing or reducing undesirable physical or chemical constituents, or both, from equipment to reduce the potential for cross-contamination.

Development - The process by which sediment and other residual materials are removed from the well after installation, and the monitored aquifer returned to its natural hydraulic conditions to the extent possible. Development may be accomplished using pumps, bailers, surge blocks, or swabbing.

Development Water Field Screening/Disposal Sheet - A form used to record the values of water quality parameters/contaminants measured during well development.

Drill Bit - A cutting or boring tool located at the lower end of a drill stem.

Drill Collar (Stabilizer) - A heavy, very thick-walled length of drill stem used in rotary drilling, which is placed immediately behind the bit to add weight and rigidity to the bit to help it drill into formations faster and straighter.

Drill Stem (Drill Pipe/Drill String/Drill Rods) - Thick-walled, hollow, steel pipe, which is added in sections as the borehole is advanced.

Equipment Decontamination Inspection Summary - A form used to record the adequacy of decontamination of the drill rig and tools, drill pipe and bits, well construction materials, and well development equipment prior to use.

Groundwater Protection Program (GWPP) - A program developed per DOE Order 5400.1 to characterize the hydrologeology and monitor and protect groundwater quality at the Oak Ridge Y-12 Plant.

GWPP Manager - Person responsible for the day-to-day management of the Oak Ridge Y-12 Plant GWPP.

Headspace - The air space in a sample container between the water or cuttings sample and the cap.

Inner Casing - Casing installed through the surface casing, in an open-interval well or a core hole, to the top of the monitoring interval of interest.

Lithologic/Sampling Log or Well Log - A description of the lithology of the borehole and a record and lithologic description of the samples taken.

Open-Hole Interval or Open Interval - The bottom section of an open-hole well drilled in competent rock unsupported by well screen or casing, which penetrates the monitoring interval of interest.

Organic Vapor Analyzer (OVA) - A field monitoring device used to determine the concentrations of organic compounds in air using flame ionization or photoionization detection systems. The organic vapor analyzer measures the concentration of organic compounds in air in parts per million (ppm).

Oversight Geologist - A geologist or professional geologist, registered in the State of Tennessee, responsible for field supervision of the well installation and development operations.

pH Meter - An instrument used to measure the acidity or the alkalinity of groundwater samples obtained during well development.

Piezometer - A small-diameter well, often temporary, used to measure the elevation of the water table or potentiometric surface.

Protective Surface Casing - A section of large-diameter steel or PVC casing that is emplaced over the surface extension of a smaller diameter monitoring well casing to provide structural protection to the well and restrict unauthorized access to the well.

Structure - Physical features of a rock mass that develop in response to stress, such as bedding, foliation, jointing/fracturing, cleavage, or brecciation.

Surface Casing - Steel or PVC casing set from the ground surface into the top of competent bedrock to support the unconsolidated section of the borehole. The surface casing in a core hole extends into bedrock to the top of the open-hole interval.

Surge Block - A plunger-like tool used in well development consisting of disks of flexible material sandwiched between rigid disks.

Tremie Method - A method for placing cement, sand, or bentonite in the well annulus. The annular material is pumped or gravity-fed into the annulus through a small-diameter pipe (usually 2-in. or less). The pipe is raised as the material is emplaced. Use of this method reduces the potential for the material to bridge and ensures placement of annular material along the entire length of the borehole.

Tremie Pipe - A small diameter (usually 2-in. or less) pipe or tube used to emplace the sand filter pack and annular seal materials from the ground surface into the borehole or casing annulus.

Water Table - The boundary below the ground surface between the vadose zone and the saturated zone. It is the level to which a well screened in an unconfined aquifer would fill with water.

Well Casing - Steel, stainless steel, or PVC pipe, which provides unobstructed access to the monitored interval.

Well Construction Diagram - A form on which well construction details, such as borehole depths and dimensions, casing and screen lengths and dimensions, annular seal material elevations, etc. are recorded alongside a graphic representation of a typical well cross-section.

Well Cuttings Field Screening/Disposal Form - A form on which the background and maximum observed values of field measurement parameters from composite cuttings screening samples are recorded.

Well Development Progress Form- A form on which daily development water volumes and water quality parameters are recorded.

Well Development Summary Form- A form on which a summary of the well development details is recorded, including well volume, total volume of development water produced, beginning and ending water quality values, disposition of the development water, and any comments pertinent to the development of the well.

Well Screen - Casing with either slots, holes, gauze, or continuous wire wrap that allows fluids but minimal solids to enter the well.

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5.0 PRECAUTIONS AND LIMITATIONS

5.1 Well-Site Access

The well site and/or site access roads may have to be cleared, graded, enlarged, or improved to facilitate normal drilling and well construction operations.

5.2 Well Construction Type Selection

Geologic setting, well-site location, monitoring requirements, and regulatory requirements will determine well construction type; applicable guidance must be reviewed prior to determining construction type.

5.3 Drilling Method

Well construction type, in addition to well-site location and geologic conditions, will determine the drilling equipment and drilling method used for well installations.

5.4 Well Construction Materials

Well construction materials should be new items in unopened manufacturer-packaged containers. If new, unopened packaged materials are not available, well construction materials are to be adequately decontaminated so no foreign contaminants would be introduced into the groundwater system.

5.5 Cavities and Fractures

Cavities, fractures, joints, bedding planes, or other voids may be encountered during the drilling of the wellbore resulting in greater volumes of filter sand, bentonite, or cement to fill the annulus than calculated from the borehole depth and diameter. These features may also result in lost circulation and increase the risk of borehole collapse. These features may also produce greater than expected volumes of drilling effluents that require management.

5.6 Grouting Schedules

The length of a column of cement emplaced at one time should not exceed 300 ft so that the weight of the cement is less than the fracture pressure of the monitored formation. This will also minimize the infiltration of cement into the formation. Grout cure times will be specified by the oversight geologist. Cure times will be determined depending on temperature, required compressive strengths, and additives using guidelines established in reference 4.1.1.

5.7 Limits of Tape Measurement

Some wellbores are completed to depths (i.e., greater than 300 ft) that cannot be measured with a flat, weighted steel or fiberglass measuring tape. A circular, stainless steel or coated steel cable (or similar device) shall be used to measure all wells and boreholes greater than 300 ft deep and may be required to obtain accurate results at shallower depths.

5.8 Measurement Accuracy

Increased depth and large water columns decrease the accuracy of the well depth measurements. In general, depth measurements made during well installation and development will be to the nearest 0.1 ft, unless otherwise directed.

5.9 Well Development

Well development should occur as soon as practical, but not before 24 hours elapse from the time the installation is completed. Immediately prior to well development, a water level is measured in the well and a well volume is calculated. The bottom of the well should be measured to validate the depth of the well and confirm the presence or absence of any accumulated sediment. The bottom of the well should be measured again following well development to confirm the removal of sediment accumulations during development.

5.10 Core Drilling

Core drilling should be accomplished using only compatible core bits, core barrels, and drill rods. Core lost from a run is to be considered lost from the bottom of said run and is picked up at the top of the next run.

5.11 Circulation Loss

Circulation of the drilling medium (air, water, or mud) may be lost due to the presence of cavities or fractures. Loss of circulation may result in borehole collapse and subsequent loss of part or all of the drill stem. Measures must be taken to ensure continuous circulation including use of foaming agents, water, and intermediate casings as necessary.

5.12 Decontamination and Lubricants

Only properly decontaminated drilling tools and equipment shall be used for well installation. Lubricants for casing couplings and drilling stem components must be nonpetroleum-based and noncontaminating.

5.13 General Safety

Established safety standards and requirements of Lockheed Martin Energy Systems, Inc., the U.S. Department of Energy (DOE), and applicable Occupational Safety and Health Administration (OSHA) standards will apply to all well installation and development field operations. Field personnel will be provided with appropriate safety clothing, equipment, and training. Mechanical equipment shall be inspected prior to each task and must be kept in proper working order. Equipment inspections shall be documented. A well installation oversight checklist shall be completed prior to the start of each new well installation.

5.14 Best Management Practices

Well installation and development activities at the Y-12 Plant will adhere to Best Management Practices (BMPs) with regard to environmental protection. The following practices are among those to be followed: plastic sheeting will be placed under the rigs (including development rig) to catch any hydraulic fluid, fuel, or motor oil leaks or spills; silt fencing will be placed around bare soil piles to prevent siltation to surface waters; hay bales will be used to filter drilling effluent run-off; and a stocked spill kit, containing at least oil-absorbent material, oil-absorbent pads, a shovel, and plastic bags, shall be maintained at the well-site at all times. A best management practices plan may be required as a prerequisite to drilling activities; this plan is typically done in conjunction with the NEPA review (see Sect. 7.7).

6.0 EQUIPMENT, TOOLS, AND SUPPLIES

A multitude of equipment, tools, and supplies are required to install and develop a well. The following lists some of the equipment, tools, and supplied required; however, it is not all inclusive. Additional equipment and supplies may be required due to well design, well location, or site conditions.

6.1 Drilling Equipment

Drilling equipment includes a fully equipped drilling rig and drilling tools, including drill bits, drill collar (stabilizer), drill pipe, augers, and diverter assembly. A fully equipped coring machine includes, at a minimum, a drive capable of providing rotation, feed, and retraction by hydraulic or mechanical means; a fluid pump or air compressor; core barrels and bits; longitudinally split inner tubes; drill rods; reaming shells; casing; and core boxes.

6.2 Well Construction Materials

Construction materials include conductor casing, surface casing, intermediate casing (if required), well screen, well casing, bottom cap/silt trap, centralizers, filter pack sand, bentonite pellets or aggregate, and grouting supplies.

6.3 Grouting Supplies and Equipment

Grouting supplies include Class A cement, additives, potable water, mixer, hand tools, pump, tremie pipe, tremie pipe clamp, and grout scales.

6.4 Health and Safety Monitoring/Waste Screening Equipment

At a minimum these items include organic vapor analyzer (FID and/or PID), pH meter, conductivity meter, radiological meters (beta/gamma and alpha), sample containers, and aluminum foil. An LEL/oxygen meter or Jerome mercury vapor analyzer may also be required.

6.5 Site Hazard and Emergency Preparedness Equipment

This equipment includes, but is not limited to, spill kit, fire extinguisher, electrical grounding rod and cable, shovels, work site delineation flagging, traffic signs, safety cones, and plastic sheeting.

6.6 Well Development Equipment

Development equipment includes, but is not limited to, workover rig, swab tubing with check valve, bailers, pumps, pump tubing, drums, and pallets.

6.7 Well Completion Materials

Well completion equipment includes, but is not limited to, metal posts, pad form, concrete, high visibility paint, well identification tag, hasp, lock, and locking cap.

6.8 Safety Equipment

Safety equipment includes, at a minimum, safety shoes or boots, hard hat, safety harness, protective eyewear, hearing protection, rubber and/or leather gloves, and work clothing. Disposable coveralls, respiratory protection, outer boots, and gloves may be required based on site conditions.

6.9 Containment System

As required, a containment system may include excavated containment pit, drums, tanks, cuttings pan, and diverter assembly.

6.10 Decontamination Equipment

This equipment includes, but is not limited to, steam cleaner, potable water, and mild detergent. Isopropyl alcohol and deionized water may also be required for selected projects.

6.11 Field Reporting/Well Logging Equipment

Field equipment includes all-weather field logbook, Munsell Color Chart, 10% HCl, Alizarin Red, paper towels, permanent markers, magnifying glass, measuring tape, water level indicator, and weighted tape.

6.12 Core Drilling Supplies

In addition to the standard field equipment, core drilling supplies include core storage boxes, duct tape, spacers, worktable, etc.

7.0 PREREQUISITES

Examples of prerequisite forms are included in Appendices B and C to the Monitoring Well Installation Plan for the U.S. Department of Energy Y-12 Plant, Oak Ridge, Tennessee, Y/SUB/97-99069C(Y27)/1, as denoted below.

7.1 Well Installation Oversight Checklist

This checklist (Appendix C.1) is completed by the Y-12 Plant GWPP Manager or authorized designee and is used (1) to outline the scope of the well installation project, (2) to summarize the applicable project documentation, (3) to detail the monitoring requirements and construction specifications of each well to be installed, and (4) to state any special conditions that pertain to the project.

7.2 Excavation/Penetration Permit

This permit (Appendix C.16) is issued prior to any well installation and is used to ensure against the accidental severing of any underground utility cable or pipeline that may lie in the vicinity of the well site. The Excavation/Penetration permit is initiated by the Y-12 Plant GWPP Manager or authorized designee, who obtains the completed permit from the appropriate site engineering organizations.

7.3 Well Installation Waste Management Plan

The waste management plan (Appendix B.1) is completed by the Y-12 Plant GWPP Manager or authorized designee prior to well installation activities. The plan includes (1) the estimated volume of cuttings and fluids that will be generated during the well installation and development, (2) the types and concentrations of contaminants (if any) known to be present at the well site, (3) the appropriate waste containment method required during the well installation operations (i.e., discharge to ground surface or containment system), (4) an estimate of the number and types of samples (e.g., cuttings) to be collected during well installation and the required analysis of the samples prior to disposal or treatment, and (5) the proposed disposition or treatment of any containerized material.

7.4 Site-Specific Health and Safety Checklist

The site-specific health and safety checklist (Appendix C.17) is completed by the Y-12 Plant GWPP Manager or authorized designee and is presented to the drill crew and oversight personnel during a health and safety briefing prior to the commencement of well installation activities. The checklist consists of (1) a brief description of the well site including a statement of the site's history and use, (2) a health and safety hazard evaluation, (3) a breakdown of the engineering controls, administrative controls, and the personal protective equipment requirements for the task, (4) the monitoring requirements during the installation, and (5) an analysis of the chemical, ionizing radiation, electrical, temperature, noise, and miscellaneous hazards that may be encountered during the installation.

7.5 Welding/Burning/Hot-Work Permit

The welding/burning/hot-work permit (Appendix C.22) is initiated by the Y-12 Plant GWPP Manager or authorized designee and is completed by the drilling subcontractors' supervisor. This permit is required prior to initiating any welding or burning (torch) activities at the work site.

7.6 Radiological Safety Work Permits, Safety Work Permits, or Task Hazard Analyses

These prerequisites (Appendices C.18, C.19, and C.20) may be required for well installation within selected areas (i.e., designated radiological areas). The need for such prerequisite documentation is identified during completion of the Well Installation Oversight Checklist in conjunction with applicable safety organizations.

7.7 NEPA Review/BMP Plan

Under special circumstances, a well installation activity may require a National Environmental Protection Act (NEPA) review (Appendix C.21). If a NEPA review is required, the Y-12 Plant GWPP Manager or authorized designee obtains a NEPA Checklist from the Y-12 Plant NEPA Coordinator. The checklist is completed by the Y-12 Plant GWPP Manager or authorized designee prior to commencement of the well installation project. A BMP Plan may be required if special precautions or extra awareness of potential environmental insult is needed.

7.8 Notifications

Any time a well installation occurs within the Y-12 Plant proper, the Y-12 Plant GWPP Manager or authorized designee will notify the building manager in the area of the planned installation. This is done to inform the building manager of the upcoming activity and, in turn, information regarding special circumstances, procedures, or obstacles/hazards may be exchanged. This notification is normally done verbally. The Plant Shift Superintendent (PSS) is also notified in the event of after hours work or work sites that may obstruct traffic lanes.

7.9 Equipment Decontamination Inspection Summary

The equipment decontamination inspection summary (Appendix C.12) is completed by the oversight geologist after an inspection of the drill rig and tools, drill pipe and bits, well construction materials, and well development equipment. The form provides a mechanism to validate and document the cleanliness of equipment and materials prior to use.

8.0 EQUIPMENT DECONTAMINATION

8.1 Drilling Equipment

Decontaminate the drill rig and the miscellaneous drilling accessories, drill bit, drill collar (stabilizer), hole opener, drill pipe, and conductor casings in accordance with

ESP-900 and project requirements prior to any intrusive work. Steam clean surface casing and/or intermediate casing prior to insertion into the borehole.

8.2 Well Construction Materials

Well screen, well casing, caps, and centralizers do not require additional decontamination as long as the items are in unopened manufacturer's packaging. Manufacturer's certificates of decontamination or cleanliness should be retained by the oversight geologist for inclusion in the well installation report, if required by the Y-12 Plant GWPP Manager.

8.3 Development Equipment

Steam clean the workover rig, swab tubing, bailers, pumps, pump tubing, or any equipment to be used for development of the well prior to well development.

9.0 WELL INSTALLATION AND DEVELOPMENT

9.1 Prerequisites

Confirm that all necessary well installation prerequisite documentation (Installation Oversight Plan, Excavation/Penetration Permit, Well Installation Waste Management Plan, Site-Specific Health and Safety Checklist, etc.) has been completed and all required notifications have been made.

9.2 Well-Site Preparation

Clear and grub, grade, and gravel an access road (if required) to the proposed well location. Clear and grub, grade, and gravel the proposed well location (if required) to allow sufficient work space for normal drilling and well installation activities. Mobilize the drilling and grouting equipment and well construction materials to the well site. Conduct equipment inspections and health and safety briefings as required. Establish site boundaries (flagging, signs, traffic cones, etc.) as specified. If specified in the Well Installation Waste Management Plan, set up the containment system or excavate a cuttings pit.

9.3 Screened Wells with Surface Casing

Screened wells incorporating surface casing are those in which the aquifer to be monitored are found in the bedrock horizon. The surface casing prevents the sides of the borehole from collapsing, prevents the loss of drilling fluids to porous formations, and prevents unwanted fluids from entering the borehole.

9.3.1 Advance a pilot borehole of approximately 8 7/8- to 10 5/8-in. diameter approximately 10 ft into bedrock to obtain information on the unconsolidated and weathered bedrock horizons. Steel conductor casing may be used to support the collar of the pilot borehole while drilling. Ream the pilot hole using a two-stage hole-opener having a diameter of approximately 15 to 17 in. to a set point ideally 3 to 5 ft into competent (unweathered) bedrock. Again, a section of conductor casing may be used to support the borehole collar while reaming.

9.3.2 The technical specifications of certain projects may not require a pilot borehole for surface casing. In these cases, advance a borehole of sufficient diameter to allow for the placement and adequate cementation of the surface casing to a set point ideally 3 to 5 ft into competent bedrock. Conductor casing may be used to support the borehole collar while drilling.

9.3.3 Install surface casing (typically 10.0-in. ID/10.75-in. OD, or 11.0-in. ID/11.75-in. OD steel) into the reamed borehole to the set point. Cement the surface casing in place using a Class A cement-2% bentonite slurry with a density of 12 to 15 pounds per gallon (lbs/gal). Place the cement either by pouring directly into the surface casing annulus or by the tremie method if the annulus is water-filled. This will ensure a competent cement seal at the bottom of the casing. At the discretion of the Y-12 Plant GWPP Manager, additional cement may be poured or tremied into the annulus to ensure an annular seal to the ground surface. For deep surface casings (80 to 100 ft or deeper) pressure grouting techniques may be used. Allow the cement to cure in accordance with applicable curing schedules.

9.3.4 Once adequate cure time has elapsed, advance the wellbore to the target zone. The borehole may be advanced in 10- to 15-ft increments with a 0.5-hr observation period after each increment has been drilled to determine if a water-bearing zone has been intersected. The borehole should be advanced such that the specific transmissive feature to be monitored lies approximately at the mid-point of the proposed screened interval. Upon reaching the total depth of the borehole, thoroughly clean (circulate) the hole to remove all of the cuttings.

9.3.5 After the final borehole cleaning, place approximately 1 ft of high-purity filter sand into the borehole on which to set the screen. Install the screen (typically one, 10-ft section of 4.25-in. ID/4.5-in. OD, continuous wire-wound, 0.01-in. openings, 2- or 4-pitch, flush-threaded stainless steel) and riser casing (typically 5- to 10-ft sections of 4.25-in. ID/4.5-in. OD, schedule 5, number 304, flush-threaded stainless steel) into the borehole. Place stainless steel centralizers on the riser casing at approximately 40-ft intervals.

9.3.6 Place a sand pack consisting of high-purity filter sand around the well screen using PVC tremie pipe and potable water. Monitor the rising sand level by continuously sounding with a weighted measuring tape. Bring the level of the sand pack to approximately 1 ft above the top of the screen. Place a 2-ft thick minimum unhydrated bentonite pellet seal on top of the sand pack by slow pouring, monitoring the seal level and avoiding bridging by constantly sounding with a weighted measuring tape. Allow the seal to hydrate as per the manufacturer's specifications and verify the level to ensure a minimum seal thickness of 2 ft. Plug the remaining annulus to the ground surface using Class A cement-2% bentonite slurry with a density of 12 to 15 lbs/gal, preferably in several stages depending on the depth of the well. Allow an appropriate cure time in between cement stages.

9.4 Screened Wells Without Surface Casing.

9.4.1 Advance a borehole of approximately 8 7/8- to 10 5/8-in. dia. to the target depth. Steel conductor casing may be used to support the collar of the pilot borehole while drilling. Upon reaching the total depth of the borehole, thoroughly clean (circulate) the hole to remove the cuttings.

9.4.2 Install screen, riser casing, centralizers, following the same process as described in Section 9.3.5.

9.4.3 Install the filter pack, bentonite seal, and annular grout seal as described in Section 9.3.6.

9.5 Open-Interval Wells

Open-interval wells are designed to monitor groundwater in intermediate (greater than 100 ft) to deep (greater than 300 ft) bedrock horizons. The open intervals are usually designed to be no more than 50 ft long.

9.5.1 Advance a pilot borehole of approximately 8 7/8- to 10 5/8-in. diameter approximately 10 ft into bedrock to obtain information on the unconsolidated and weathered bedrock horizons. Steel conductor casing may be used to support the collar of the pilot borehole while drilling. Ream the pilot borehole using a two-stage hole-opener having a diameter approximately 15 to 17 in. to a set point ideally 3 to 5 ft into competent (unweathered) bedrock. Again, a section of conductor casing may be used to support the borehole collar while reaming.

9.5.2 The technical specifications of certain projects may not require a pilot borehole for surface casing. In these cases, advance a borehole of sufficient diameter to allow for the placement and adequate cementation of the surface casing to a set point ideally 3 to 5 ft into competent bedrock. Conductor casing may be used to support the borehole collar while drilling.

9.5.3 Install surface casing (typically 11.0-in. ID/11.75-in. OD steel) into the reamed borehole to the set point. Cement the surface casing in place using Class A cement-2% bentonite slurry with a density of 12 to 15 lbs/gal. Place the cement either by pouring directly into the surface casing annulus or by the tremie or pressure grouting methods if the annulus is water-filled. This will ensure a competent cement seal at the bottom of the casing. Additional cement may be poured or tremied into the annulus to ensure an annular seal to the ground surface at the discretion of the Y-12 Plant GWPP Manager or authorized designee. Allow the cement to cure in accordance with applicable curing schedules.

9.5.4 Advance the pilot borehole to the top of the monitoring interval and thoroughly circulate the borehole. Install intermediate casing (typically 6.54-in. ID/7.0-in. OD steel with a threaded float shoe on the bottom) into the borehole. Float shoes may not be required for some wells, particularly shallower ones. Centralizers are placed on the inner casing at 60- to 80-ft intervals. Pressure-grout the casing in place using a Class A cement-2% bentonite grout mixture. Calcium chloride to a ratio of 2% by weight may be added to accelerate cement curing, particularly for deeper wells. Potable water may be circulated through the casing and float shoe to remove any accumulated fill at the base and ensure that the casing had been set completely on the bottom of the pilot borehole. Circulation of borehole conditioners, such as bentonite gel slurry or Flocele™, may be necessary to aid in sealing the borehole wall to minimize grout migration into the surrounding formations. Use a rubber plug to displace the grout within the casing. This provides added assurance against grout backflow through the float shoe. Allow the grout to cure in accordance with applicable curing schedules. Additional cement may be poured or tremmied into the annulus to ensure an annular seal to the ground surface at the discretion of the Y-12 Plant GWPP Manager or authorized designee.

9.5.5 After an appropriate cure time, advance the borehole 2 to 3 ft below the inner casing set-point using a 6.25-in. diameter tricone bit. Circulate air until the borehole is completely dry and observe the interval for a minimum of 0.5 hr to ensure a competent seal around the inner casing. A competent annular seal is denoted by an absence of groundwater infiltrating the annulus and accumulating in the well casing. If the annular seal is competent, advance the completion interval to the total depth. The borehole may be advanced in 10- to 15-ft increments with a 0.5-hr. observation period after each increment is drilled to determine if a water-bearing zone has been intersected.

9.6 Flush-Mounted Wells

Construction of a flush-mounted well is identical to that of screened or open-hole wells (with and without surface casing) with the exception that, when finished, the surface casing (if applicable) and well casing are cut off at or below the ground surface. The wellhead is subsequently protected by a below-ground enclosure and manhole-type cover installed flush with the ground surface. Details of flush-mounted wellhead completions are provided in Sect. 9.11.5

9.7 Core Drilling

The drilling of core holes is an exploratory method used to obtain a continuous sample of bedrock. At the Y-12 Plant, exploratory core holes up to 1400 ft deep have been used for characterization purposes, such as the installation of multiple-port monitoring systems.

9.7.1 In preparation for core drilling, it may be desirable to first advance a pilot borehole of approximately 8 7/8- to 10 5/8-in. diameter to the top of competent bedrock. Steel surface casing (typically 6.54-in. ID/7.0-in. OD) may be installed in the borehole and cemented in place using the methods described in Sects. 9.3.2 and 9.5.2.

9.7.2 Seat a string of inner casing (typically HX-size casing: 4-in. ID/4 1/2-in. OD) with a threaded reaming shell into bedrock to prevent circulation loss within the borehole and to prevent loss of drilling fluid. It may be necessary to first level the surface of the rock at the bottom of the casing using an appropriate bit.

9.7.3 Begin core drilling using compatible core bit, core barrel, and drill rods. Continue core drilling to the target depth. Drill each run until core blockage occurs or until the net length of the core barrel has been drilled. Remove the core barrel from the borehole and disassemble it as necessary to remove the core (or retrieve the inner tube using a wireline and recover the core). Reassemble the core barrel and return it to the hole (or, using the wireline, return the inner tube through the rods back to the core barrel) and resume coring.

9.7.4 Place the recovered core in core boxes with the upper end of the core in the upper-left corner of the core box, filling the rest of the core-box sections from left to right. A run block containing: drill-hole designation, run number, drilled interval, length drilled, and amount recovered is placed at the beginning of each run. An arrow that points in the down-hole direction is drawn on each piece of core using an indelible marker. The ends of core broken to fit inside the core box should be marked to distinguish from natural breaks. Continue boxing the core using the appropriate markings, spacers, and blocks. A depth block should be placed at the beginning and end of each subsequent core box.

9.8 Piezometers

Piezometers generally consist of small-diameter screen and casing and are used to measure groundwater levels or to determine groundwater flow direction. Piezometers rarely are installed using surface casing, and adherence to formal installation procedures is not nearly as strict as for a monitoring well. Piezometer design at the Y-12 Plant will be evaluated on a case by case basis depending on characterization needs but will basically follow the screened well without surface casing procedure described in Sect. 9.4. Piezometer design criteria will be dictated in the Well Installation Oversight Checklist and project-specific statement of work, as required.

9.9 Custom Installations

Custom installations are those that differ from the standard well installation procedures and may include variations in dimensions and/or the types of well construction materials, departure from normal end use of the well, or the method of drilling or installation. As in the case of piezometer installation, custom well installations are dictated by project requirements and are evaluated on a case by case basis.

9.10 Well Development

Upon completion of well installation, develop the well to restore the natural hydraulic conditions of the aquifer and to remove foreign sediment to ensure turbid-free groundwater samples. This is accomplished using the following general procedure: (1) establish a permanent reference measurement point on the well casing or the protective casing; (2) measure the static water level inside the well and calculate a well volume in gallons of water (at this time it may also be desirable to measure the depth of the bottom of the well and compare this measurement to the constructed depth of the well noting the presence and amount, if any, of accumulated sediment); (3) calculate a casing volume; (4) commence well development, and measure initial pH, temperature, and specific conductivity values; (5) continue development, measuring field parameters after approximately each casing volume; and (6) remove a minimum of three well volumes from the well or develop the well until the pH and specific conductivity values have stabilized over three consecutive measurements. If the nonspecific parameters have stabilized but the turbidity of the water remains high, then the well development should be continued until no further turbidity improvements are noted, or until terminated by the Y-12 Plant GWPP Manager or authorized designee. Swabbing, using a bailer, and using a submersible pump are all standard development methods at the Y-12 Plant. Other methods may be used based on site conditions or project requirements. Core holes and piezometers are not normally developed.

9.10.1 Swab Method: The swab method is the preferred method of well development for wells greater than 50 ft deep. To develop a well using the swab method, insert swab tubing (preferably with a check valve on the bottom end) into the well to the bottom. Run a swab tool attached to a stainless steel or teflon-coated wireline inside the tubing to the bottom. Alternately move the swab tool up and down the tubing to evacuate the groundwater through the tubing outlet. Collect representative groundwater samples and measure water quality parameters as specified by the Y-12 Plant GWPP Manager or authorized designee until development is complete.

9.10.2 Bailing: For wells less than 50 ft deep, or where conditions warrant, develop the well by bailing. Lower the bailer (securely attached to a wireline, cable, or rope) to the bottom of the well. Move the bailer up and down until it has been determined that the bailer is full. Pull the filled bailer to the surface to empty. Repeat bailing of the well. Collect representative groundwater samples and measure water quality parameters as specified by the Y-12 Plant GWPP Manager or authorized designee until development is complete.

9.10.3 Submersible Pump: If conditions warrant, or if required, develop the well using a submersible pump. Attach pump tubing and a retriever line securely to the pump and lower into the well to the bottom. The pump should have a screen to prevent drawing in of sediment that may clog or damage the pump impellers. Pump the water out of the well. Collect representative groundwater samples and measure water quality parameters as specified by the Y-12 Plant GWPP Manager or authorized designee until development is complete.

9.10.4 Surge Block: If conditions warrant, or if required, develop the well using a surge block along with one of the aforementioned water removal methods. Run a surge block into the well to the required depth. Alternately raise and lower the surge block within the well casing and/or screened interval to create an inward and outward movement of water through the screen. Use one of the aforementioned well development methods to remove the groundwater from the well. Collect representative groundwater samples and measure water quality parameters as specified by the Y-12 Plant GWPP Manager or authorized designee until development is complete.

9.10.5 Jetting/Air Lift: If conditions warrant, or if required, develop the well using the jetting/air lift method. Lower the jetting tool and the air and discharge lines into the well. As the jetting tool back-flushes the screen and filter pack, apply the compressed air to discharge the jetted water out of the well. Collect representative groundwater samples and measure water quality parameters as specified by the Y-12 Plant GWPP Manager or authorized designee until development is complete.

9.11 Well Completion

9.11.1 Protective Casing: When required, a section of steel protective casing around the riser casing adds additional security to the well. The protective casing should be of large enough diameter to fit easily around the riser casing and allow easy access for development or sampling activities, extend above the top of the riser casing, extend below the ground surface, and be embedded in the concrete pad. The protective casing may also be fitted with security devices and identification. A weep hole should be drilled into the protective casing at the top of the concrete pad to allow water to drain.

9.11.2 Concrete Pads and Protective Posts: Install a concrete pad around the wellhead with standard dimensions of 4-ft × 4-ft and 0.5-ft thick. The bottom of the pad should be below the ground surface slightly and should have a surface that slopes away from the well casing. Install protective posts around the concrete pad at such a height and in such an array as to prevent collision damage to the well. The posts should be painted a high-traffic yellow color.

9.11.3 Security and Identification: Install locking mechanisms (hasp, locking cap, and lock) to prevent unauthorized access to the well. Affix an identification tag to the well casing.

9.11.4 Reclamation: Reclaim all disturbed areas at the well site by grading the ground surface and restoring the location as close to its original contour as possible. Sow grass at well sites and stabilize the area using straw cover.

9.11.5 Flush-Mounted Wells: Where an above-ground wellhead is not possible, use a flush-mount completion. Excavate around the wellhead and install a flush-mounted well enclosure. The flush-mounted well enclosure should be cemented or concreted in place to minimize post-installation disturbance of the wellhead. Backfill the inside of the enclosure box with gravel to allow rainwater that may accumulate inside the enclosure to drain. Cut off the riser casing stick-up below the ground surface and install a watertight cap.

10.0 ACCEPTANCE CRITERIA

The oversight geologist will verify that well installation and development activities were performed in accordance with this specified procedure. Upon completion of the well, the Y-12 Plant GWPP Manager or authorized designee will conduct an inspection of the well and associated documentation to determine if well construction and surface completion complies with specifications. When specifications are met, well installation and construction will be complete.

11.0 POST PERFORMANCE WORK ACTIVITIES

The oversight geologist will submit the well installation and development documentation to the Y-12 Plant GWPP Manager or authorized designee.

Waste materials generated during the well installation and development will be disposed of in accordance with the Well Installation Waste Management Plan.

A survey to determine the location coordinates and reference measuring point elevation of the monitoring well will be scheduled by the Y-12 Plant GWPP Manager or authorized designee. The location data, along with the well construction data, will be incorporated into the *Updated Subsurface Data Base for Bear Creek Valley, Chestnut Ridge, and Parts of Bethel Valley on the U.S. Department of Energy Oak Ridge Reservation*.

12.0 RECORDS

The documentation listed in items 12.1 through 12.17 below will be included in the annual well installation summary report. All items are incorporated into the administrative record of the Y-12 Plant GWPP. Examples of the forms and checklists discussed may be found in Appendices B and C of Monitoring Well Installation Plan for the Department of Energy Y-12 Plant, Oak Ridge, Tennessee, Y/SUB/97-99069C(Y27)/1, as denoted below.

12.1 Well Installation Oversight Checklist

Reference Sect. 7.1 and Appendix C.1.

12.2 Excavation/Penetration Permit

Reference Sect. 7.2 and Appendix C.16.

12.3 Well Installation Waste Management Plan

Reference Sect. 7.3 and Appendix B.1.

12.4 Site-Specific Health And Safety Checklist

Reference Sect. 7.4 and Appendix C.17.

12.5 RWPR/SWPs

Reference Sect. 7.6 and Appendices C.18 and C.19.

12.6 NEPA Checklist/BMP Plan

Reference Sect. 7.7 and Appendix C.21.

12.7 Well Installation Diagrams

Well installation diagrams (Appendices C.2 through C.5) are completed by the oversight geologist. Well construction details, such as borehole depths and dimensions, casing and screen lengths and dimensions, bedrock depth, centralizer locations, and annular material depths are recorded alongside a graphic representation of the applicable well cross-section.

12.8 Well Installation Activity/Progress Report

A Well Installation Activity/Progress Report (Appendices C.6 and C.7) is completed by the oversight geologist and includes chronological descriptions of the daily activities performed during well installation operations. Items to be recorded on this report include, but are not limited to, well construction material types and quantities, results of field screening, specified deviations, site visitors, and downtime or standby time.

12.9 Well Log

A Well Log (Appendices C.8 and C.9) is completed by the oversight geologist and includes descriptions of the lithologies encountered while drilling the wellbore. Apparent structural discontinuities, water-producing intervals, cavities, and drilling characteristics are also noted on the Well Log. The Well Log also includes a record of the location and values from health and safety monitoring and cuttings composite screening. The lithologic description of soil and rock cuttings are done according to acceptable classification systems (i.e., Folk's classification for carbonate rocks, Mohs' hardness scale, Wentworth's particulate size classification, etc.). Description of the soil and rock matrix may include, but is not limited to: color, grain size, mineral composition, texture, sorting, packing, crystal shape, fossil content, cementation, and degree of weathering.

12.10 Well Cuttings Field Screening/Disposal Sheet

A Well Cuttings Field Screening/Disposal Sheet (Appendix B.2) is completed by the oversight geologist. This form contains (1) a list of the specific monitoring instruments used during well installation, (2) the background and maximum values from the cuttings composite screening, and (3) the disposition of the waste cuttings generated during drilling of the wellbore.

12.11 Well Development Progress Form (as applicable)

A Monitoring Well Development Progress form (Appendix C.10) is completed by the oversight geologist and is a tabulation of daily development water volume and water quality values.

12.12 Well Development Summary Form (as applicable)

A Monitoring Well Development Summary form (Appendix C.11) is completed by the oversight geologist at the conclusion of well development. This form summarizes the well development activities and includes the method of development, the volume of water produced by development, beginning and ending water quality values, a description of development water turbidity at the start and end of development, and the disposition of the development water.

12.13 Well Water Field Screening/Disposal Sheet (as applicable)

A Well Water Field Screening/Disposal Sheet (Appendix B.3) is completed by the oversight geologist and includes (1) a list of the specific screening instruments used during well development; (2) all of the screening results, including the date and time of screening, for purged groundwater; and (3) the disposition of the waste water generated during development.

12.14 Equipment Decontamination Inspection Summary

Reference Sect. 7.9 and Appendix C.12.

12.15 Core Drilling Log (as applicable)

A Core Drilling Log (Appendix C.13) is completed by the oversight geologist and contains drilling information about each core run, such as starting and ending times, starting and ending depths, and percent recovery.

12.16 Core Lithology Log (as applicable)

A Core Lithology Log (Appendix C.14) is completed by the oversight geologist. This form consists of a detailed lithologic description, plus the thickness and depths of each lithologic unit represented in the core. The lithologic description of rock core is done according to acceptable classification systems (i.e., Folk's classification system for carbonate rocks, Mohs' hardness scale, Wentworth's particle size classification, etc.). Description of the rock matrix may include, but is not limited to: color, grain size, mineral composition, texture, sorting, packing, crystal shape, fossil content, cementation, and degree of weathering.

12.17 Core Structure Log (as applicable)

A Core Structure Log (Appendix C.15) is completed by the oversight geologist and is used to record the depth and the number of fractures and faults within each core run, the bedding dip attitude and depth of the dip measurement, and detailed descriptions of discontinuities. A description of the discontinuities may include: spacing, aperture, persistence, planarity, roughness, and infilling material.

12.18 Daily Log

A daily log book of field well installation activities is maintained by the oversight geologist. This log will be placed in the administrative record of the Y-12 Plant GWPP at the conclusion of field activities.

13.0 DEVIATIONS

Deviations from the standard well installation and development methods are often required due to project requirements, site conditions, contamination concerns, and borehole conditions. All deviations in the aforementioned procedures must be pre-approved by the Y-12 Plant GWPP Manager or authorized designee and will be documented on the activity/progress report. Well installation/development deviations may include but are not limited to "hanging" the surface casing above the intended set point, use of a pre-packed screen, use of bentonite pellets or aggregate to bridge voids, installing temporary screen and casing, use of intermediate casings, eliminating or widening the placement interval of centralizers, allowing annular grout seals to remain below ground surface, use of screened or open intervals in lengths greater than 10 and 50 ft, respectively, removing less than the minimum 3 well volumes required during development due to extremely low recharge rates, and terminating development before the water has cleared entirely or shows no signs of improving.

APPENDIX B

Y-12 PLANT GWPP DRILLING AND DEVELOPMENT EFFLUENTS WASTE MANAGEMENT GUIDELINES

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1. INTRODUCTION

The ultimate objective of monitoring groundwater is gathering data to assess potential impacts to human health and the environment. It is also the objective of the Y-12 Plant Groundwater Protection Program (GWPP) to handle drilling and development effluents from the installation of groundwater monitoring wells or borings in a manner that protects the environment. Site-specific professional judgment is used to determine the potential for contamination prior to the installation of each well. Factors considered in evaluating potential for site contamination include the following:

- previously collected sampling and analysis data,
- groundwater flow patterns,
- geologic and hydrogeologic setting, and
- purpose of the well (contaminant plume assessment, background monitoring, compliance, monitoring, etc.).

Based on the evaluation, one of two options is selected:

- stabilize material on site or
- collect material for treatment or storage.

2. DRILLING EFFLUENTS DISPOSAL

There are two levels of drilling effluents management at the Y-12 Plant: (1) drill-site disposal and (2) containerization for waste treatment and/or disposal. Disposal of effluents at the drill site following best management practices (BMP) is permitted if the cuttings do not exceed the criteria discussed below. If the criteria are exceeded, the cuttings must be containerized at the drill site, labeled, and handled according to Y-12 Plant waste disposal procedures. Sampling and field screening of the effluents will be conducted in accordance with the procedures specified in the Energy Systems Environmental Surveillance Procedures Quality Control Program document (Energy Systems 1988).

2.1 FIELD SCREENING

Field screening of drill cuttings will consist of measuring three parameters: radioactivity, organic vapors, and pH. The Energy Systems procedures specified in Table 1 will be followed with some modification as described below.

Radioactivity will be measured using two separate meters: a survey meter with a pancake Geiger tube for determining beta and gamma activity and a scintillation counter with a zinc sulfide window for determining alpha activity. The meters will be passed over the surface area of the cuttings and the highest readings will be recorded.

Screening for organic vapors will be conducted on composite samples from the effluents generated each day from a single well. The sample will be collected with a hand trowel or similar tool to select cuttings from several depths. Enough cuttings will be placed in a clean 1-liter glass or metal container to half fill it. Aluminum foil will be placed over the mouth of the container to make an airtight seal. The sample will then be incubated for 10 minutes in a warm environment. Organic vapors in the headspace of the sample container will be measured by puncturing the aluminum foil and inserting the probe of an organic vapor analyzer. This instrument will have a photoionization detector with a 10.2 eV lamp and will be calibrated to isobutylene and/or a flame ionization detector calibrated to methane. The highest reading of the headspace vapors will be recorded.

Table 1. Y-12 Plant field-screening criteria for drilling effluents and development water

Field analysis	Energy Systems procedure no.	Limit
pHESP-307-1 Rev. 1	4.0–10.5	
Specific conductivity [a]	ESP-307-1 Rev. 1	< 1000 µmhos/cm
Organic vapors	ESP-307-6 Rev. 1	< 10 ppm
Radioactivity	ESP-307-7 Rev. 1	
beta/gamma		< 600 dpm/100 cm^2 (< 100 cpm)
alpha		< 1000 dpm/100 cm^2 (< 500 cpm)

[a] Not applicable to drill cuttings.

The pH of the cuttings will be measured by adding deionized water to the composite sample used to determine the presence of organic vapors. The sample will be agitated until well mixed.. The pH of the mixture will be determined by using a pH meter and recorded.

2.2 QUANTITATIVE SCREENING

In addition to field screening, samples for selected laboratory analyses (i.e., VOCs, metals, radioisotopes) may be required for quantitative verification of contaminant levels. Quantitative screening is typically conducted in areas of known or suspected contamination where certain criteria are of concern (i.e., RCRA TCLP levels). The well installation waste management plan will specify the types of quantitative screening to be conducted.

2.3 CONTAINERIZATION FOR WASTE DISPOSAL

If the effluents from a borehole exceed any one of the field screening limits, they will be containerized at the drill site and labeled with the contents (drill cuttings), borehole number, and date. The cuttings will then be handled according to Y-12 Plant waste disposal procedures.

An exception to the above may be made if the cuttings only exceed the organic vapor limits. Weather permitting, those cuttings may be passively treated by aeration at the drill site to reduce the organic vapor content. Such treatment shall not exceed five working days. If reanalysis following aeration indicates the cuttings continue to exceed the organic vapor limits, they must be containerized and handled as above.

If quantitative screening is performed, the exceedance of applicable quantitative screening criteria will result in containment of effluents.

2.4 BEST MANAGEMENT PRACTICES FOR DRILL SITE DISPOSAL

Drilling effluents that do not exceed the containment criteria will be disposed of at the drill site, if practicable. BMPs dictate that the effluents be disposed in such a way as to not be unsightly or cause erosion/sedimentation impacts on nearby surface water. The cuttings shall, therefore, be used as part of the restoration of the drill site, to fill in low areas and tire tracks, or spread to conform to the natural topography. They will subsequently be seeded and mulched. Care shall be taken to ensure that liquid fractions infiltrate or evaporate at the drill site and in no case run off into surface waters, ephemeral drainages, or storm sewers. Drill cuttings that do not exceed the containment criteria but cannot be disposed of at the drill site due to its location (parking lot, yard, etc.) will be transported to a designated location and disposed of as clean fill, following BMP.

2.5 DOCUMENTATION

The results of all field-screening analyses and a description of the disposition of the drilling effluents from each borehole will be documented on a Drill Cuttings Field Screening/Disposal Sheet, an example of which is attached. These forms will be completed for each borehole by the on-site geologist who conducts the screening and maintained as part of the permanent record for the well.

3. DEVELOPMENT WATER DISPOSAL

There are two levels of development water management at the Y-12 Plant: (1) drill-site disposal and (2) containerization for waste treatment and/or disposal. Disposal of development water at the drill site following BMP is permitted if the water does not exceed the criteria discussed below. If the criteria are exceeded, the water must be containerized at the drill site, labeled, and handled according to Y-12 Plant waste disposal procedures. Sampling and field screening of development water will be conducted in accordance with the procedures specified in the Energy Systems Environmental Surveillance Procedures Quality Control Program document (Energy Systems 1988).

3.1 FIELD SCREENING

Initial development water will be containerized until it has been screened. This is accomplished by pumping the water into drums or other suitable container(s). Subsequent screening will be conducted on grab samples taken approximately after each casing volume is removed. (An alternative to the grab sampling is to totally contain all the development water produced at a well, then analyze a composite sample.) If initial grab samples do not exceed the limits specified in

Table 1, development water may be pumped directly on the ground (following BMP) unless or until a subsequent grab sample exceeds the limits.

Field screening of development water will consist of measuring four parameters: radioactivity, organic vapors, specific conductivity, and pH. The Energy Systems procedures specified in Table 1 will be followed with some modification, as described below.

Radioactivity will be measured using two separate meters: a survey meter with a pancake Geiger tube for determining beta and gamma activity and a scintillation counter with a zinc sulfide window for determining alpha activity. The meters will be passed over the surface area of the sample and the highest readings will be recorded.

Screening for organic vapors will be conducted by placing enough development water in a clean 1-liter glass or metal container to half fill it. Aluminum foil will be placed over the mouth of the container to make an airtight seal. The sample will then be incubated for 10 minutes in a warm environment. Organic vapors in the headspace of the sample container will be measured by puncturing the aluminum foil and inserting the probe of an organic vapor analyzer. This instrument will have a photoionization detector with a 10.2 eV lamp calibrated to isobutylene and/or a flame ionization detector calibrated to methane. The highest reading of the headspace vapors will be recorded.

Specific conductivity and pH will be measured as soon as possible after collecting the sample. The specific conductivity and pH of the development water will be measured by immersing the probes of applicable instruments calibrated to the appropriate buffer solutions into the sample. The resulting readings will be recorded. If either instrument is equipped with a temperature option, the temperature of the sample will also be recorded.

3.2 QUANTITATIVE SCREENING

In addition to field screening, sampling for selected laboratory analyses (i.e., VOCs, metals, radioisotopes) may be required for quantitative verification of contaminant levels. Quantitative screening is typically conducted in areas of known or suspected contamination where certain criteria are of concern. The well installation waste management plan will specify the types of quantitative screening to be conducted.

3.3 CONTAINERIZATION FOR WASTE DISPOSAL

If the development water from a well exceeds any one of the field screening limits, it will be containerized at the drill site and labeled with the contents (development water), well number, and date. The water will then be handled according to Y-12 Plant waste disposal procedures.

An exception to this may be made if the development water only exceeds the organic vapor limits. Weather permitting, the water may be passively treated at the drill site by leaving the containers open for aeration to reduce the organic vapor content. Such treatment shall not exceed five working days and shall not be conducted over weekends without supervision. If reanalysis following aeration indicates the development water continues to exceed the organic vapor limits, it must be containerized and handled as above. If quantitative screening is performed, the exceedance of applicable quantitative screening criteria will result in containment of effluents.

3.4 BEST MANAGEMENT PRACTICES FOR DRILL SITE DISPOSAL

Development water that does not exceed the containment criteria will be disposed of at the drill site if practicable. BMP dictates that the water be disposed in such a way as to not cause erosion or enter nearby surface water or storm sewers. Precautions shall, therefore, be taken to ensure that development water pumped onto the ground or released from containers at the drill site either infiltrates or evaporates at the site and in no case runs off into surface waters, ephemeral drainages, or storm sewers. Development water that does not exceed the field screening but cannot be disposed of at the well site due to its location (i.e., within a drainage, near a storm sewer, etc.) will be transported to a designated location and disposed as clean water following BMP.

3.5 DOCUMENTATION

The results of all field-screening analyses and a description of the disposition of the development water from each well will be documented on a Development Water Field Screening/Disposal Sheet, an example of which is attached. These forms will be completed for each well by the on-site geologist who conducts the screening and maintained as part of the permanent record for the well.

4.0 REFERENCES

United States Environmental Protection Agency (EPA). 1992. *Management of Contaminated Media.* TSC-92-02.

Lockheed Martin Energy Systems (Energy Systems), Inc. 1988. *Environmental Surveillance Procedures Quality Control Program.* ES/ESH/INT-14.

Energy Systems. *Management of Waste Generated from Field Investigation and Sampling Activities.* ER WM/ER-P2103, Rev. 1.

APPENDIX B.1

WELL INSTALLATION WASTE MANAGEMENT PLAN

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM
WELL INSTALLATION
WASTE MANAGEMENT PLAN

WELL NO:

DATE:

Borehole Diameter(s): Borehole Depth(s):

ESTIMATED VOLUME OF CUTTINGS: ESTIMATED VOLUME OF FLUIDS:

Potential contaminants and maximum concentration levels (if known) that may be encountered:

CONTAMINANTS	CONCENTRATIONS

Source of data (attach analytical results if available):

DISCHARGE DRILLING MATERIALS TO:

_______ Ground surface at drill site
_______ Unlined containment pit at drill site
_______ Lined containment pit at drill site
_______ Containment vessels at drill site

SAMPLE ANALYSIS REQUIRED PRIOR TO DISPOSAL/TREATMENT FOR:

_______ FLUIDS PARAMETERS:

_______ CUTTINGS PARAMETERS:

PROPOSED DISPOSITION/TREATMENT OF CONTAINERIZED MATERIAL:

FLUIDS:

CUTTINGS:

APPROVALS

DRILLING COORDINATOR: DATE:

GWPP MANAGER: DATE:

ISE ENVIRONMENTAL COORDINATOR: DATE:

WTSD DISPOSAL COORDINATOR: DATE:

(Signature required for disposal/treatment options)

FORM DATE 1/17/1991

APPENDIX B.2

WELL CUTTINGS FIELD SCREENING/DISPOSAL FORM

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM	WELL NO. ________
WELL CUTTINGS FIELD SCREENING / DISPOSAL FORM	Page ___ of ___

LOCATION: ______________________________ DATE: START: __________

APPROX. VOLUME OF CUTTINGS: ______________________ FINISH: __________

CALIBRATION OF INSTRUMENTS: Check those calibrated to manufacturer's specifications.

pH meter ________ (model) ______________________

Organic vapor meter ________ (model) ______________________

Beta/gamma meter ________ (model) ______________________

Alpha meter ________ (model) ______________________

FIELD SCREENING RESULTS (background/highest observed values):

pH ______________ Date/Time __________ (4.0-10.5)

Organic vapors ______________ Date/Time __________ (<10 ppm above background)

Beta/Gamma ______________ Date/Time __________ (<100 cpm above background)

Alpha ______________ Date/Time __________ (<500 cpm above background)

Weather: ______________________________ Temp.: ____________________

DISPOSITION: Drill-site Disposal ______________ Containerization ____________
(Labeled?) y / n

Describe:

On-site Geologist (print): ______________________________________

Signature: ______________________________________ Date: __________

97-030MS (AppB.3)/081897

APPENDIX B.3

WELL WATER FIELD SCREENING/DISPOSAL FORM

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM	WELL NO. ________
WELL WATER FIELD SCREENING / DISPOSAL FORM	Page ___ of ___

LOCATION: ______________________________ DATE: START: __________

APPROX. VOLUME OF DEVELOPMENT WATER: ______________ FINISH: __________

CALIBRATION OF INSTRUMENTS: Check those calibrated to manufacturer's specifications.

pH meter	______	(model)	______________
Sp. Cond. meter	______	(model)	______________
Organic vapor meter	______	(model)	______________
Beta/gamma meter	______	(model)	______________
Alpha meter	______	(model)	______________

FIELD SCREENING RESULTS:

Date	Time	pH	Sp. Cond.	Organic Vapors	Beta/ Gamma	Alpha
		(4.0-10.5)	(<1000 umhos/cm)	(<10 ppm)	(<100 cpm)	(<500 cpm)

Weather: ______________________________ Temp.: ______________

DISPOSITION: Drill-site Disposal ______________ Containerization (Labeled?) y/n ______________

Describe:

On-site Geologist (print): ______________________________

Signature: ______________________________ Date: __________

97-0305MS (AppB.4)/081897

APPENDIX C

PREPARATORY CHECKLISTS, PERMITS, AND DOCUMENTATION

APPENDIX C.1

WELL INSTALLATION OVERSIGHT CHECKLIST

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL INSTALLATION OVERSIGHT CHECKLIST

WELL INFORMATION

Well Number:____________ Location/Functional Area:________________

Wellsite Access Requirements:____
____

INSTALLATION SCOPE

Brief description of the well installation project:__________________
____
____
____
____

PRE-DRILLING DOCUMENTATION/NOTIFICATION

	YES	NO	N/A
Excavation/Penetration Permit	[ ]	[ ]	[ ]
Well Installation Waste Management Plan	[ ]	[ ]	[ ]
Site-specific Health & Safety Checklist	[ ]	[ ]	[ ]
Activity Hazard Analysis (if construction)	[ ]	[ ]	[ ]
NEPA Checklist	[ ]	[ ]	[ ]
Area Manager Notification	[ ]	[ ]	[ ]
Equipment Inspection Checklist	[ ]	[ ]	[ ]
Equipment Decontamination Checklist	[ ]	[ ]	[ ]
Other:_______________________	[ ]	[ ]	[ ]

Comments:____
____

SPECIFICATIONS

Drilling Method

[ ] Rotary [ ] Auger [ ] Core [ ] Other:__________________

Is surface casing required with this installation?_____. If yes, describe:__________
____

Is containment required with this installation?______. If yes, describe:__________
____
____
____

(refer to Well Installation Waste Management Plan for sampling, handling, disposition/treatment requirements of cuttings and/or fluids).

Brief description of drilling requirements:____________________

Well Construction Type

[ ] Screened Well [ ] Open-interval Well [ ] Other:________

[ ] Stainless Steel [ ] Steel [ ] PVC [ ] Other:________

Length of screen or open interval:________

Centralizer Spacing:________

Special filter pack requirements:________

Special bentonite seal requirements:________

Special grouting requirements:________

WELL DEVELOPMENT

[ ] Swab Method [ ] Bailer [ ] Pump [ ] Other:________

Development requirements:________

WELL COMPLETION

[ ] Above-ground casing [ ] Flush-mount [ ] Other:________

Concrete pad dimensions:________

Protective post placement:________

	YES	NO
Protective Casing required:	[ ]	[ ]

APPENDIX C.2

WELL INSTALLATION DIAGRAM FOR A FLUSH-MOUNTED WELL

90M-13761a

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM	WELL NO. ______
WELL INSTALLATION DIAGRAM	

LOGGED BY: ______________________

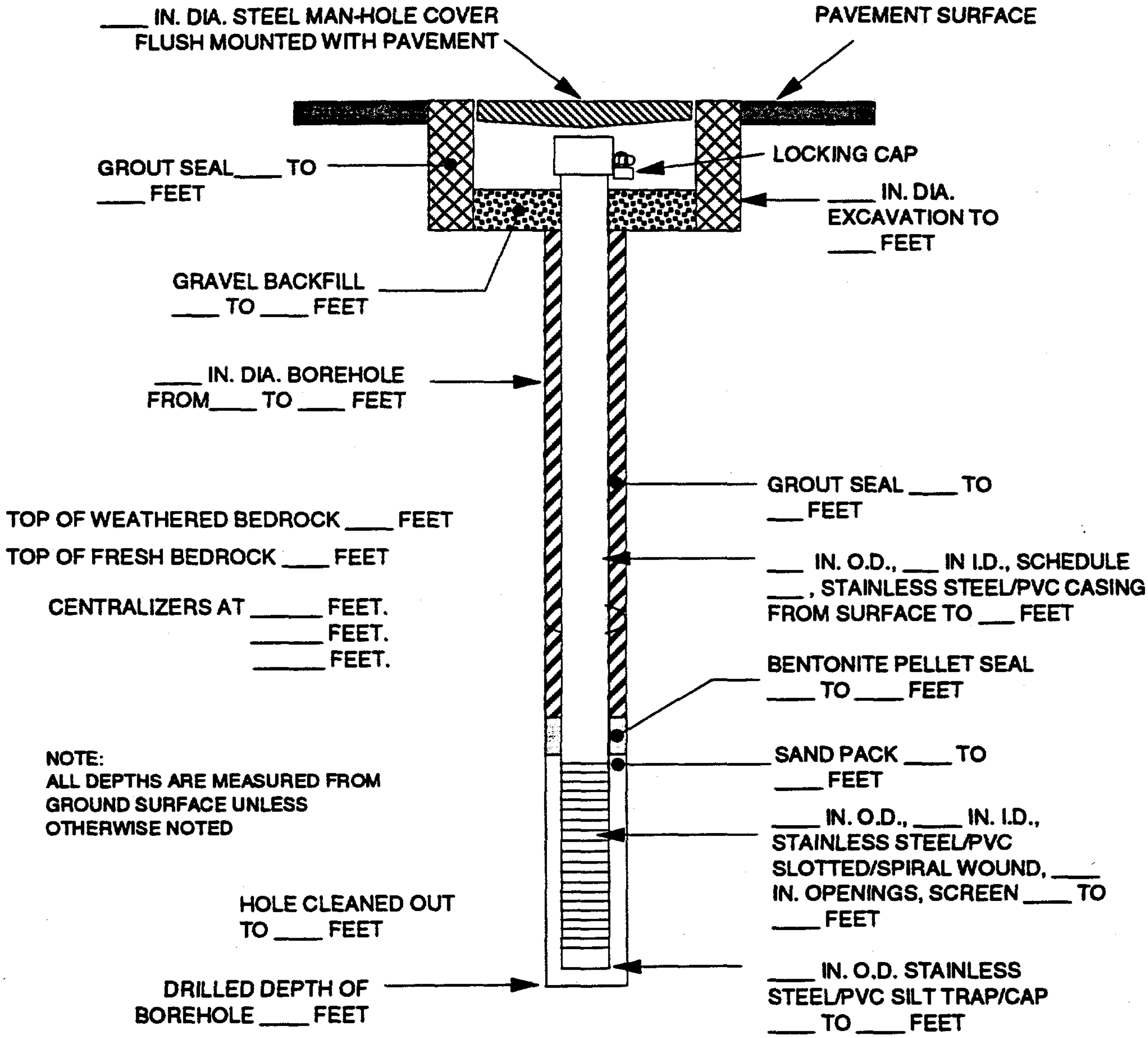
DRILLING COMPANY: ______________________

DRILLER: ____________ HELPER: ____________

DRILLING DATES

STARTED: ________

FINISHED: ________



NOT TO SCALE

1997 Project Files/1997 Well Log Templates

APPENDIX C.3

WELL INSTALLATION DIAGRAM FOR AN UNCONSOLIDATED ZONE SCREENED WELL

ORNL-DWG 90M-13687

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM	WELL NO. ____
WELL INSTALLATION DIAGRAM	

LOGGED BY: ____________________

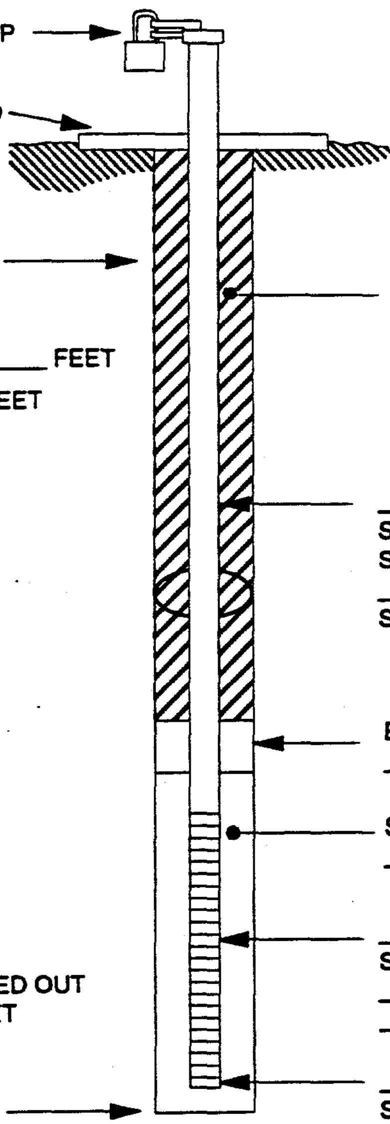
DRILLING COMPANY: ____________________

DRILLER: ____________ HELPER: ____________

DRILLING DATES

STARTED: ____________

FINISHED: ____________



NOT TO SCALE

APPENDIX C.4

WELL INSTALLATION DIAGRAM FOR A BEDROCK ZONE SCREENED WELL

ORNL-DWG 90M-13685

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM	WELL NO. ________
WELL INSTALLATION DIAGRAM	

LOGGED BY: ______________________________

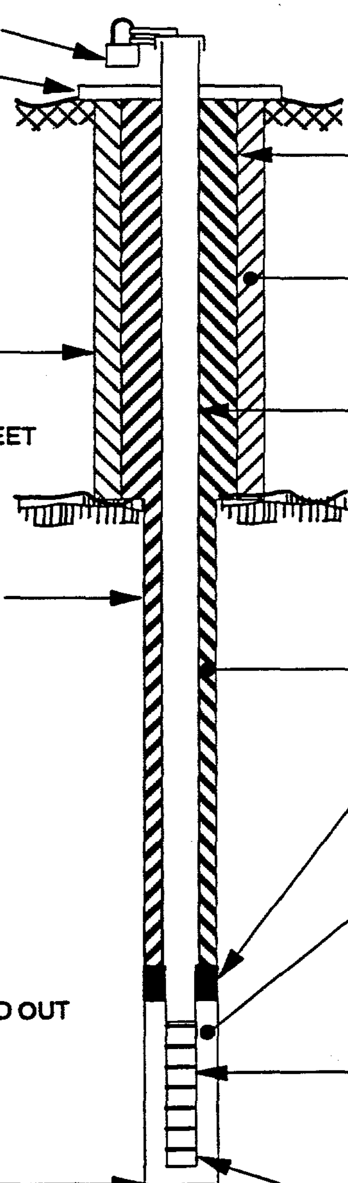
DRILLING COMPANY: ______________________________

DRILLER: ______________ HELPER: ______________

DRILLING DATES

STARTED: __________

FINISHED: __________



NOTE:
ALL DEPTHS ARE MEASURED FROM GROUND SURFACE UNLESS OTHERWISE NOTED

NOT TO SCALE

APPENDIX C.5

WELL INSTALLATION DIAGRAM FOR A BEDROCK ZONE OPEN-HOLE WELL

ORNL-DWG 90M-13760

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL INSTALLATION DIAGRAM

WELL NO. ____

LOGGED BY: ____________________

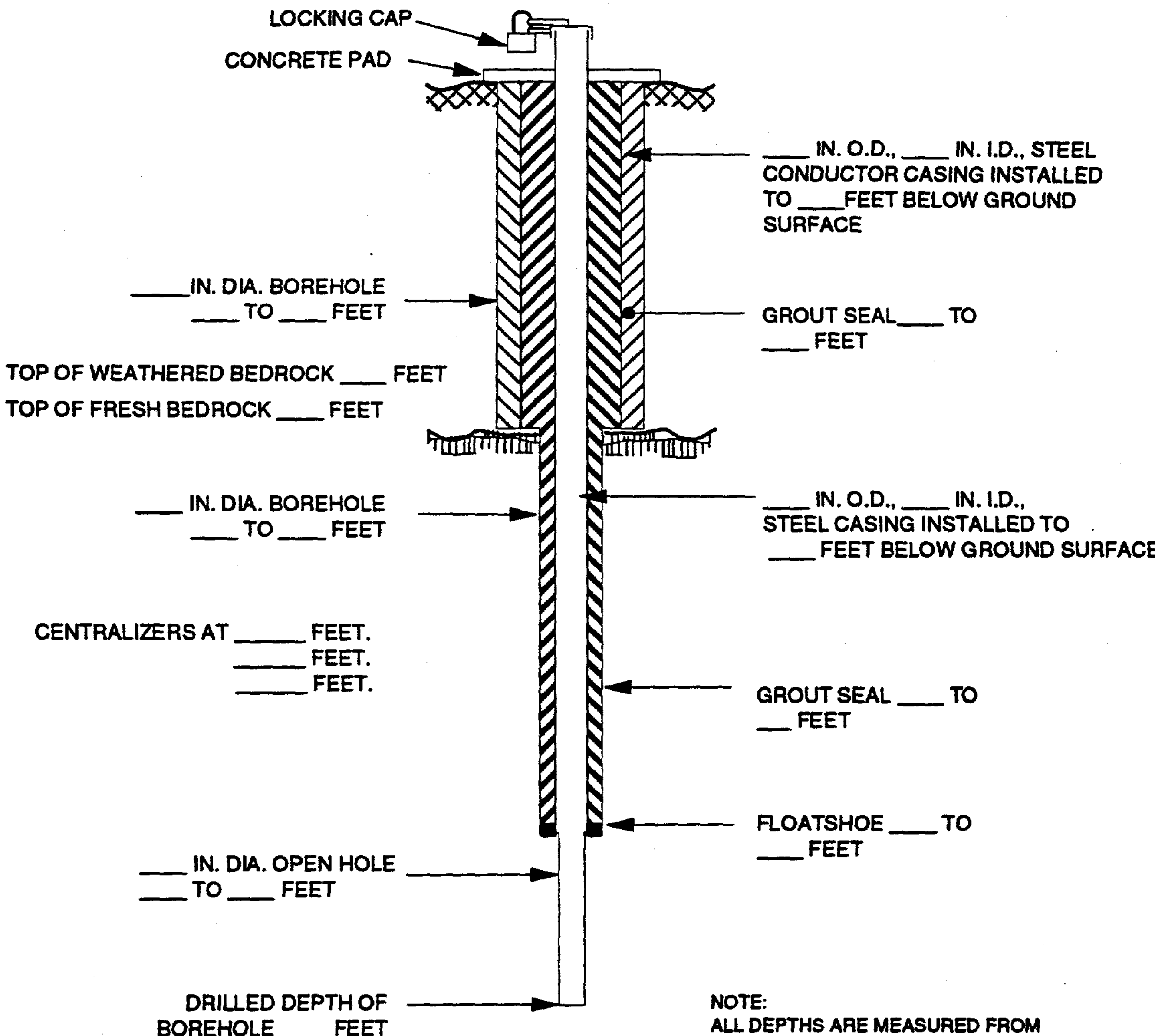
DRILLING COMPANY: ____________________

DRILLER: ____________ HELPER: ____________

DRILLING DATES

STARTED: ____________

FINISHED: ____________



NOTE:
ALL DEPTHS ARE MEASURED FROM GROUND SURFACE UNLESS OTHERWISE NOTED

NOT TO SCALE

APPENDIX C.6

WELL INSTALLATION ACTIVITY/PROGRESS REPORT

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM	WELL NO. ________
WELL INSTALLATION ACTIVITY/PROGRESS REPORT	PAGE 1 of

LOCATION: ____________	DATE: START: ____________
OPERATOR: ____________	FINISH: ____________
HELPER: ____________	
WORK-OVER RIG: ____________	LOGGED BY: ____________

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	

APPENDIX C.7

WELL INSTALLATION ACTIVITY/PROGRESS REPORT CONTINUATION

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM	WELL NO. ________
WELL INSTALLATION ACTIVITY/PROGRESS REPORT continued	PAGE 2 of

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
(cont.)			

APPENDIX C.8

WELL LOG

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM	PROBE NO. ______
WELL LOG	PAGE 1 of

LOCATION: ______	DATE: START: ______
DRILLERS: ______	FINISH: ______
HELPER: ______	DRILLING METHOD: ______
DRILL: ______	LOGGED BY: ______

NOTES: ______

DEPTH (ft)		SAMPLE (NO. & INTERVAL)	SOIL/BEDROCK DESCRIPTION
FROM	TO		

APPENDIX C.9

WELL LOG CONTINUATION

ORNL-DWG 90M-13614

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM	PROBE NO. ______
WELL LOG - continued	PAGE 2 of

DEPTH (ft)		SAMPLE (NO. & INTERVAL)	SOIL/BEDROCK DESCRIPTION
FROM	TO		

95-030MS/081497

APPENDIX C.10

MONITORING WELL DEVELOPMENT PROGRESS FORM

ORNL-DWG 90M-13612

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

MONITORING WELL DEVELOPMENT PROGRESS

WELL NO. ________

LOCATION: ______________________________

WELL INSTALLATION COMPLETION DATE: ______________________________

ONE WELL VOLUME: ________ GALLONS

DATE	GALLONS PUMPED	DESCRIPTION OF TURBIDITY	pH	DISSOLVED SOLIDS (μS)	TOTAL GALLONS PUMPED	WELL VOLUMES PUMPED	COMMENTS
RESULTS AT END OF DEVELOPMENT							

COMMENTS:

APPENDIX C.11

MONITORING WELL DEVELOPMENT SUMMARY FORM

ORNL-DWG 90M-13755

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM	WELL NO. ________
MONITORING WELL DEVELOPMENT SUMMARY	

METHOD OF DEVELOPMENT: ______________________

DEVELOPMENT OBSERVED BY: ______________________

DEVELOPMENT DATE:
START: __________
FINISH: __________

ONE WELL VOLUME: ______________ GALLONS

TOTAL GALLONS PUMPED: __________ TOTAL WELL VOLUMES PUMPED: __________

INITIAL pH: ______________ FINAL pH: ______________

INITIAL SPECIFIC CONDUCTANCE: ______________ FINAL: __________

DESCRIPTION OF INITIAL TURBIDITY: ______________________

DESCRIPTION OF FINAL TURBIDITY: ______________________

FINAL MEASURED TURBIDITY: ______________________

WELL APPROVED BY: ______________________

ODOR OF WATER: ______________________

WATER DISCHARGED TO:
- ☐ GROUND SURFACE
- ☐ STORM SEWERS
- ☐ DRUMS
- ☐ TANK TRUCK
- ☐ STORAGE TANKS
- ☐ OTHER __________

INITIAL PRE-DEVELOPMENT
WATER DEPTH: ______________________

DEVELOPMENT OBSERVATIONS: ______________________

OBSERVER SIGNATURE: ______________

DATE: ______________

97-030MS/081497

APPENDIX C.12

EQUIPMENT DECONTAMINATION INSPECTION SUMMARY FORM

Y-12 GWPP-DWG 93N-00001

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

EQUIPMENT DECONTAMINATION INSPECTION SUMMARY

WELL NO. ________

INSTALLATION ☐
P&A ☐
REDEVELOPMENT ☐

LOCATION: ____________________ DATE: START: ________

DECONTAMINATION CREW: ____________________ FINISH: ________

____

EQUIPMENT	DECON DATE	INSPECTION DATE	INSPECTION (PASS/FAIL)	INSPECTOR'S INITIALS
DRILL RIG ________ (Mast, Chassis, Cables, Carousel, Hoses, Etc.)				
DRILLING TOOLS (Pipe Wrenches, Hand Tools, Lifting Bells, Clevis, Chains, Etc.)				
DOWN HOLE TOOLS (Drilling Rods, Stabilizers, Washover Pipe, Bits, Etc.)				
WELL CONSTRUCTION MATERIALS (Casing, Screen, Centralizers, Etc.)				
WORKOVER RIG ________ (Mast, Chassis, Cables, Hoses, Etc.)				
DEVELOPMENT TOOLS (Tubing, Bailers, Pumps, Etc.)				
OTHER EQUIPMENT OR RE-INSPECTIONS (SPECIFY)				

COMMENTS:

97-030MS)/081497

APPENDIX C.13

CORE DRILLING LOG

CORE DRILLING

Well ________ Date ________ Logged by ______________ Page ____ of ____

Run	Time		Depth		Drilled	Recovered	%	Comments
	Start	End	From	To				

APPENDIX C.14

CORE LITHOLOGY LOG

CORE LITHOLOGY

Well ________ Date ________ Logged by ________________ Page ____ of ____

Run	Length	Depth		Description	% Shale
		From	To		

APPENDIX C.15

CORE STRUCTURE LOG

CORE STRUCTURE

Well ________ Date ________ Logged by ________________ Page ____ of ____

Run	Number of Fractures/ Faults	Bedding DIP / Depth	Fracture/Fault Location, Dip, and Description

APPENDIX C.16

EXCAVATION/PENETRATION PERMIT

EXCAVATION/PENETRATION PERMIT

NUMBER

PROJECT/JOB TITLE

DESCRIPTION OF WORK

LOCATION PLANT BUILDING FLOOR COLUMN | OTHER

PERMIT BOUNDARIES/LIMITS | WORK ORDER/CONTRACT NUMBER

REQUESTER (NAME AND ORGANIZATION) | PHONE

DRAWING/SKETCH NUMBER(S)

ON THE BASIS OF INFORMATION AVAILABLE, UNDERGROUND, EMBEDDED, OR HIDDEN UTILITIES MARKED "YES" IN THE TABLE BELOW ARE KNOWN TO EXIST AT OR ADJACENT TO THE EXCAVATION(S) OR PENETRATION(S) COVERED BY THIS PERMIT. THIS LISTING MAY NOT BE A COMPLETE DESCRIPTION OF ALL OBSTRUCTIONS. SITE UTILITIES DRAWINGS ARE NOT COMPLETE AND MAY CONTAIN INACCURACIES. THOSE PERFORMING EXCAVATION/PENETRATION WORK MUST BE ALERT TO ENCOUNTERING UNCHARTED OR INACCURATELY CHARTED UNDERGROUND OBSTRUCTIONS. **STOP WORK IMMEDIATELY** AND CONTACT THE PERMIT ISSUER IF OBSTRUCTIONS OTHER THAN THOSE DEFINED ARE ENCOUNTERED. NOTE: ALL NON-DOUBLE INSULATED DRILLING AND CUTTING SHALL BE GROUNDED IN ACCORDANCE WITH ES-1.2-6.

UTILITY	DISC	YES	UN-KNOWN	INIT	UTILITY	DISC	YES	UN-KNOWN	INIT	UTILITY	DISC	YES	UN-KNOWN	INIT
1. SANITARY SEWERS	CV				10. CHILLED WATER	FMS				19. NATURAL GAS	FMS			
2. STORM DRAINS	CV				11. COOLING WATER	FMS				20. ACID	FMS			
3. CATHODIC PROTECTION	EE				12. RAW WATER	FMS				21. AIR	FMS			
4. ELECTRICAL	EE				13. H/PRESS. FIREWATER	FMS				22. OXYGEN	FMS			
5. TELEPHONE COMM.	EE				14. STEAM/CONDENSATE	FMS				23. HYDROGEN	FMS			
6. FIRE ALARM	EE				15. TOWER WATER	FMS				24. NITROGEN	FMS			
7. GROUND GRID	EE				16. PROCESS WASTE	FMS				25. OTHER (LIST)				
8. SANITARY WATER	FMS				17. LIQ.LOW LEVEL WASTE	FMS				26. OTHER (LIST)				
9. RECIRCULATING WATER	FMS				18. OIL	FMS				27. OTHER (LIST)				

CIVIL AND SITE ENGINEERING

CIVIL AND SITE ENGINEERING

REVIEWER | PHONE | DATE

ELECTRICAL ENGINEERING

REVIEWER | PHONE | DATE

FACILITY MECHANICAL SYSTEMS ENGINEERING

REVIEWER | PHONE | DATE

STRUCTURAL ENGINEERING

REVIEWER | PHONE | DATE

PAGE OF

EXCAVATION/PENETRATION PERMIT (CONTINUED)

NUMBER

PERMIT REVIEWED; IS ADDITIONAL KNOWN INFORMATION TO BE PROVIDED? IF YES, SPECIFY DETAILS.

☐ NO ☐ YES UTILITIES SUPERVISOR, MECHANICAL
☐ NO ☐ YES UTILITIES SUPERVISOR, ELECTRICAL

UTILITIES SUPERVISOR, MECHANICAL	DATE	UTILITIES SUPERVISOR, ELECTRICAL	DATE

SPECIAL WORK REQUIREMENTS AND PRECAUTIONS
☐ NO ☐ YES IF YES, LIST. (IF ADDITIONAL SPACE IS NEEDED, USE AN ATTACHMENT.)

COMPANION WORK PERMITS REQUIRED ☐ NO ☐ YES IF YES, LIST. SAFETY SYSTEMS OR TSR AFFECTED ☐ NO ☐ YES IF YES, LIST WORK REQUIREMENTS.	SIGNATURE - SUPERVISOR IN CHARGE	DATE

COMMENTS

CONSTRUCTION AND SERVICE CONTRACT PROJECTS MANAGED BY ENGINEERING REQUIRE A MEETING BETWEEN THE PERMIT ISSUER AND RECIPIENT TO DETERMINE THE NEED FOR SURVEYS USING DETECTION EQUIPMENT AND/OR PERSONNEL PROTECTIVE MEASURES.

PERMIT ISSUED TO: ☐ CONSTRUCTION MANAGER ☐ MAINTENANCE ☐ SERVICE CONTRACTOR	SIGNATURE - RECIPIENT	DATE
PERMIT ISSUED BY: ☐ CONSTRUCTION ENGINEER ☐ CIVIL ENGINEER SUPERVISOR ☐ SERVICE COORDINATOR	SIGNATURE - ISSUER	DATE

SURVEYS AND/OR PERSONNEL PROTECTION REQUIRED

SERVICE SUPERVISOR IS RESPONSIBLE FOR PROVIDING PERTINENT INFORMATION TO WORKERS INVOLVED IN EXCAVATION/PENETRATION ACTIVITIES. THE PERMIT SHALL BE KEPT AT THE WORK SITE AT ALL TIMES. **NOTE:** CONTRACTOR MUST NOTIFY APPROPRIATE UTILITIES FOR WORK OUTSIDE THE PLANT PERIMETER FENCES IN ACCORDANCE WITH THE TENNESSEE UNDERGROUND UTILITIES DAMAGE PREVENTION ACT.

SERVICE SUPERVISOR NAME AND ORGANIZATION (PRINT & SIGN.)	DATE

EXCAVATION/PENETRATION PERMIT ISSUE DATE	EXCAVATION/PENETRATATION PERMIT TERMINATION DATE

WERE UTILITIES, UNEXPECTED OBSTRUCTIONS, AND/OR UNUSUAL CONDITIONS ENCOUNTERED? ☐ NO ☐ YES
(IF YES, LIST AND DESCRIBE ON ATTACHED SHEET WITH DRAWING NUMBER REFERENCES.)

EXCAVATION/PENETRATION WORK COVERED BY THIS PERMIT COMPLETED AT:

TIME	DATE	SERVICE SUPERVISOR	DATE
☐ AM ☐ PM			

UCN-12096 BACK

APPENDIX C.17

SITE-SPECIFIC HEALTH AND SAFETY CHECKLIST

SITE-SPECIFIC HEALTH AND SAFETY CHECKLIST

FOR

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM (GWPP)
MONITORING WELL INSTALLATION AND PLUGGING AND ABANDONMENT ACTIVITIES

Site Name: ____

Prepared by: ____
(Signature) (Date)
GWPP Project Health and Safety Officer

Reviewed by: ____
(Signature) (Date)
GWPP Drilling Project Manager

1.0 SITE DESCRIPTION

The ________________ site is located at ____ (see site map)

The ________________ site is near the (streams, roads, other landmarks) ____________________
____
____
____

The ________________ site is (brief description of terrain, vegetation, land use, etc.) ____________________
____
____

2.0 SITE HISTORY

(Brief description of site history and use. Include all site activities that may contribute to current site conditions.)
____
____
____
____

3.0 HEALTH AND SAFETY HAZARD EVALULATION

[Place an X in each box to indicate presence of hazard]

3.1 Physical Hazards

- [ ] Confined Space
- [ ] Enclosed Space
- [ ] Heavy Lifting
- [ ] Cold Stress
- [ ] Tripping/Falling
- [ ] High Voltage
- [ ] High Pressure Water
- [ ] Heat Stress
- [ ] Oxygen deficient
- [ ] Explosive/Flammable
- [ ] Vibration
- [ ] Noise

3.2 Construction Hazards

- [ ] Trenching
- [ ] Excavating
- [ ] Heavy Equipment Operation
- [ ] Demolition
- [ ] High Work
- [ ] Welding/Cutting
- [ ] Ladders
- [ ] Traffic
- [ ] Other________________
- [ ] Rotating Equipment

3.3 Chemical Hazards

- [ ] Organic Chemical
- [ ] Inorganic Chemical
- [ ] Carcinogen
- [ ] Corrosive
- [ ] Reactive
- [ ] OSHA Specific Substance
- [ ] Mutagen
- [ ] Teratogen
- [ ] Other________________

3.4 Ionizing Radiological Hazards

- [ ] Internal Exposure
- [ ] External Exposure

3.5 Non-Ionizing Radiological Hazards

- [ ] Ultraviolet
- [ ] RF
- [ ] Microwave
- [ ] Laser

3.6 Biological/Vector Hazards

☐ Wildlife ☐ Plants ☐ Medical Waste ☐ Parasites

☐ Bacterial

4.0 TASK BREAKDOWN

(Provide detailed descriptions, controls, and requirements, for each task to be performed [i.e., drilling, sampling, etc.]).

Level of Personal Protective Equipment: Primary ________ Contingency ________

Type of Work: Intrusive ☐ Extrusive ☐

Engineering Controls: ______________________________

____

____

Administrative Controls (required permits, training, etc.) ______________________________

____

____

Personal Protective Equipment:

	Primary Yes	Primary No	Contingency Yes	Contingency No
a) Respiratory Protection:	☐	☐	☐	☐
b) Protective Clothing:	☐	☐	☐	☐
c) Head Protection:	☐	☐	☐	☐
d) Eye Protection:	☐	☐	☐	☐
e) Foot Protection:	☐	☐	☐	☐
f) Hand Protection:	☐	☐	☐	☐
g) Hearing Protection:	☐	☐	☐	☐
h) Tape-up Required:	☐	☐	☐	☐

5.0 MONITORING REQUIREMENTS

Instrument	Task(s)	Monitoring Frequency	Action Guidelines
LEL Meter			
Photoionization Detector (PID)			
Flame Ionization Detector (FID)			
Alpha Meter			
Beta/Gamma Meter			
Other (Specify) ________			

0 HAZARD ANALYSIS

6.1 Chemical (Refer to Site-Specific Waste Management Plan)

Chemical: PEL/TLV: IDLH:
Action Level: STEL: LEL:
Route of Exposure:
Monitoring Equipment:
Symptoms/Effects of Exposure:
Special Medical Monitoring:

Chemical: PEL/TLV: IDLH:
Action Level: STEL: LEL:
Route of Exposure:
Monitoring Equipment:
Symptoms/Effects of Exposure:
Special Medical Monitoring:

Chemical: PEL/TLV: IDLH:
Action Level: STEL: LEL:
Route of Exposure:
Monitoring Equipment:
Symptoms/Effects of Exposure:
Special Medical Monitoring:

Chemical: PEL/TLV: IDLH:
Action Level: STEL: LEL:
Route of Exposure:
Monitoring Equipment:
Symptoms/Effects of Exposure:
Special Medical Monitoring:

Chemical: PEL/TLV: IDLH:
Action Level: STEL: LEL:
Route of Exposure:
Monitoring Equipment:
Symptoms/Effects of Exposure:
Special Medical Monitoring:

6.2 Ionizing Radiation (Refer to Site-Specific Waste Management Plan)

6.3 Electrical Hazards

High-Voltage (>100Kv) eletcirical transmission lines nearby? Yes/No

Location,distance, and voltage: ______________________________

____

____

Electrical shock hazard? Yes/No

_______ Voltage

_______ Current

Location of hazard: ______________________________

6.4 Temperature Extremes Hot ☐ Cold ☐

Work Load:

☐ Light

☐ Moderate

☐ Heavy

Work/Rest regimen:

_______ % work

_______ % rest

6.5 Noise

Noise Extremes? Yes/No

Noise source(s): ______________________________

____

Noise above 85 dB(A) (hearing protection required) Yes/No

6.6 Illumination

Additonal illumination required? Yes/No

6.7 Safety Hazards

Traffic control/flagmen Yes/No

Site posting required? Yes/No

Access control required? Yes/No

Entry/exit logs required? Yes/No

Escape routing/posting required (include site map)? Yes/No

Special precautions required related to physical limitations or medical conditions? Yes/No

6.8 Personal Protective Equipment (PPE) Hazards

Heat stress is addressed in section 6.4.

Is visibility impaired by protective clothing or PPE? If yes: Yes/No

1. Promote awareness of vision limitations, such as a reduced field of vision, fogging face shield, or a loose hood, and adjust worker activities accordingly. Continuous awareness of the surroundings and the worker's physical condition is imperative.

2. Only wear PPE that properly fits or may be adjusted (e.g., taping up an oversized tyvek suit) for a more proper fit.

Will PPE requirements increase slipping, tripping, or falling hazards (e.g., encumbrance, ill-fitted or overly loose clothing, impaired or reduced visibility, poor traction conditions, etc.)? If yes: Yes/No

1. Workers must adjust their work and movement capabilities to the encumbrance of the PPE. Workers should minimize activities that may cause overbalancing (e.g., running, jumping, rapid movements, and complex physical tasks).

2. Only wear PPE that properly fits or may be adjusted (i.e., taping up an oversized tyvek suit) for a more proper fit.

3. The buddy system must be utilized for ALL activities where vision is impaired or reduced by PPE, such as a respirator or hood. Two or more workers will be required to work together and monitor each others movements and physical condition, including the condition of each others' PPE.

Will cutting and welding activities be performed while wearing PPE greater than level D? If yes: Yes/No

1. Flame resistant PPE is required during ALL cutting, welding, and burning activities. For cutting, welding, and burning activities, the use of tape on wrists and ankles is prohibited. PPE with elastic wrists and ankles may be used where full protection is required.

2. A second individual performing as a firewatch over cutting, welding, and burning operations is mandatory. The individual performing as a firewatch must observe both the surroundings and the operator's person for signs of smoldering, smoke, and/or fire during the activity and observe the work area for at least 30 minutes after the activity.

3. An appropriate fire extinquisher is required on-site during all cutting, welding, and burning operations. This extinguisher should be fully charged, undamaged, and dedicated to the designated fire watch individual.

6.8 (Continued)

Will PPE requirements result in an increased entanglement hazard for personnel working around rotating machinery? If yes: Yes/No

1. Ensure that all site workers are aware of equipment which may present an entanglement hazard. Locate and identify catch or snag points on equipment. Determine if guarding is required and feasible. If not, maintain a safe distance from equipment in operation.

2. Ensure that loose PPE is minimized, use extra tape-up when required and as allowed (no tape on PPE is permitted during cutting, welding, and burning operations).

APPENDIX C.18

RADIOLOGICAL WORK PERMIT REQUEST

MARTIN MARIETTA ENERGY SYSTEMS, INC.	RADIOLOGICAL WORK PERMIT REQUEST

Requestor: Phone: Badge: Date:

Organization/Department: | Priority [High/Med/Low]:

Projected Start Date/Time: | Previous RWP Number:

Estimated Duration/End Date:

Work Description:

Job Supervisor: Name: Badge: Phone:

Associated Permits:

Location Description:

JOB BREAKDOWN

TO BE COMPLETED BY REQUESTOR				RADIOLOGICAL CONTROL ORGANIZATION USE ONLY		
Component task	Craft/Dept.	# Workers	Estimated person-hours	Avg. Dose rate (mR/hr)	Estimated exposure (mR)	
					Max. individual	Collective
Received by:				Total:		

Date: | Time: | Assigned RWP #:

Comments:

SUBMIT FORM TO THE RADIOLOGICAL CONTROL SUPERVISOR FOR THE AREA.

APPENDIX C.19

SAFETY WORK PERMIT

SAFETY WORK PERMIT

1 a	b. PERMIT NO.:		
2a. ISSUED TO (Supervisor-In-Charge):	b. Employee No.:	c. Phone No.:	d. Work Order/Request No.:

GOOD FOR DATE AND TIME SPECIFIED (MAXIMUM OF 90 DAYS)

3a. FROM: (Date and Time)	b. TO: (Date and Time)	c. BUILDING:	d. ROOM NO.:

4. DESCRIPTION OF WORK:

5. THE WORK IS SAFETY SYSTEM RELATED AND IS SUBJECT TO CONFIGURATION CONTROL REQUIREMENTS ☐ Yes ☐ No

THE FOLLOWING PREPARATIONS HAVE BEEN COMPLETED IN CONNECTION WITH THIS WORK

6. EQUIPMENT CONDITION REQUIREMENTS — PERMIT NO.

a. Valves closed ☐ Yes ☐ No
b. Pipelines pressure ________ psig ☐ Yes ☐ No
c. Pipelines drained or blanked ☐ Yes ☐ No
d. Pressure vessels checked and cleaned ☐ Yes ☐ No
e. Pipelines and equipment purged ☐ Yes ☐ No
f. Lockout/Tagout Permit required ☐ Yes ☐ No

7. FIRE PREVENTION REQUIREMENTS — PERMIT NO.

a. Explosive atmosphere test required ☐ Yes ☐ No
b. Non-sparking tools required ☐ Yes ☐ No
c. Fire Extinguisher Equip. on hand ☐ Yes ☐ No
d. Welding/Hotwork Permit required ☐ Yes ☐ No

Requires further Review/Evaluation by Fire Protection ☐ Yes ☐ No

FP (SIGNATURE)*

8. ELECTRICAL REQUIREMENTS — PERMIT NO.

a. Lockout/Tagout Permit Required ☐ Yes ☐ No
b. Circuits have been de-energized ☐ Yes ☐ No

9. INDUSTRIAL HYGIENE REQUIREMENTS - POSSIBLE HAZARDS — COMMENTS

Consulted With Industrial Hygiene	☐ Yes	☐ No	Man-made Mineral Fibers	☐ Yes	☐ No
Asbestos	☐ Yes	☐ No	Mechanical Ventilation	☐ Yes	☐ No
Biological Hazards	☐ Yes	☐ No	Noise	☐ Yes	☐ No
Confined Space	☐ Yes	☐ No	Oxygen Def.	☐ Yes	☐ No
HAZWOPER	☐ Yes	☐ No	Toxic Material	☐ Yes	☐ No
Heat/Cold Stress	☐ Yes	☐ No	Welding/Hot Work	☐ Yes	☐ No
			Other ________		

IH (SIGNATURE)

Any box checked "YES" requires further review/evaluation by the Industrial Hygiene Section.

10. RADIATION PROTECTION REQUIREMENTS — PERMIT NO.

a. Consulted with Health Physics ☐ Yes ☐ No
b. Radiation Hazard/Contamination Hazard ☐ Yes ☐ No
c. Radiation Work Permit required ☐ Yes ☐ No

HP (SIGNATURE)

11. ENGINEERING CONTROLS / PROTECTIVE EQUIPMENT / SAFETY REQUIREMENTS

☐ Elevated Work Surfaces	☐ Safety Glasses	☐ Aprons	☐ Lab Coats	☐ Gloves (Type) ________
☐ Trenching & Shoring	☐ Face Shield	☐ Hard Hats	☐ Impermeable Suit	☐ Respirators (Type)* ________
☐ Traffic Control	☐ Safety Harness	☐ Monogoggles	☐ Ear Plugs	Cartridge Type * ________
☐ Equipment Grounding	☐ Shoe Covers	☐ Acid Suits	☐ Laser Eyewear	☐ Other ________
☐ Excav./Penetration	☐ Hoisting and Rigging required			

Industrial Safety Signature ________

Requires further review/evaluation by Industrial Safety ☐ Yes ☐ No

*Requirements must be made by IH or HP and initialed.

12.. **I have personally inspected site and certify that the work area has been properly cleared for work and that conditions are safe for the work indicated. This Safety Work Permit is therefore approved for the work described.**

13. Issuing Authority: Division	Badge No.:	Time: ☐ AM ☐ PM	Date:	Logged By:	
14. Received By:	Badge No.:	Time: ☐ AM ☐ PM	Date:		
15. Work Complete - Permit Returned By:	Badge No.:	Time: ☐ AM ☐ PM	Date:		
16. Permit Closed By:	Badge No.:	Time: ☐ AM ☐ PM	Date:	Logged By:	

AT START OF WORK: The original copy is issued by requesting supervisor and goes to the supervisor-in-charge, and duplicate is retained by the requesting supervisor. Upon completion of work: (1) Supervisor-in-charge releases the original copy, returns to the requesting supervisor; (2) the requesting supervisor closes and logs the permits as required; (3) the original copy goes to the requesting supervisor's Division Safety Officer for distribution of xerox copies to: Industrial Hygiene Department, Fire Department, Safety Department, and supervisor-in charge's Division Safety Officer; and (4) the canary copy will be destroyed by the requesting supervisor after the original cvopy has been closed by requesting supervisor.

UCN-3694A (3 6-93)

NOTE: Personal Signatures Required!

TEMPORARY SUSPENSION	By (Supervisor-in-charge)	TEMPORARY SUSPENSION	By (Supervisor-in-charge)
FOR		FOR	
APPROVED BY (Originating Div.)		APPROVED BY (Originating Div.)	
TIME	DATE 19	TIME	DATE 19
PERMIT REISSUED BY		PERMIT REISSUED BY	
TIME	DATE 19	TIME	DATE 19
TEMPORARY SUSPENSION	By (Supervisor-in-charge)	TEMPORARY SUSPENSION	By (Supervisor-in-charge)
FOR		FOR	
APPROVED BY (Originating Div.)		APPROVED BY (Originating Div.)	
TIME	DATE 19	TIME	DATE 19
PERMIT REISSUED BY		PERMIT REISSUED BY	
TIME	DATE 19	TIME	DATE 19

THE FOLLOWING PERSONNEL WORKED UNDER THIS PERMIT:

Name	Employee No.	Name	Employee No.	Name	Employee No.

APPENDIX C.20

TASK ANALYSIS WORKSHEET

Plant/Division	Task Analyzed	TASK ANALYSIS	Approvals
Department	Date Completed	WORKSHEET	Signature / Function / Date
Occupation	Completed By		Signature / Function / Date
			Signature / Function / Date

No.	Significant Steps or Critical Activities	Loss Exposures (Safety - Quality - Production)	Efficiency Check		RECOMMENDED CONTROLS
			Yes	No	

APPENDIX C.21

ENERGY SYSTEMS NEPA PROJECT REVIEW CHECKLIST

ENERGY SYSTEMS NEPA PROJECT REVIEW CHECKLIST

1. ADMINISTRATIVE INFORMATION

NEPA STAFF USE ONLY

DATE RECEIVED:	PROJECT NUMBER:	NEPA STATUS:
COMMENTS:		

Project Title:			Estimated Start Work Date:
ADS No:	MJR No:	ESO No:	NEPA Needed By (Date):
Project Engineer/Manager (Print Name and Sign):		Bldg/MS/Phone No:	Date:
Project Location (Plant, Site, Area, Bldg No):		Customer Contact (Name):	Bldg/MS/Phone No:

DOE Program Office Providing Funding:
☐ DP ☐ AD ☐ NN ☐ CE ☐ EM ☐ ER ☐ NE ☐ TD ☐ NPR ☐ WFO ☐ CR ☐ LL

Project Funding Category: ☐ LI ☐ CE ☐ GPP ☐ EXP ☐ GPE	Division/Office:	Charge No:
Project Status: ☐ Ongoing ☐ Proposed ☐ Revised	Regulatory/Start Date: Regulatory Action(s) (circle if applicable): TSCA RCRA CERCLA CWA CAA SDWA NESHAPS	

2. ENVIRONMENTAL SUMMARY: Would changes and/or disturbances occur within the following entities either during construction or operation?

	Y	N	U		Y	N	U
1. Air Emissions	___	___	___	16. Threatened and/or endangered species	___	___	___
2. Liquid effluents	___	___	___	17. Prime farmlands	___	___	___
3. Floodplain/wetland interaction	___	___	___	18. Clearing or excavation	___	___	___
4. Solid waste	___	___	___	19. Activity outside area fence	___	___	___
5. Radioactive waste/soil	___	___	___	20. Archeological/cultural resources	___	___	___
6. Hazardous or PCB waste	___	___	___	21. Elevated noise levels	___	___	___
7. Mixed waste (rad & haz)	___	___	___	22. Rad./haz. substance chemical exposures	___	___	___
8. Classified waste streams	___	___	___	23. Pesticide/herbicide use	___	___	___
9. Chemical storage/use	___	___	___	24. Explosives	___	___	___
10. Petroleum storage/use	___	___	___	25. Transportation issues	___	___	___
11. Volatile/toxic/water reactives	___	___	___	26. Other	___	___	___
12. Asbestos waste	___	___	___				
13. Water use/diversion	___	___	___				
14. Drinking water system	___	___	___				
15. Sewage system	___	___	___				

Would the action require new/modifications to environmental permits? If yes, identify.

Y=Yes,N=No,U=Uncertain

3. PURPOSE AND NEED FOR PROPOSED ACTION: State intention, purpose, and need for the action, and any pertinent background information. Include attachments where appropriate.

4. LOCATION OF ACTION: Describe the location at which the action would take place. Attach maps where appropriate.

5. DESCRIPTION OF PROPOSED ACTION: Describe the components of the action, including construction/ demolition and/or operation phases of the action. Be sure to include all support facilities/activities (e.g., utility lines, access roads, and equipment decontamination). Is this a CERCLA action? If so, provide cost and time data. Include attachments where appropriate.

6. DESCRIPTION OF MATERIALS/WASTES: Describe the kinds and amounts of materials that would be used and the wastes that would be generated during both the construction/demolition and/or operational phases. Include attachments where appropriate.

7. FACILITY EFFECTS

7.1 SEWER SYSTEM/WATER SYSTEM: Consider whether the action would involve constructing or expanding the capacity or extending the useful life of systems such as wastewater treatment system, stormwater drainage system, groundwater monitoring wells, etc. (wastewater includes car wash rinse waters, laundry, boiler blowdown, and stormwater runoff). Would the action involve or affect:

	Y	N	U	Describe
Wastewater treatment system				
Stormwater drainage system				
Water system (domestic, process, and wells)				
Groundwater monitoring wells				

Y=Yes, N=No, U=Uncertain

7.2 DISTURBANCE OF HAZARDOUS/RADIOACTIVE SUBSTANCES: Consider whether the action would involve the disturbance of hazardous substances, pollutants, contaminants, and/or CERCLA-excluded petroleum and natural gas products that preexist in the environment. Would the action involve or affect:

	Y	N	U	Describe
Disturbance of hazardous substances				
Disturbance of radioactive contamination				
Control equipment/spill prevention precautions				
Contaminated groundwater				
Solid waste management units				
Air emissions				

Y=Yes, N=No, U=Uncertain

8. ENVIRONMENTAL EFFECTS: Would the action involve or affect:

	Y	N	U	Describe
Undeveloped areas				
Threatened and/or endangered species/habitat				
Prime farmland				
Clearing, grading, excavating areas (cleared areas > 1 acre; > 5 acres?)				
100- or 500-year floodplain				
Wetland areas				
Groundwater/surface water				
Historic sites, districts, or properties				
Archeological sites, districts, or properties				
Modification/demolition of a structure or a portion thereof				

Y=Yes, N=No, U=Uncertain

9. WASTE GENERATION AND HANDLING

Indicate solid and/or liquid wastes that would be generated, stored, treated, and/or disposed as a result of the action.

	Waste Category (check if applicable)						Waste Type (check if applicable)						
Waste Stream	Rad	RCRA	TSCA	Mixed	Sanitary Industrial	Bio-Hazard	Low-Level Rad	PCB	Oil/ Oily	Asbestos	Organics/ Solvents	Heavy Metals	Soil Debris
Solid													
Liquid													
Sludge													

If solid and/or liquid wastes are generated as a result of the action, estimate the quantity below by waste category and describe the means by which they would be treated, stored, and/or disposed. Attach additional information as appropriate.

	Waste Collection, Treatment, and/or Disposal (estimate amounts in appropriate box)					
Waste Stream	Underground Storage (Tanks/Boxes)	Above-ground Storage (Tanks/ Boxes/Drums)	Discharge into Storm Sewer	Discharge into Sanitary Sewer	Landfill (specify)	Other
Solid						
Liquid						
Sludge						

Would the action require the expansion or construction of a waste storage, treatment, or disposal facility?

Would the action generate airborne emissions? If yes, estimate amounts and describe below.

	Waste Category (check if applicable)						Waste Type (check if applicable)						
Waste Stream	Rad	RCRA	TSCA	Mixed	Sanitary Industrial	Bio-Hazard	Low-Level Rad	Particulates	Smoke	Asbestos	Organics/ Solvents	Heavy Metals	Gases Dust
Airborne													

What types of administrative or control equipment would be used to mitigate airborne emissions?

10. POLLUTION PREVENTION/WASTE MINIMIZATION: This section involves incorporation of pollution prevention/waste minimization principles into the action to reduce or eliminate liquid, solid, or gaseous waste/materials.

10.1 Source reduction activities	Y	N	N/A	Describe
Substitution of less hazardous input materials				
Improving operating practices (e.g., inventory control, volume reduction, best management practices)				
Selecting environmentally friendly (less toxic) or longer life products				
Implementing process/technology changes (e.g., equipment modifications)				

10.2 Recycling activities				Describe
Implementing in-process recycling (e.g., solvent recovery)				
Reusing surplus materials on-site (e.g., chemical exchange)				
Recycling materials off-site (e.g., scrap metal, fluorescent light bulbs)				

10.3 Affirmative procurement activities				Describe
Buying materials with recycled contents (e.g., building and office supplies)				
Purchasing energy and water efficient equipment				
Segregating waste/material types (e.g., hazardous, rad, sanitary)				

Y=Yes, N=No, N/A=Not applicable

Would the proposed action result in ongoing emissions or discharges of airborne or waterborne wastes?

_______ **NO** _______ **YES**

APPENDIX C.22

WELDING/BURNING/HOTWORK PERMIT

WELDING / BURNING / HOTWORK PERMIT

DATE	PERMIT ISSUED TO:
PERMIT ISSUED FOR THE FOLLOWING WORK:	PROJECT TITLE / WORK ORDER NO.:

WORK LOCATION:	BUILDING:	FLOOR:	COLUMN:

PERMIT STARTS: ☐ A.M. ☐ P.M.	PERMIT EXPIRES: ☐ A.M. ☐ P.M. (24 HRS. MAX.)

THE FOLLOWING PRECAUTIONS HAVE BEEN TAKEN:

	Y	NA
APPLICABLE BUILDING SPRINKLER SYSTEM IS IN SERVICE.		
SMOKE DETECTORS IN AREA HAVE BEEN PLACED OUT OF SERVICE.		
______________________ SYSTEM CLEANED AND / OR PURGED.		

DO NOT WELD, BURN, OR PERFORM HOTWORK UNTIL THE FOLLOWING PRECAUTIONS ARE TAKEN AND MAINTAINED. IF CONDITIONS CHANGE DURING THE COURSE OF THE WORK, THIS PERMIT IS VOID AND A NEW PERMIT MUST BE ISSUED.

	Y	NA	V
FIRE FIGHTING EQUIPMENT AND NEAREST PHONE/FIRE ALARM BOX IDENTIFIED.			
ATMOSPHERE TESTED FOR FLAMMABLE VAPORS. (% LEL ______________)			
CHEMICAL HAZARDS EVALUATED (COATINGS, PAINTS, CLEANERS, METAL FUMES)			
PRESENCE OF RADIOACTIVE CONTAMINATION DETERMINED			
FLOOR AREA SWEPT CLEAN.			
IF COMBUSTIBLE FLOOR, WET DOWN.			
COMBUSTIBLE MATERIALS REMOVED OR PROTECTED WITH NONCOMBUSTIBLE SHIELDS IF WITHIN 35 FEET.			
OPENINGS, CRACKS, HOLES IN WALLS OR FLOORS PROTECTED WITHIN 35 FEET.			
NO FLAMMABLE LIQUIDS WITHIN 50 FEET.			
PROVISIONS MADE FOR SAFE PLACEMENT OF COMPRESSED GAS CYLINDERS.			
SEE BACK FOR SPECIAL CONDITIONS.			

SIGNATURE (ISSUING AUTHORITY)

WELDING/BURNING/HOTWORK MAY BEGIN AFTER IT HAS BEEN VERIFIED THE ABOVE CONDITIONS HAVE BEEN MET.

NAMES OF TRAINED AND APPROVED FIRE WATCHERS (REQUIRED DURING AND 30 MINUTES AFTER COMPLETION OF WORK):

WORK AREA HAS BEEN PERSONALLY INSPECTED WITH ALL PRECAUTIONS FULLY IMPLEMENTED AND VERIFIED COLUMN HAS BEEN COMPLETED

SIGNATURE (SERVICE SUPERVISOR)

PERMIT MUST BE READILY VISIBLE AT THE WELDING/BURNING/HOTWORK TASK.

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