Y-12

OAK RIDGE Y-12 PLANT

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FISCAL YEAR 1997 WELL INSTALLATION, PLUGGING AND ABANDONMENT AND REDEVELOPMENT SUMMARY REPORT Y-12 PLANT, OAK RIDGE, TENNESSEE

September 1997

Prepared by

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Under Purchase Order 78B-99069C-Y27

for the

Water Compliance Department
Environmental Compliance Organization
Oak Ridge Y-12 Plant
Oak Ridge, Tennessee

Managed by

Lockheed Martin Energy Systems, Inc.
for the
U.S. Department of Energy
Under Contract Number DE-AC05-84OR21400

MANAGED BY
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY
97-035MS/092597

UCN-13872 (28 8-95)

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CONTENTS

FIGURES	iv
TABLES	iv
ABBREVIATIONS	v
EXECUTIVE SUMMARY	vi
1. INTRODUCTION	1-1
1.1 FISCAL YEAR 1997 WELL INSTALLATION SUMMARY	1-1
1.2 FISCAL YEAR 1997 WELL PLUGGING AND ABANDONMENT SUMMARY	1-2
1.3 FISCAL YEAR 1997 WELL REHABILITATION/REDEVELOPMENT SUMMARY	1-2
2. GENERAL GEOLOGY	2-1
2.1 LOCATION AND PHYSIOGRAPHY	2-1
2.2 STRATIGRAPHY	2-1
2.3 HYDROLOGY	2-6
3. WELL INSTALLATIONS	3-1
3.1 UEFPC CA RI PIEZOMETERS	3-1
3.2 BCV TREATABILITY PIEZOMETERS	3-1
4. WELL PLUGGING AND ABANDONMENT	4-1
4.1 DRILLING CONTRACTOR	4-1
4.2 PLUGGING AND ABANDONMENT METHODS	4-1
4.3 GROUTING PROCEDURES	4-1
4.4 WASTE MANAGEMENT PRACTICES	4-3
4.5 DEVIATIONS FROM NORMAL PLUGGING AND ABANDONMENT PROCEDURES	4-3
4.6 PLUGGING AND ABANDONMENT SUMMARIES	4-4
5. WELL REHABILITATION/REDEVELOPMENT	5-1
6. QUALITY ASSURANCE	6-1
7. HEALTH AND SAFETY	7-1
8. REFERENCES	8-1
APPENDIX A: PLUGGING AND ABANDONMENT ACTIVITY/PROGRESS REPORTS	A-1
APPENDIX B: PLUGGING AND ABANDONMENT DIAGRAMS	B-1
APPENDIX C: WASTE MANAGEMENT PLAN	C-1
APPENDIX D: DISPOSAL AND SCREENING RECORDS	D-1
APPENDIX E: EQUIPMENT DECONTAMINATION SUMMARIES	E-1
APPENDIX F: WELL REHABILITATION/REDEVELOPMENT REPORTS	F-1
APPENDIX G: WELL LOCATION MAPS	G-1

FIGURES

2.1	Generalized geologic cross-section through the Y-12 Plant and vicinity	2-2
2.2	Bear Creek Valley geologic map	2-3
2.3	Generalized geologic cross-section of the member formations of the Conasauga Group	2-4
2.4	Stratigraphic units in the vicinity of the Y-12 Plant	2-5

TABLES

3.1	UEFPC CA RI piezometer construction data	3-1
3.2	Temporary piezometer locations	3-2
4.1	Summary of drilling contractor services provided at each abandoned well, piezometer, or boring	4-2
4.2	Summary of decommissioned well construction data (Part I)	4-5
4.3	Summary of decommissioned well construction data (Part II)	4-6
5.1	FY 1997 rehabilitated wells and functional areas	5-1
5.2	FY 1997 well development summary, rehabilitated wells	5-1
7.1	Action levels used for well plugging and abandonment	7-1

ABBREVIATIONS

API	American Petroleum Institute
BCV	Bear Creek Valley
BGS	below ground surface
BMP	best management practices
BTOC	below top of casing
CA	characterization area
CDM	CDM Federal Programs Corporation
DOT	U.S. Department of Transportation
ECO	Environmental Compliance Organization (formerly Health, Safety, Environment, and Accountability Organization)
EFPC	East Fork Poplar Creek
Energy Systems	Lockheed Martin Energy Systems, Inc. (formerly Martin Marietta Energy Systems, Inc.)
EPA	U.S. Environmental Protection Agency
FID	flame ionization detector
ft	foot/feet
FY	fiscal year
gpm	gallons per minute
GWPP	Groundwater Protection Program
Highland	Highland Drilling Company
hr	hour
ID	inside diameter
in.	inch(es)
IR	Ingersoll-Rand
LEFPC	Lower East Fork Poplar Creek
OD	outside diameter
ORR	Oak Ridge Reservation
OVA	organic vapor analyzer
P&A	plugging and abandonment
PID	photoionization detector
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
SAIC	Science Applications International Corporation
TD	total depth
TOFR	top of fresh rock
TOWR	top of weathered rock
UEFPC	Upper East Fork Poplar Creek
Weston	Roy F. Weston, Inc.

EXECUTIVE SUMMARY

This report summarizes the well installation, plugging and abandonment, and redevelopment activities conducted during the federal fiscal year (FY) 1997 at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee.

No new groundwater monitoring wells were installed during FY 1997. However, 13 temporary piezometers were installed around the Upper East Fork Poplar Creek (UEFPC) in the Y-12 Plant. An additional 36 temporary piezometers, also reported in this document, were installed in FY 1996 and, subsequently, assigned GW-series identification.

A total of 21 monitoring wells at the Y-12 Plant were decommissioned in FY 1997.

Three existing monitoring wells underwent redevelopment during FY 1997.

All well installation and development (including redevelopment) was conducted following industry-standard methods and approved procedures in the Environmental Surveillance Procedures Quality Control Program (Energy Systems 1988), the *Resource Conservation and Recovery Act (RCRA) Groundwater Monitoring Technical Enforcement Guidance Document* (EPA 1986), and *Guidelines for Installation of Monitoring Wells at the Y-12 Plant* (Geraghty & Miller 1985). All wells were plugged and abandoned in accordance with the *Monitoring Well Plugging and Abandonment Plan for the U.S. Department of Energy, Y-12 Plant, Oak Ridge, Tennessee* (HSW, Inc. 1991).

Health and safety monitoring and field screening of drilling returns and development waters were conducted in accordance with approved Lockheed Martin Energy Systems, Inc. (Energy Systems) guidelines.

1. INTRODUCTION

In September 1996, Science Applications International Corporation (SAIC) was authorized by Lockheed Martin Energy Systems, Inc. (Energy Systems) to provide hydrogeologic oversight for the Oak Ridge Y-12 Plant Groundwater Protection Program (GWPP) during the installation, plugging and abandonment (P&A), and redevelopment of groundwater monitoring wells from October 1, 1996 through September 30, 1997. As part of this effort, SAIC was tasked with supervising drilling activities, directing monitoring well construction and development, providing well-site health and safety monitoring, and providing technical oversight (including well-site health and safety monitoring) for the P&A of obsolete monitoring wells and for the redevelopment of existing monitoring wells.

No monitoring wells requiring SAIC oversight were installed at the Y-12 Plant during federal fiscal year (FY) 1997; however, 13 temporary piezometers were installed at the Y-12 Plant by CDM Federal Programs Corporation (CDM). A total of 21 monitoring wells located along the East Fork Poplar Creek (EFPC) in the vicinity of the Y-12 Plant were decommissioned in FY 1997. Three existing monitoring wells at the Y-12 Plant underwent redevelopment during FY 1997.

This report presents a summary of the Y-12 Plant GWPP well drilling and development activities that took place during FY 1997. The report is organized in the following manner:

- general introduction and FY 1997 summaries of the Y-12 Plant drilling and development activities (Chap. 1);
- general geologic and hydrologic settings of the Y-12 Plant and vicinity (Chap. 2);
- discussion of Y-12 Plant well installations during FY 1997 (Chap. 3);
- discussion of well decommissioning (including P&A methods, grouting procedures, and waste management practices) during FY 1997 (Chap. 4);
- discussion of well redevelopments during FY 1997 (Chap. 5); and
- quality assurance/quality control (QA/QC) and health and safety protocols used on the Y-12 Plant GWPP activities during FY 1997.

Copies of the P&A activity/progress reports, P&A diagrams, field screening/disposal forms, equipment decontamination summaries, and well rehabilitation/redevelopment reports are included in Appendixes A, B, D, E, and F, respectively. The Y-12 Plant GWPP drilling and development effluents waste management guidelines appear in Appendix C.

1.1 FISCAL YEAR 1997 WELL INSTALLATION SUMMARY

No new groundwater monitoring wells were installed at the Y-12 Plant during FY 1997. CDM did, however, install a total of 13 temporary piezometers along the upper reaches of the Upper East Fork Poplar Creek (UEFPC) (Plate 2; Plates 1 and 2 are in Appendix G). The temporary piezometers were installed in the unconsolidated zone as part of the UEFPC Characterization Area (CA) Remedial Investigation (RI) under the Comprehensive Environmental Response, Compensation, and Liability Act.

1.2 FISCAL YEAR 1997 WELL PLUGGING AND ABANDONMENT SUMMARY

A total of 21 groundwater monitoring wells at the Y-12 Plant were plugged and abandoned in FY 1997 (Plate 1). All of the wells were located along the lower reaches of the East Fork Poplar Creek (EFPC). These wells were decommissioned in preparation for a remediation project of the EFPC floodplain.

1.3 FISCAL YEAR 1997 WELL REDEVELOPMENT SUMMARY

Three wells at the Y-12 Plant underwent redevelopment in FY 1997 (Plate 2). In all cases, redevelopment of the wells was requested following reports of excessively turbid water by the sampling crews.

2. GENERAL GEOLOGY

2.1 LOCATION AND PHYSIOGRAPHY

The Oak Ridge Y-12 Plant is located in Bear Creek Valley on the U.S. Department of Energy Oak Ridge Reservation (ORR), in the southwestern corner of Anderson County. The area of interest covered by this report includes Pine Ridge (which bounds Bear Creek Valley to the north), Chestnut Ridge (to the south of Bear Creek Valley), and parts of Bethel Valley.

The ORR, occupying an area of approximately 55 square miles, lies in a portion of the Tennessee section of the Valley and Ridge Physiographic Province (McMaster 1963). This province is characterized by narrow, elongated ridges and valleys trending northeast-southwest. Resistant sandstone, siltstone, and siliceous limestone and dolostone typically form the ridges; the valleys are commonly underlain by less resistant shale and soluble carbonates (Rodgers 1953). Elevations within the ORR range from about 900 ft to just over 1200 ft above mean sea level.

2.2 STRATIGRAPHY

Four major stratigraphic units, classified according to lithology, fossils, and age, underlie the Y-12 Plant vicinity. From oldest to youngest, these units are the Rome Formation, Conasauga Group, Knox Group, and Chickamauga Group. The formations located in and around Bear Creek Valley generally strike N47°E to N67°E. Regional dips range from 30° to 50° to the southeast (King and Haase 1987). Figures 2.1 and 2.2 represent a generalized geologic cross section and map, respectively, that illustrate the locations and stratigraphic relationships of the major stratigraphic groups and formations that occur in the Bear Creek Valley area.

The Rome Formation, which forms Pine Ridge, is of Lower Cambrian age and consists of interbedded sandstone, shale, and siltstone with local beds of dolostone (McMaster 1963).

The Conasauga Group, of Middle to Upper Cambrian age, has been subdivided into six formations of alternating, predominantly shale and limestone lithologies. The six formations, from oldest to youngest, are the Pumpkin Valley Shale, Rutledge Limestone, Rogersville Shale, Maryville Limestone, Nolichucky Shale, and Maynardville Limestone. Detailed lithologic descriptions of these formations are given in King and Haase (1987). Figure 2.3 presents the relative positions of the member formations of the Conasauga Group, in cross section, as they appear in Bear Creek Valley.

Chestnut Ridge, to the south of Bear Creek Valley, is underlain by siliceous dolostones of the Knox Group. This upper Cambrian to lower Ordovician-aged unit is divided into five formations that are, from oldest to youngest, the Copper Ridge Dolomite, Chepultepec Dolomite, Longview Dolomite, Kingsport Formation, and Mascot Dolomite. Detailed lithologic descriptions of the Knox Group formations are published in Milici (1973).

The Chickamauga Group consists of Middle to Upper Ordovician units of mostly limestone composition with varying amounts of interlayered dolostone, conglomerate, chert, hematite-rich clastic red beds, shales, and siltstones. This group is subdivided, in Bethel Valley from oldest to youngest, into the following units: the Blackford Formation, the Eidson Member, the Fleanor Shale Member (Lincolnshire Formation), the Rockdell Formation, the Benbolt/Wardell Formation, the Bowen Formation, the Witten Formation, and the Moccasin Formation. Detailed lithologic descriptions of these formations are given in Hatcher et al. (1992).

All of the bedrock formations in Bear Creek Valley and vicinity are overlain by unconsolidated deposits of fill, alluvium, colluvium, and in situ weathered bedrock (residium and saprolite). The thickness of unconsolidated deposits overlying the Conasauga and Chickamauga Groups (occupying valleys) ranged from approximately 1.0 ft to as much as 46.0 ft. Unconsolidated deposits overlying the Knox Group on Chestnut Ridge are considerably thicker than those in the adjacent valleys.

Source: McMaster 1963

Fig. 2.1. Generalized geologic cross section through the Y-12 Plant and vicinity.

Fig. 2.2. Bear Creek Valley geologic map.

Fig. 2.3. Generalized geologic cross-section of the member formations of the Conasauga Group.

Figure 2.4 is a generalized stratigraphic column of the major stratigraphic units and accepted subdivisions of the Y-12 Plant area bedrock formations.

2.3 HYDROLOGY

Three distinct hydrogeologic regimes exist (Bear Creek, UEFPC, and Chestnut Ridge) in the Y-12 Plant vicinity. Within Bear Creek Valley, the UEFPC Regime encompasses the UEFPC drainage channel and shallow groundwater in most of the Y-12 Plant vicinity and to the east. The Bear Creek Regime encompasses the Bear Creek drainage channel and shallow groundwater west of the Y-12 Plant to Highway 95. The flow path systems within the Maynardville Limestone that underlie the streams provide the principal conduits for groundwater movement. Although the surface and subsurface hydrologies have been altered by construction and recontouring of the topography, the original drainage still plays an important role in the subsurface movement of water. Major components of groundwater flow include movement through unconsolidated weathered rock and fill under unconfined conditions, and flow along bedding planes, fractures, and solution channels in the consolidated rock, generally under confined conditions (Kamp 1985). In Bear Creek Valley, recharge occurs predominantly by infiltrating precipitation through unconsolidated material downward to the underlying bedrock. In general, groundwater flow in bedrock appears to be predominantly within solution cavities and fractures in the bedrock.

The Chestnut Ridge Regime contributes recharge to Bear Creek Valley through strike-normal flow to the UEFPC and Bear Creek regimes (Geraghty & Miller 1990). Groundwater flow within this regime is also principally in fractures and cavities within consolidated bedrock or in the weathered bedrock zone under unconfined conditions. Groundwater flow in this regime is substantially influenced by topography of surface streams with the principal pathways both parallel and normal to strike. Groundwater discharges to surface streams and springs in Bear Creek Valley to the north and Bethel Valley to the south and potentially springs and surface streams along Scarboro Creek east of the Y-12 Plant.

Age	Group	Formation	Approximate Thickness (ft)		
			King and Haase 1987	Milici 1973	McMaster 1963
Middle & Upper Ordovician	Chickamauga	Undifferentiated	Not Determined		1750
Lower Ordovician	Knox	Mascot Dolomite	Not Determined	400-800	3000 (undivided)
		Kingsport Formation		200-320	
		Longview Dolomite		250-450	
		Chepultepec Dolomite		725-880	
		Copper Ridge Dolomite		900-1000	
Middle & Upper Cambrian	Conasauga	Maynardville Limestone	418-450		1500 (undivided)
		Nolichucky Shale	422-550		
		Maryville Limestone	346-445		
		Rogersville Shale	90-120		
		Rutledge Limestone	90-120		
		Pumpkin Valley Shale	260-320		
Lower Cambrian		Rome	Not Determined		800+

Fig. 2.4. Stratigraphic units in the vicinity of the Y-12 Plant.

3. WELL INSTALLATIONS

No new groundwater monitoring wells were installed at the Y-12 Plant in FY 1997. However, CDM installed a total of 13 temporary piezometers to obtain additional groundwater data for the UEFPC CA RI. In addition, another 36 temporary piezometers installed at the Y-12 Plant for the Bear Creek Valley (BCV) treatability study will be presented here.

3.1 UEFPC CA RI PIEZOMETERS

In April 1997, CDM installed a total of 13 temporary piezometers along the UEFPC to obtain additional groundwater data for the UEFPC CA RI. The piezometers were installed using a direct push probe sampling apparatus. After reaching refusal, the piezometers, consisting of a 5.0-(ft) section of 10-slot, 1.25-inch (in.) outside diameter (OD) polyvinyl chloride (PVC) screen and 1.25-in. OD schedule 40 PVC casing, were installed on top of the expendable probe point. Table 3.1 lists the UEFPC CA RI temporary piezometers and includes estimated location coordinates, total depth (TD) of probe hole, top of screen depth, and bottom of screen depth.

Table 3.1. UEFPC CA RI piezometer construction data

Piezometer	Coordinates		Total depth (ft BGS)	Top of screen (ft BGS)	Bottom of screen (ft BGS)	
	Northing	Easting				
GP-1	29,020	64,200	12.1	7.1	11.9	
GP-2	28,850	64,265	13.1	8.0	12.9	
GP-3	28,837	64,142	16.6	11.5	16.4	
GP-4	28,662	63,735	24.2	19.1	24.0	
GP-5	28,885	63,210	22.2	17.2	22.0	
GP-6	28,885	62,898	14.5	9.4	14.3	
GP-7	29,020	62,475	18.0	13.0	17.8	
GP-8	28,802	62,280	11.4	6.3	11.2	
GP-9	29,145	62,015	17.1	12.1	16.9	
GP-10	28,900	61,698	21.3	16.3	21.1	
GP-11	29,000	61,070	12.9	7.9	12.7	
GP-12	N/A	N/A	N/A	N/A	N/A	Not installed
GP-13	28,830	60,575	8.7	3.7	8.5	
GP-14	28,960	60,360	8.8	3.8	8.6	
GP-15	N/A	N/A	6.1	1.1	5.9	Abandoned
GP-16	N/A	N/A	11.7	6.7	11.5	Abandoned

3.2 BCV TREATABILITY PIEZOMETERS

During the summer of 1996, 36 temporary piezometers were installed in the vicinity of the western end of the Y-12 Plant to help identify groundwater contaminant pathways near the headwaters of Bear Creek. During FY 1997, Y-12 Plant GWPP personnel assigned GW-numbers to the BCV treatability study piezometers that appear in this summary report. Piezometers GW-854 through GW-880 were installed using a Geoprobe™ direct push rig. Upon reaching refusal the piezometers, consisting of a 2.0-ft section of 10-slot, 1-in. OD PVC screen and 1-in. OD schedule 80 PVC casing, were installed. A sand pack extending from TD to approximately 1.0 ft above the top of the screen was installed, followed by a bentonite annular seal from the top of the sand pack to the ground surface. Piezometers GW-881 through GW-885 used a direct push probe apparatus to drive 2-in. OD steel casing with an expendable point to refusal. At refusal, the steel

casing was retracted 2 ft and the piezometer, consisting of a 2.1-ft section of 10-slot, 1.25-in. OD PVC screen and 1.25-in. OD schedule 80 PVC casing, was installed. These piezometers did not utilize a sand pack nor a bentonite annular sealant. Rubber packer/washers act as annular plugs at the top of the screened interval and the top of the steel casing stick-up. Piezometers GW-834 through GW-837 were installed in boreholes that had been extended to refusal (bedrock) using a hollow-stem auger. These piezometers, consisting of a 2.0-ft section of 10-slot, 4-in. inside diameter (ID) PVC screen and 4-in. ID schedule 80 PVC casing, were installed and completed with a sand filter pack and bentonite annular seal. Table 3.2 lists the BCV treatability piezometers and includes location coordinates, TD of piezometer, and functional area.

Table 3.2. Temporary piezometer locations

Piezometer	Original number	Easting coordinate	Northing coordinate	Total depth (ft BGS)	Functional area
GW-834	BPA-04	50855.00	30020.30	19.8	S3 Ponds
GW-835	BPA-02	51358.36	29822.02	22.1	S3 Ponds
GW-836	BPA-03	51356.24	29774.56	27.4	S3 Ponds
GW-837	BPA-04	52281.57	29969.06	30.9	S3 Ponds
GW-854	TPB-01	50862.26	30050.68	16.5	S3 Ponds
GW-855	TPB-02	51002.32	30123.76	20.9	S3 Ponds
GW-856	TPB-03	N/A	N/A	N/A	Abandoned
GW-857	TPB-04	50846.69	30017.36	16.6	S3 Ponds
GW-858	TPB-05	50872.25	29928.39	20.4	S3 Ponds
GW-859	TPB-06	51410.93	29781.15	16.6	S3 Ponds
GW-860	TPB-07	51229.86	29757.29	23.5	S3 Ponds
GW-861	TPB-08	51144.29	29745.83	19.6	S3 Ponds
GW-862	TPB-09	52281.32	29958.44	16.6	S3 Ponds
GW-863	TPB-10	52062.66	29911.55	25.3	S3 Ponds
GW-864	TPB-11	51838.90	29858.65	20.4	S3 Ponds
GW-865	TPB-12	49773.83	30063.55	16.0	Burnyard/boneyard
GW-866	TPB-13	49551.56	29970.97	20.0	Burnyard/boneyard
GW-867	TPB-14	49478.25	29912.20	11.7	Burnyard/boneyard
GW-868	TPB-15	51349.84	29768.96	19.9	S3 Ponds
GW-869	TPB-16	51363.03	29828.61	16.6	S3 Ponds
GW-870	TPB-17	N/A	N/A	N/A	Abandoned
GW-871	TPB-18	51286.82	29812.18	23.3	S3 Ponds
GW-872	TPB-19	52420.49	29948.10	14.0	S3 Ponds
GW-873	TPB-20	49702.40	30009.87	14.8	Burnyard/boneyard
GW-874	TPB-21	49752.14	29940.63	19.1	Burnyard/boneyard
GW-875	TPB-22	49791.72	29873.18	21.5	Burnyard/boneyard
GW-876	TPB-23	49471.15	29914.63	23.8	Burnyard/boneyard
GW-877	TPB-24	50827.71	29965.39	18.7	S3 Ponds
GW-878	TPB-25	52029.77	30074.96	16.6	S3 Ponds
GW-879	TPB-26	51520.13	30151.23	19.9	S3 Ponds
GW-880	TPB-27	51237.66	30244.31	21.5	S3 Ponds
GW-881	TPB-28	52001.47	30228.20	23.1	S3 Ponds
GW-882	TPB-29	51465.49	29876.85	23.1	S3 Ponds
GW-883	TPB-30	51526.39	30024.42	22.6	S3 Ponds
GW-884	TPB-31	52234.25	30052.04	13.3	S3 Ponds
GW-885	TPB-32	52236.31	30053.34	19.3	S3 Ponds

BGS - Below Ground Surface

4. WELL PLUGGING AND ABANDONMENT

4.1 DRILLING CONTRACTOR

The principal drilling contractor for plugging and abandonment activities at the Y-12 Plant during FY 1997 was Highland Drilling Company (Highland). Roy F. Weston, Inc. (Weston) decommissioned one well during FY 1997 (Table 4.1).

Highland utilized either an air rotary drilling rig or a backhoe outfitted with an auger motor to plug and abandon wells during FY 1997. An Ingersoll-Rand (IR) XL-750 air rotary drilling rig was used in the decommissioning of well GW-668. A Ford 555B backhoe equipped with a McMillan Diggerhead auger motor was used in the decommissioning of wells AN:D-7, AN:D-8, AN:D-9, AN:D-10, AN:D-11, and GW-667. A number of wells decommissioned during FY 1997 were located in places that did not allow drill rig access or where wellbore reaming was not necessary (see Sect. 4.5, Deviations from Normal Plugging and Abandonment Procedures). These wells were pulled out of the ground (in most cases with the entire well assembly intact and in one piece) and the empty bore plugged. Wells AN:D-1, GW-663, and GW-666 were pulled out of the ground using the previously-mentioned backhoe. Wells AN:D-6, AN:D-unknown, GW-661, and GW-664 were pulled out of the ground using a winch truck. A hand-operated winch was used to pull out wells AN:D-2, AN:D-3, AN:D-4, and AN:D-5. Wells GW-662 and GW-665 were plugged in place; no drilling equipment was used in the decommissioning of these wells, nor was the well screen/casing removed from the ground. Weston used a trackhoe to pull AN:D-unknown 2 out of the ground before plugging the wellbore.

4.2 PLUGGING AND ABANDONMENT METHODS

There are four generalized plugging and abandonment methods for the decommissioning of obsolete monitoring wells at the Y-12 Plant. The four methods are discussed in *Monitoring Well Plugging and Abandonment Plan for the Department of Energy Y-12 Plant, Oak Ridge, Tennessee* (HSW, Inc. 1991). These methods are applicable to different types of well, piezometer, or boring construction. Wells that were plugged and abandoned during FY 1997 required the use only of method A.

Method A is used for wells constructed of ≤ 7.0 -in. OD steel or stainless steel well casing, typically completed with 5.0- to 20.0-ft well screens and sand filter packs. Wells completed in bedrock may also have 8.0- to 12.0-in. OD steel or PVC surface casing extending from ground surface to the top of bedrock. Some wells may also be completed with a conductor casing in place. Method A involves the over wash and removal of casing with washover pipe. Once the well casing has been removed, the borehole is reamed with a tricone bit or auger at least 0.25 in. larger in diameter than the original bore. American Petroleum Institute (API) Class A (Type I) neat cement is tremied to within 4.0 ft of the surface (if there is no surface casing or conductor casing) and, after verification of the depth to the grout plug, the remaining 4.0 ft of bore is capped using compacted noncontaminated soil or local materials. If the well was completed with surface casing, the first grout plug is tremied to the bottom of the surface casing and allowed to cure. The surface casing is then over washed in the same manner as the inner casing, and grout is tremied from the bottom to within 4.0 ft of the surface. If the well was also completed with a conductor casing, it is removed in a manner similar to that for the surface casing.

4.3 GROUTING PROCEDURES

Screened Monitoring Wells and Piezometers

Following removal of screen and casing from these wells, and subsequent conditioning of the borehole, neat cement grout was placed into the bore to within 4.0 ft of the bottom of surface casing (if no surface casing was present, grout was brought to within 4.0 ft of the ground surface). After the grout had cured, surface casings (if any) were removed, and neat cement grout

Table 4.1. Summary of drilling contractor services provided at each abandoned well, piezometer, or boring

Well	Drilling contractor	Service supplied
AN:D-1	Highland Drilling Company	Plugging and abandonment of a stainless steel screened well.
AN:D-2	Highland Drilling Company	Plugging and abandonment of a stainless steel screened well.
AN:D-3	Highland Drilling Company	Plugging and abandonment of a stainless steel screened well.
AN:D-4	Highland Drilling Company	Plugging and abandonment of a stainless steel screened well.
AN:D-5	Highland Drilling Company	Plugging and abandonment of a stainless steel screened well.
AN:D-6	Highland Drilling Company	Plugging and abandonment of a stainless steel screened well.
AN:D-7	Highland Drilling Company	Plugging and abandonment of a stainless steel screened well.
AN:D-8	Highland Drilling Company	Plugging and abandonment of a stainless steel screened well.
AN:D-9	Highland Drilling Company	Plugging and abandonment of a stainless steel screened well.
AN:D-10	Highland Drilling Company	Plugging and abandonment of a stainless steel screened well.
AN:D-11	Highland Drilling Company	Plugging and abandonment of a stainless steel screened well.
AN:D-Unknown	Highland Drilling Company	Plugging and abandonment of a stainless steel screened well.
AN:D-Unknown2	Roy F. Weston, Inc.	Plugging and abandonment of a stainless steel screened well.
GW-661	Highland Drilling Company	Plugging and abandonment of a stainless steel screened well.
GW-662	Highland Drilling Company	Plugging and abandonment of a stainless steel screened well.
GW-663	Highland Drilling Company	Plugging and abandonment of a stainless steel screened well.
GW-664	Highland Drilling Company	Plugging and abandonment of a stainless steel screened well.
GW-665	Highland Drilling Company	Plugging and abandonment of a stainless steel screened well.
GW-666	Highland Drilling Company	Plugging and abandonment of a stainless steel screened well.
GW-667	Highland Drilling Company	Plugging and abandonment of a stainless steel screened well.
GW-668	Highland Drilling Company	Plugging and abandonment of a stainless steel screened well with surface casing.

was placed into the reamed bore to within 4.0 ft below ground surface (BGS). This grout was allowed to cure, and the remaining open bore was filled with a clay/soil plug.

Highland either hand-mixed API Class I (Type I) grout used in P&A or used premixed cement of the same specifications delivered to the site by a cement subcontractor. In bores greater than 20.0 ft deep, grout was tremied through 1.5-in. OD PVC tremie pipe at a depth of approximately 10.0 to 20.0 ft from the bottom of the bore. Grouting of boreholes less than 20.0 ft deep or where the danger of bridging was negligible was accomplished by pouring or by pumping directly into the bore.

4.4 WASTE MANAGEMENT PRACTICES

Waste management guidelines for the plugging and abandonment program were supplied by Energy Systems (Appendix C). In the case where well sites were outside areas of known or suspected contamination, drilling cuttings and water were discharged to the ground surface or to an excavated cuttings pit, provided that field screening criteria for radioactivity, volatile organics, and pH were not exceeded.

Certain well sites on the LEFPC floodplain were located in areas with suspected mercury contamination in the upper 2 to 3 ft of the soil (a Jerome mercury vapor analyzer was added to the suite of monitoring instruments used during the P&A of these wells). If possible, the wells in the suspected mercury-contaminated areas were pulled out of the ground and the wellbores subsequently plugged without disturbing the contaminated horizon (see Sect. 4.5, Deviations from Normal Plugging and Abandonment Procedures). Additional health physics support was provided by M-K Ferguson for the wells on the LEFPC floodplain.

Extracted well screen and casings were cleaned of all remaining annular cement, cut into manageable lengths, split lengthwise, and segregated by material prior to removal from site. In the event that drill (or auger) cuttings or materials exceeded acceptable disposal limits, Environmental Compliance Organization (ECO) personnel directed subcontractor personnel in the proper disposal techniques.

Organic vapors. A headspace analysis of the cuttings composite from well AN:D-9 measured in excess of acceptable disposal limits. After resealing the sample and allowing the appropriate incubation period (1 hr), the headspace was again analyzed resulting in a measurement that was in the acceptable range for on-site disposal. The source of the high headspace reading was never determined.

pH. A measure of the pH of the cuttings composition from well GW-668 was in excess of acceptable disposal limits. Cement fragments/dust in the cuttings composite were identified as the source of the high pH. The cuttings were scattered around the well location with no further action taken.

4.5 DEVIATIONS FROM NORMAL PLUGGING AND ABANDONMENT PROCEDURES

Due to certain irregularities or unusual circumstances in the installation of the well to be decommissioned, deviations from the approved P&A methods were necessary to complete the P&A. Authorization to deviate from P&A methods was obtained from ECO prior to beginning P&A activities. Generally, deviations of this type included milling of PVC well casing/screen while simultaneously reaming the wellbore to fresh material, thereby streamlining the applicable P&A method; using bentonite aggregate instead of cement to bridge voids, cavities, or fractures; and abbreviating P&A activities at a well when removal of the well casing/screen was deemed impractical (either casing could not be extracted or waste generation was a concern).

The following is a list of deviations (other than the generalized ones listed above) that occurred during FY 1997.

LEFPC floodplain wells. A number of wells decommissioned in FY 1997 were located on portions of the LEFPC floodplain and were difficult to access with a drilling rig or applicable equipment to ream the wellbore following screen/casing extraction. ECO personnel granted a blanket deviation not requiring borehole conditioning for difficult-to-access wells on the LEFPC floodplain. The wells involved in this deviation include AN:D-1, AN:D-2, AN:D-3, AN:D-4, AN:D-5, AN:D-6, AN:D-unknown 2, GW-663, GW-664, and GW-666.

AN:D-unknown and GW-661. While pulling the well assemblies out of the ground of AN:D-unknown and GW-661, portions of the casing and/or screens of both wells broke off and were unobtainable. ECO personnel approved plugging the wellbores at both locations with part of the casing/screen still in the ground.

GW-662 and GW-665. The aboveground portions of wells GW-662 and GW-665 were intentionally removed and the below ground portions of both wells plugged in place, with ECO approval.

GW-668. The surface-cased portion of well GW-668 was not reamed entirely to 0.25-in. larger than the original wellbore diameter as per procedures.

Bentonite aggregate was approved for used to plug all wells/wellbores decommissioned during FY 1997 rather than cement as required by the procedures.

4.6 PLUGGING AND ABANDONMENT SUMMARIES

This section provides a brief P&A summary of each of the 21 wells decommissioned for the Y-12 Plant GWPP during FY 1997. The wells are arranged numerically within the same geographic region or operational area. A summary of the recorded well construction and location information is presented in Tables 4.1 and 4.2 (Jones, Thompson, and Field 1995, Y/TS-881/R3). Occasionally, minor differences existed between reported construction and actual construction. These differences, as well as deviations from the P&A procedures, are included below. Some wells had no listing in the Subsurface Data Base (Y/TS-881/R3). Some of the information for these wells reported in Tables 4.2 and 4.3 is based on field observations.

Lower East Fork Poplar Creek floodplain. The EFPC originates in the Y-12 Plant and flows east and north toward the city of Oak Ridge through a water gap in Pine Ridge at Scarboro Road. The creek then flows alongside Illinois Avenue and roughly parallel to the Oak Ridge Turnpike, flowing west out of the city.

In preparation for a remediation effort, 21 groundwater monitoring wells on and along the LEFPC floodplain were plugged and abandoned during FY 1997.

AN:D-1. Well AN:D-1 was an obsolete stainless-steel screened well constructed in a 6-in. diameter borehole with a reported total depth of 4.9 ft. The 2 3/8-in. OD well casing and screen were pulled out of the ground along with a 2.5-ft section of 9-in. OD steel conductor casing. The (unreamed) wellbore was plugged from 4.9 ft to 1.0 ft BGS by pouring 2, 50-lb sacks of 3/8-in. bentonite aggregate into the borehole. The remaining 1.0 ft of hole was backfilled with native clay soil.

AN:D-2. Well AN:D-2 was an obsolete stainless-steel screened well constructed in a 6-in. diameter borehole with a reported total depth of 8.2 ft. The 2 3/8-in. OD well casing and screen were pulled out of the ground along with a 2.5-ft section of 9-in. OD steel conductor casing. The (unreamed) wellbore was plugged from 8.2 ft to 1.0 ft BGS by pouring 2, 50-lb sacks of 3/8-in. bentonite aggregate into the borehole. The remaining 1.0 ft of hole was backfilled with native clay soil.

AN:D-3. Well AN:D-3 was an obsolete stainless-steel screened well constructed in a 6-in. diameter borehole with a reported total depth of 9.7 ft. The 2 3/8-in. OD well casing and screen were pulled out of the ground along with a 2.5-ft section of 9-in. OD steel conductor casing. The

Table 4.2. Summary of decommissioned well construction data, Part I
(Jones, Thompson, and Field 1995)

Well no.	Y-12 coordinates		Surface elevation (ft MSL)	Total depth (ft BGS)	Functional area	Other names	Screened (S) open (O)
	Northing	Easting					
AN:D-1	34,088 ^a	62440 ^a	861.5 ^b	4.9 ^b	LEFPC	None	S
AN:D-2	33990 ^a	62402 ^a	862.7 ^b	8.2 ^b	LEFPC	None	S
AN:D-3	33900 ^a	62358 ^a	863.2 ^b	9.7 ^b	LEFPC	None	S
AN:D-4	33810 ^a	62321 ^a	862.1 ^b	4.9 ^b	LEFPC	None	S
AN:D-5	33760 ^a	62265 ^a	862.7 ^b	6.1 ^b	LEFPC	None	S
AN:D-6	33680 ^a	62197 ^a	863.4 ^b	3.8 ^b	LEFPC	None	S
AN:D-7	40355 ^a	53400 ^a	835.6 ^b	8.0 ^b	LEFPC	None	S
AN:D-8	40295 ^a	53360 ^a	834.6 ^b	8.4 ^b	LEFPC	None	S
AN:D-9	40242 ^a	53284 ^a	834.3 ^b	10.0 ^b	LEFPC	None	S
AN:D-10	40191 ^a	53237 ^a	833.7 ^b	9.3 ^b	LEFPC	None	S
AN:D-11	40015 ^a	53061 ^a	834.1 ^b	8.4 ^b	LEFPC	None	S
AN:D-Unknown	32502 ^a	63738 ^a	879.0 ^c	N/A	LEFPC	Unknown	S
AN:D-Unknown 2	33277.69	63008.87	871.2	N/A	LEFPC	Unknown	S
GW-661	32793.69	63483.20	878.8	7.8	LEFPC	AN:E-2	S
GW-662	34093.89	62401.88	861.6	17.5	LEFPC	AN:E-3	S
GW-663	34515.14	61993.74	861.0	4.0	LEFPC	AN:E-4	S
GW-664	35085.79	61748.97	859.0	5.9	LEFPC	AN:E-5	S
GW-665	35457.01	61708.44	859.5	30.7	LEFPC	AN:E-6	S
GW-666	39754.19	55755.36	837.2	7.9	LEFPC	AN:E-7	S
GW-667	39666.59	55792.90	836.9	8.0	LEFPC	AN:E-8	S
GW-668	40289.58	53381.51	835.5	23.1	LEFPC	AN:E-9	S

MSL = mean sea level

BGS = below ground surface

^aLocation coordinates of AN: D-series wells are estimated

^bSource: SAIC. 1994. East Fork Poplar Creek-Sewer Line Beltway Remedial Investigation Report, DOE/OR/02-1119&D2&V1, January.

^cEstimated

Table 4.3. Summary of decommissioned well construction data (Part II)
(Jones, Thompson, and Field 1995)

Well no.	Protective casing depth/OD (ft, BGS/in.)	Surface casing type	Surface casing depth ^a /OD (ft, BGS/in.)	TOWR (ft, BGS)	TOFR (ft, BGS)	Plugging and abandonment method	Rock formation(s) ^b
AN:D-1	2.5/9 ^c	Steel	1.4/2 3/8	4.9	N/A	A	Chickamauga
AN:D-2	2.5/9 ^c	Steel	3.7/2 3/8	8.2	N/A	A	Chickamauga
AN:D-3	2.5/9 ^c	Steel	3.8/2 3/8	9.7	N/A	A	Chickamauga
AN:D-4	2.5/9 ^c	Steel	2.3/2 3/8	4.9	N/A	A	Chickamauga
AN:D-5	2.5/9 ^c	Steel	2.6/2 3/8	6.1	N/A	A	Chickamauga
AN:D-6	2.0/9 ^c	Steel	1.3/2 3/8	3.8	N/A	A	Chickamauga
AN:D-7	2.0/9 ^c	Steel	4.6/2 3/8	8.0	N/A	A	Chickamauga
AN:D-8	3.5/9 ^c	Steel	4.1/2 3/8	8.4	N/A	A	Chickamauga
AN:D-9	2.0/9 ^c	Steel	2.9/2 3/8	N/A	N/A	A	N/A
AN:D-10	2.0/9 ^c	Steel	5.1/2 3/8	N/A	N/A	A	N/A
AN:D-11	2.0/9 ^c	Steel	6.2/2 3/8	N/A	N/A	A	N/A
AN:D-unknown	N/A	Steel	N/A/2 3/8	N/A	N/A	A	Rome
AN:D-unknown2	2.5/7.75	Steel	6.8/2 3/8	N/A	N/A	A	Rome
GW-661	N/A/10 3/4	Steel	4.8/2 3/8	7.8	N/A	A	Rome
GW-662	N/A/10 3/4	Steel	10.0/2 3/8	8.0	N/A	A	Rome
GW-663	N/A	N/A	3.0/2 3/8	N/A	N/A	A	Rome
GW-664	N/A	N/A	4.9/2 3/8	N/A	N/A	A	Rome
GW-665	N/A	Steel	19.7/2 3/8	N/A	5.5	A	Rome
GW-666	N/A	N/A	4.9/2 3/8	N/A	N/A	A	Rome
GW-667	N/A	N/A	5.8/2 3/8	N/A	N/A	A	Rome
GW-668	8.0/11 3/4	Cast iron	13.1/4 1/2	N/A	N/A	A	Rome

TOWR = Top of weathered rock

TOFR = Top of fresh rock

^aDenotes surface casing for open-interval wells or well casing for screened interval wells

^bDepth of contact given in parentheses.

^cSource: SAIC 1994. East Fork Poplar Creek Sewer Line Beltway Remedial Investigation Report, DOE/OR/02-1119&D2&V1, January.

(unreamed) wellbore was plugged from 9.7 ft to 1.0 ft BGS by pouring 2, 50-lb sacks of 3/8-in. bentonite aggregate into the borehole. The remaining 1.0 ft of hole was backfilled with native clay soil.

AN:D-4. Well AN:D-4 was an obsolete stainless-steel screened well constructed in a 6-in. diameter borehole with a reported total depth of 4.9 ft. The 2 3/8-in. OD well casing and screen were pulled out of the ground along with a 2.5-ft section of 9-in. OD steel conductor casing. The (unreamed) wellbore was plugged from 4.9 ft to 1.0 ft BGS by pouring 2, 50-lb sacks 3/8-in. bentonite aggregate into the borehole. The remaining 1.0 ft of hole was backfilled with native clay soil.

AN:D-5. Well AN:D-5 was an obsolete stainless-steel screened well constructed in a 6-in. diameter borehole with a reported total depth of 6.1 ft. The 2 3/8-in. OD well casing and screen were pulled out of the ground along with a 2.5-ft section of 9-in. OD steel conductor casing. The (unreamed) wellbore was plugged from 6.1 ft to 1.0 ft BGS by pouring 2, 50-lb sacks of 3/8-in. bentonite aggregate into the borehole. The remaining 1.0 ft of hole was backfilled native clay soil.

AN:D-6. Well AN:D-6 was an obsolete stainless-steel screened well constructed in a 6-in. diameter borehole, with a reported total depth of 3.8 ft. The 2 3/8-in. OD well casing and screen were pulled out of the ground along with a 2.5 ft section of 9-in. OD steel conductor casing. The (unreamed) wellbore was plugged from 3.8 ft to 1.0 ft BGS by pouring 2, 50-lb sacks of 3/8-in. bentonite aggregate into the borehole. The remaining 1.0 ft of hole was backfilled with native clay soil.

AN:D-7. Well AN:D-7 was an obsolete stainless-steel screened well constructed in a 6-in. diameter borehole with a reported total depth of 8.0 ft. The 2 3/8-in. OD well casing and screen were pulled out of the ground along with a 2.0-ft section of 9-in. OD steel conductor casing. A 9-in. diameter solid stem auger was used to ream the wellbore to fresh material to a depth of 9.0 ft BGS. The reamed wellbore was plugged from 8.4 ft to 0.8 ft BGS by pouring 3, 50-lb sacks of 3/8-in. bentonite aggregate into the borehole. The remaining 0.8 ft of hole was backfilled with native clay soil.

AN:D-8. Well AN:D-8 was an obsolete stainless-steel screened well constructed in a 6-in. diameter borehole with a reported total depth of 8.4 ft. The 2 3/8-in OD well casing and screen were pulled out of the ground along with a 3.6-ft section of 9-in. OD steel conductor casing. A 9-in. diameter solid stem auger was used to ream the wellbore to fresh material to a depth of 8.4 ft BGS (auger refusal). The reamed wellbore was plugged from 6.7 ft to 0.9 ft BGS by pouring 3, 50-lb sacks of 3/8-in. bentonite aggregate into the borehole. The remaining 0.9 ft of hole was backfilled with native clay soil.

AN:D-9. Well AN:D-9 was an obsolete stainless-steel screened well constructed in a 6-in. diameter borehole with a reported total depth of 10.0 ft. The 2 3/8-in. OD well casing and screen were pulled out of the ground along with a 2.0-ft section of 6 5/8-in. OD steel conductor casing. A 7 7/8-in. OD hollow-stem auger was used to ream the wellbore to fresh material to a depth of 11.0 ft BGS. The reamed wellbore was plugged from 11.0 ft to 0.7 ft BGS by pouring 4, 50-lb sacks of 3/8-in. bentonite aggregate into the borehole. The remaining 0.7 ft of hole was backfilled with native clay soil.

AN:D-10. Well AN:D-10 was an obsolete stainless-steel screened well constructed in a 6-in. diameter borehole with a reported total depth of 9.3 ft. The 2 3/8-in. OD well casing and screen were pulled out of the ground along with a 4.3-ft section of 9-in. OD steel conductor casing. A 7 7/8-in. OD hollow-stem auger was used to ream the wellbore to fresh material to a depth of 10.4 ft BGS (auger refusal). The reamed wellbore was plugged from 10.2 ft to 1.0 ft BGS by pouring 3 1/2, 50-lb sacks of 3/8-in. bentonite aggregate into the borehole. The remaining 1.0 ft of hole was backfilled with native clay soil.

AN:D-11. Well AN:D-11 was an obsolete stainless-steel screened well constructed in a 6-in. diameter borehole with a reported total depth of 8.4 ft. The 2 3/8-in. OD well casing and screen were pulled out of the ground along with a 2.0-ft section of 9-in. OD conductor casing. A 7 7/8-in. OD hollow-stem auger was used to ream the wellbore to fresh material to depth of 9.4 ft BGS. The reamed wellbore was plugged from 8.5 ft to 1.0 ft BGS by pouring 3, 50-lb sacks of

3/8-in. bentonite aggregate into the borehole. The remaining 1.0 ft of hole was backfilled with native clay soil.

AN:D-unknown. Well AN:D-unknown was an obsolete stainless-steel screened well constructed in a borehole of unknown diameter and depth. A total of 12.0 ft of the 2 3/8-in. OD casing was pulled out of the ground along with a 10.0 ft section of 6 5/8-in. OD steel conductor casing. During well extraction, the casing broke, leaving an unknown length of casing and all (but an unknown amount) of the screen in the wellbore. The wellbore (with the unretrievable well components in place) was plugged from an unknown depth to 1.0 ft BGS. The remaining 1.0 ft of hole was backfilled with native clay soil.

AN:D-unknown 2. Well AN:D-unknown 2 was an obsolete stainless-steel screened well constructed in a borehole with an apparent diameter of 8 in., but of unknown depth. The 2 3/8-in. OD well casing and screen were pulled out of the ground along with a 2.5-ft section of 7 3/4-in. OD steel surface casing. The (unreamed) wellbore was plugged from 8.8 ft to 0.5 ft BGS by pouring 2, 50-lb sacks of 3/8-in. bentonite pellets into the borehole. The remaining 0.5 ft of hole was left unfilled because the top 1.5 ft of the area was to be excavated as part of a remediation effort.

GW-661. Well GW-661 was an obsolete stainless-steel screened well constructed in an 8 3/4-in. diameter borehole with a reported total depth of 7.8 ft. The 2 3/8-in. OD well casing and screen were pulled out of the ground along with a 5.0-ft section of 10 3/4-in. OD steel conductor casing. The (unreamed) wellbore was plugged from 7.8 ft to 1.0 ft BGS by pouring 2, 50-lb sacks of 3/8-in. bentonite aggregate into the borehole. The remaining 1.0 ft of hole was backfilled with native clay soil.

GW-662. Well GW-662 was an obsolete stainless-steel screened well completed in a 6-1/4 in. diameter borehole with a reported total depth of 17.5 ft. The 2 3/8-in. OD well casing, the 6 5/8-in. OD steel protective casing, and the 10 3/4-in. OD steel conductor casing were all cut off 0.8 ft BGS. The well casing and screen were plugged from 15.0 ft to 0.8 ft BGS by pouring 2, 50-lb sacks of 3/8-in. bentonite aggregate into the well. The 0.8-ft deep excavation over the well location was capped with native clay soil.

GW-663. Well GW-663 was an obsolete stainless-steel screened well constructed in an 8 3/4-in. diameter borehole with a reported total depth of 4.0 ft. The 2 3/8-in. OD well casing and screen were pulled out of the ground. The (unreamed) wellbore was plugged from 4.0 ft to 1.0 ft BGS by pouring 1/2, 50-lb sack of 3/8-in. bentonite aggregate into the borehole. The remaining 1.0 ft hole was backfilled with native clay soil.

GW-664. Well GW-664 was an obsolete stainless-steel screened well constructed in an 8 3/4-in. diameter borehole with a reported total depth of 5.9 ft. The 2 3/8-in. well casing and screen were pulled out of the ground. The (unreamed) wellbore was plugged from 5.9 ft to 1.0 ft BGS by pouring 2, 50-lb sacks of 3/8-in. bentonite aggregate into the borehole. The remaining 1.0 ft of hole was backfilled with native clay soil.

GW-665. Well GW-665 was an obsolete stainless-steel screened well constructed in a 6 1/4-in. diameter borehole with a reported total depth of 30.7 ft. The 2 3/8-in. OD well casing was cut off at 1.0 ft BGS. The well casing and screen were plugged from 29.7 ft to 1.0 ft BGS with 3/8-in. bentonite aggregate. The 1.0 ft deep excavation over the well location was capped with native clay soil.

GW-666. Well GW-666 was an obsolete stainless-steel screened well constructed in an 8 3/4-in. diameter borehole with a reported total depth of 7.9 ft. The 2 3/8-in. OD well casing and screen were pulled out of the ground. The (unreamed) wellbore was plugged from 2.0 ft to 0.7 ft BGS by pouring 1, 50-lb sack of 3/8-in. bentonite aggregate into the borehole. The remaining 0.7 ft of hole was backfilled with native clay soil.

GW-667. Well GW-667 was an obsolete stainless-steel screened well constructed in an 8 3/4-in. diameter borehole with a reported total depth of 8.0 ft. The 2 3/8-in. OD well casing and screen were pulled out of the ground. A 9-in. diameter solid-stem auger was used to ream the wellbore to fresh material to a depth of 8.3 ft BGS (auger refusal). The reamed wellbore was

plugged from 6.8 ft to 1.0 ft BGS by pouring 3, 50-lb sacks of 3/8-in. bentonite aggregate into the borehole. The remaining 1.0 ft of hole was backfilled with native clay soil.

GW-668. Well GW-668 was an obsolete stainless-steel screened well constructed in a 10 5/8-in. diameter borehole with a reported total depth of 23.1 ft. The 4 1/2-in. OD well casing and screen were over washed using 6 1/2-in. OD, 4 3/4-in. inside diameter (ID) steel washover pipe, and removed from the wellbore. The 11-in. OD cast iron surface casing was over washed using 13 1/2-in. OD, 12-in. ID steel washover pipe and removed from the borehole. A 12 1/2-in. diameter tri-cone roller bit was used to ream the completion interval of the well to fresh material to a depth of 24.8 ft BGS. The reamed wellbore was plugged from 24.3 ft to 1.0 ft BGS by pouring 27, 50-lb sacks of 3/8-in. bentonite aggregate into the borehole. The remaining 1.0 ft of hole was backfilled with native clay soil.

5. WELL REDEVELOPMENT

Well redevelopment is requested when Energy Systems' well maintenance and inspection program has identified wells with discrepancies between measured depths and reported depths. Well redevelopment is performed in an attempt to remove silt/sediment accumulations, which may be the source of the measurement difference. Prior to redevelopment, a water level is measured in each well and a casing volume is calculated. An excess of one well volume, depending on recharge rates, is removed from each well for several consecutive days. Nonspecific indicator parameters (specific conductance, pH, and temperature) are measured and turbidity levels are monitored daily during redevelopment.

Three monitoring wells at the Y-12 Plant underwent redevelopment during FY 1997 (Table 5.1). Development of these wells was by either the swab method or by bailing. A minimum total of three well volumes were removed from each well. A summary of development information for the wells redeveloped during FY 1997 is included in Table 5.2. Appendix F contains well development data and Redevelopment Activity/Progress reports.

Waste management guidelines for the well installation (and development) program were supplied by Energy Systems (Appendix C). Water produced during well redevelopment was discharged to the ground surface provided that field screening criteria for radioactivity, pH, specific conductance, and volatile organics were not exceeded. In the event that development water exceeded acceptable disposal limits, ECO personnel directed subcontractor personnel in the proper disposal procedures. At no time did the development water obtained from any of the wells redeveloped in FY 1997 exceed acceptable disposal limits.

Table 5.1. FY 1997 rehabilitated wells and functional areas

Well	Functional area	Northing coordinate	Easting coordinate
GW-142	Kerr Hollow Quarry	24524.00	64030.00
GW-156	Sediment Disposal Basin	27626.00	64020.00
GW-159	Sediment Disposal Basin	27764.00	63496.00

Table 5.2 FY 1997 well redevelopment summary

Well	Water level (ft BGS)	TD ^a (ft BGS)	Well volume (gal)	Development water		Development method	Aquifer
				(gal)	(well volumes)		
GW-142	133.0	295.0	278.4	927.0	3.3	Swab	B
GW-156	141.0	157.0	9.5	65.0	6.8	Bailer	B
GW-159	114.8	157.0	25.3	127.0	5.0	Swab	B

^aDepth to bottom of open interval or screen

6. QUALITY ASSURANCE

All monitoring wells decommissioned in FY 1997 (as well as those that underwent rehabilitation/redevelopment) were done so following procedures and technical guidelines in Environmental Surveillance Procedure ESP-600, *Well Installation, Development, and Abandonment* (Energy Systems 1988), the *RCRA Technical Enforcement Guidance Document* (EPA 1986), and *Guidelines for Installation of Monitor Wells at the Y-12 Plant* (Geraghty & Miller 1985). Details of well plugging and abandonment and redevelopment were recorded by SAIC oversight geologists in bound field books, and the information was compiled into progress reports (P&A reports in Appendix A, redevelopment reports in Appendix F). Any deviations from standard well installation guidelines, such as the use of bentonite Hole Plug™ for the borehole plug, were pre-approved by the Energy Systems GWPP Manager or designee and were recorded in the activity report.

All drilling equipment and/or development equipment was decontaminated or certified as precleaned before use at each well and as needed during well P&A. Inspection of all materials (if used) and equipment before use at each well site was conducted by the oversight geologist. Equipment was periodically checked during drilling activities to ensure sound mechanical operation and to avoid detrimental impact to groundwater from equipment failure. A nonpetroleum (beeswax)-based lubricant (Well-Guard™) was used for all drilling activities.

At times when cuttings were circulated and available for collection, these were sampled continuously over 10.0 to 20.0-ft intervals. All samples were screened and inspected for comparison with expected well and boring materials.

All well P&A and redevelopment reports underwent internal technical and editorial reviews prior to being issued to Energy Systems.

7. HEALTH AND SAFETY

A Health and Safety Plan (SAIC 1992) was followed for all FY 1997 P&A activities. All on-site personnel were in compliance with training requirements mandated by 29 CFR 1910.120, and all were enrolled in an annual health screening and occupational medical examination program. On-site personnel attended a site-specific health and safety briefing before starting drilling activities to discuss potentially hazardous materials, potentially dangerous activities and situations, protective equipment, and decontamination procedures. Low potential for exposure to hazardous materials at all work sites allowed use of Level D personal protection. This protective level consisted of not less than steel-toed footwear, gloves, hard hats, hearing protection in the form of plugs or muffs, and safety glasses.

Technical oversight personnel provided health and safety monitoring at the work sites using monitoring equipment supplied and maintained by Energy Systems. Instrumentation used on site typically consisted of an HNu Model HW-101 photoionization detector (PID), a Foxboro Century™ organic vapor analyzer (OVA) Model 108 or Model 128 flame ionization detector (FID), and Ludlum radiation meters. The HNu PID and OVA FID were used to detect ionizable organic vapors. Radiation detection instruments included a Ludlum Model 3 Survey Meter for detection of beta and gamma radiation with a Geiger-Mueller "pancake" type probe. Alpha radiation was monitored using a Ludlum Model 12 Count Ratemeter with a scintillation tube probe or an air probe. Oversight personnel were required to have been Red Cross-certified in first aid and CPR techniques and to maintain that certification throughout the task.

In addition to screening for health and safety, drilling returns and development water were screened per Energy Systems guidelines in a general waste management plan for drilling activities (Appendix C). This daily screening consisted of alpha, beta, and gamma radiation screening of composited drill cuttings and selected grab samples of development water. A headspace analysis of organic vapors and a pH measurement were also performed on the composited cuttings samples and development water samples (specific conductance was measured on development water only). Because grout cuttings often were a significant component of drilling returns during over washing and borehole reaming, pH levels sometimes exceeded the upper bounds of waste screening criteria. If grout cuttings were present, as identified visually, and no screening parameters other than pH exceeded guideline criteria, then no containment actions were taken. Screening results are contained in Appendix D.

Health and safety plan action levels (SAIC 1992) and waste management guideline values used during P&A activities are presented in Table 7.1.

Table 7.1. Action levels used for well plugging and abandonment

Parameter	Action level
Waste Management Guidelines:	
pH	<4.0 and >10.5 standard units
Organic vapors	>5 ppm
Alpha radiation	>500 counts per minute
Beta/gamma radiation	>100 counts per minute
Health and Safety Plan:	
pH	Below 5 or above 9
Explosivity	>25% Lower Explosive Limit
Organic vapors	>10 ppm in breathing zone
Radiation	>2 millirem/hr, and/or an 8-hr time-weighted average of 0.25 millirem/hr at chest level

8. REFERENCES

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APPENDIX A
ACTIVITY/PROGRESS REPORTS

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>AN:D-1</u>
WELL PLUGGING AND ABANDONMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 1
LOCATION: <u>East Fork Poplar Creek</u>		DATE: START: <u>12-26-96</u>	
OPERATOR: <u>J. Gallaher - Highland Drilling Co.</u>		FINISH: <u>12-26-96</u>	
HELPERS: <u>S. Gilbert/J. Gallaher - Highland</u>		METHOD: <u>A</u>	
DRILL: <u>N/A</u>		LOGGED BY: <u>Victor R. Harness - SAIC</u>	

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-26-96	0835	0852	Arrive at AN:D-1 site. The well consists of 6 5/8-in. outside diameter (OD) protective casing around the well casing. Casing is locked (no key available). Casing stick-up = 1.9 ft. Wrap a chain around the casing stick-up and, using the backhoe, pull out the entire well assembly. Extract 2.5 ft of 9-in. OD steel conductor casing; at least 2.0 ft of 6 5/8-in. OD protective casing (one end still encased in cement); 3.5 ft of 2 3/8-in. OD stainless steel screen (with drive point, included in length); and 3.2 ft of 2 3/8-in. OD stainless steel casing.
	0852	0911	Survey the wellbore: mercury vapors = 0.0 mg/m ³ . Extracted casings/screen surveyed (uncontaminated) by J. May (MK-F HP Technician). Slowly pour 2, 50-lb sacks of 3/8-in. bentonite aggregate into the wellbore. Unhydrated bentonite level is at approximately 1 ft below ground surface. Cap remaining wellbore with clay soil. Depart the site.
			P&A of well AN:D-1 is complete.
			Note: No intrusive work was performed on this well, hence no Cuttings Field Screening/Disposal Sheet or Equipment Decontamination Inspection Summary are included in this report.

[illegible]

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>AN: D-7</u>
WELL PLUGGING AND ABANDONMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 2
LOCATION: <u>East Fork Poplar Creek</u>		DATE: START: <u>12-16-96</u>	
OPERATOR: <u>J. Gallaher - Highland Drilling Co.</u>		FINISH: <u>12-16-96</u>	
HELPERS: <u>H. Hal/J. Monger - Highland Drilling Co.</u>		METHOD: <u>A</u>	
DRILL: <u>Ford 555B Backhoe with McMillen Diggerhead auger motor</u>		LOGGED BY: <u>Timothy Coffey - SAIC</u>	

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-16-96	1510	1538	Arrive at AN: D-7 site. Position backhoe to decommission the well. Erect flagging around the work site. Work at this location will be performed under radiation work permit #Y-RWP-30295-2.
			Remove bucket from backhoe boom, replace with auger motor.
			Well AN: D-7 consists of 6 5/8-in. outside diameter (OD), locked protective casing (no key available) around the well casing; casing stick-up = 1.9 ft. Background radiological survey of the location: alpha = 0 cpm, beta/gamma = 50 cpm.
	1538	1543	Wrap a lifting strap around the casing stick-up and attempt to pull out the well: easily pull out the entire well assembly. Extract: 1.9 ft of 9-in. OD steel conductor casing, at least 2.7 ft of 6 5/8-in. OD steel protective casing (one end of the casing still encased in cement), 3.5 ft of 2 3/8-in. OD stainless steel screen (with drive point, included in length), and an estimated 6.4 ft of 2 3/8-in. OD stainless steel casing. Extracted casings/screen surveyed (uncontaminated) by J. May (MK-F HP Technician). Survey the wellbore collar: organic vapors = 2.5 ppm (dissipating rapidly, 0.0 ppm in breathing zone); mercury vapors = 0.0 mg/m³.
	1543	1545	Rig up with a 9-in. diameter, solid-stem auger; length of lead flyte = 5.4 ft (subsequent flyte is 5.0 ft in length).

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>AN: D-7</u>
WELL PLUGGING AND ABANDONMENT ACTIVITY/PROGRESS REPORT - continued			PAGE 2 of 2
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-16-96	1545	1550	Commence reaming the wellbore using the augers. Ream from
(cont.)			0.0 ft to 9.0 ft below ground surface (BGS). No cuttings 0.0 ft to
			2.0 ft BGS. Breathing zone analysis (BZA) (mercury) 2.0 ft to 3.0 ft
			BGS = 0.0 mg/m ³ . BZA (organics) 3.0 ft to 5.0 ft BGS (continuous
			monitoring) = 0.0 ppm. Cuttings from 2.0 ft to 5.0 ft BGS are dark
			yellowish-brown (10YR 4/2), moist silty topsoil. BZA (organics)
			5.0 ft to 9.0 ft BGS (continuously) = 0.0 ppm. Cuttings from 5.0 ft
			to 9.0 ft BGS consist of dark yellowish-orange (10YR 6/6) to
			moderate yellowish-brown (10YR 5/4) wet sandy clay (sand is
			probably from the filter pack).
	1550	1553	At 9.0 ft BGS. Spin the augers to clean the borehole. Trip augers
			out of the borehole. The augers came apart leaving the lead flyte
			in the hole.
	1553	1608	Fishing for the lead auger flyte.
	1608	1610	Remove lead auger flyte from the borehole. Tag bottom at 8.4 ft
			BGS (0.6 ft of collapse).
	1610	1614	Slowly pour 3, 50-lb sacks of 3/8-in. bentonite aggregate into the
			borehole. Unhydrated bentonite level is at 0.8 ft BGS.
	1614	1626	Cap the remaining borehole with clay soil/cuttings. Breakdown
			the site. J. May surveys the augers and other equipment
			(uncontaminated).
			P&A of well AN:D-7 is complete.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>AN: D-8</u>
WELL PLUGGING AND ABANDONMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 2
LOCATION: <u>East Fork Poplar Creek</u>		DATE: START: <u>12-16-96</u>	
OPERATOR: <u>J. Gallaher - Highland Drilling Co.</u>		FINISH: <u>12-16-96</u>	
HELPERS: <u>H. Hall - Highland Drilling Co.</u>		METHOD: <u>A</u>	
DRILL: <u>Ford 555B Backhoe with McMillen Diggerhead auger motor</u>		LOGGED BY: <u>Timothy Coffey - SAIC</u>	

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-16-96	1626	1637	Arrive at AN: D-8 site. Position the backhoe to decommission the well. Erect flagging around the work site. This site to be a HAZWOPER site. Work at this location will be performed under radiation work permit #Y-RWP-30295-1. Well AN: D-8 consists of 6 5/8-in. outside diameter (OD), locked protective casing (no key available) around the well casing; casing stick-up = 2.5 ft. Background radiological survey of the location: alpha = 0 cpm, beta/gamma = 60 cpm. Don personal protective equipment (PPE).
	1637	1641	Wrap a chain around the casing stick-up, and attempt to pull out the well: entire well assembly comes out of the ground with only minor difficulties. Extract: 3.5 ft of 9-in. OD steel conductor casing, 2.6 ft of 6 5/8-in. OD steel protective casing, 4.7 ft of 2 3/8-in. OD stainless steel screen (with drive point included in length), and an estimated 6.5 ft of 2 3/8-in. OD stainless steel casing. Extracted casings/screen surveyed (uncontaminated) by J. May (MK-F HP Technician). Survey of the wellbore collar: organic vapors = <1 ppm (dissipating, 0.0 ppm in the breathing zone); mercury vapors = 0.0 mg/m ³ .
	1641	1643	Rig up with a 9-in. diameter, solid-stem auger; length of lead flyte is 5.4 ft (subsequent flyte is 5.0 ft in length).

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. AN: D-8

**WELL PLUGGING AND ABANDONMENT
ACTIVITY/PROGRESS REPORT - continued**

PAGE 2 of 2

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Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>AN: D-9</u>
WELL PLUGGING AND ABANDONMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 2
LOCATION: <u>East Fork Poplar Creek</u>		DATE: START: <u>12-13-96</u>	
OPERATOR: <u>J. Gallaher - Highland Drilling Co.</u>		FINISH: <u>12-13-96</u>	
HELPERS: <u>H. Hall/J. Monger - Highland Drilling Co.</u>		METHOD: <u>A</u>	
DRILL: <u>Ford 555B Backhoe with McMillen Diggerhead auger motor</u>		LOGGED BY: <u>Timothy Coffey - SAIC</u>	
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-13-96	0840	0853	Arrive at AN:D-9 site on the south side of EFPC. The backhoe and drilling equipment are on site. Work site boundary has been flagged. Work at this location will be performed under radiation work permit #Y-RWP-30295-2. Start backhoe and let warm up. The well consists of 6 5/8-in. outside diameter (OD), locked protective casing (no key available) around the well casing; casing stick-up = 2.0 ft. Background radiological survey of the location: alpha = 0 cpm, beta/gamma = 60 cpm.
	0853	0902	Wrap a lifting strap around the casing stick-up, and attempt to pull out the well: easily pull out the entire well assembly. Extract: 1.9 ft of 9-in. OD steel surface assembly casing, at least 2.0 ft of 6 5/8-in. OD steel protective casing (one end of casing still encased in cement), 3.8 ft of 2 3/8-in. OD stainless steel screen (with drive point, included in length), and an estimated 4.8 ft of 2 3/8-in. OD stainless steel casing. Extracted casings/screen are surveyed (uncontaminated) by J. May (MK-F HP Technician). Survey the borehole collar: organic vapors = 8 ppm (dissipating rapidly, 0.0 ppm in breathing zone); mercury vapors = meter needs regenerating, no measurement obtained.
	0902	0946	Crew removes backhoe bucket and replaces with the auger motor.
	0946	0949	Rig up with a 7 7/8-in. diameter hollow-stem auger; length of lead flyte = 5.4 ft (subsequent flyte is 5.0 ft in length).

WELL NO. AN: D-9

PAGE 2 of 2

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Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>AN: D-10</u>
WELL PLUGGING AND ABANDONMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 2
LOCATION: <u>East Fork Poplar Creek</u>		DATE: START: <u>12-13-96</u>	
OPERATOR: <u>J. Gallaher - Highland Drilling Co.</u>		FINISH: <u>12-13-96</u>	
HELPERS: <u>H. Hall/J. Monger - Highland Drilling Co.</u>		METHOD: <u>A</u>	
DRILL: <u>Ford 555B Backhoe with McMillen Diggerhead auger motor</u>		LOGGED BY: <u>Timothy Coffey - SAIC</u>	

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-13-96	1046	1100	Arrive at AN:D-10 site. Position backhoe to decommission the well. Erect flagging around the work site. Work at this location will be performed under radiation work permit #Y-RWP-30295-2. Well AN:D-10 consists of 6 5/8-in. outside diameter (OD), locked protective casing (no key available) around the well casing; casing stick-up = 2.3 ft. Background radiological survey of the location: alpha = 0 cpm, beta/gamma = 60 cpm.
	1100	1107	Remove the bucket from the backhoe boom and replace auger motor.
	1107	1118	Wrap a lifting strap around the casing stick-up and attempt to pull out the well: easily pull the entire well assembly out of the ground. Extract: 2.0 ft of 9-in. OD steel conductor casing, at least 2.3 ft of 6 5/8-in OD steel protective casing (one end of the casing still encased in cement), 3.6 ft of 2 3/8-in. OD stainless steel screen (with drive point, included in length), and an estimated 7.3 ft of 2 3/8-in. OD stainless steel casing. Extracted casings/screen are surveyed (uncontaminated) by J. May (MK-F HP Technician). Survey the wellbore collar: organic vapors = 6 ppm (dissipating rapidly, 0.0 ppm in breathing zone); mercury vapors = 0.0 mg/m³.
	1118	1124	Rig up with a 7 7/8-in. diameter, hollow-stem auger; length of lead flyte = 5.4 ft (subsequent flyte is 5.0 ft in length).

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>AN: D-10</u>
WELL PLUGGING AND ABANDONMENT ACTIVITY/PROGRESS REPORT - continued			
			PAGE 2 of 2
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-13-96	1124	1137	Commence reaming the wellbore using the augers. Ream from
(cont.)			0.0 ft to 10.4 ft below ground surface (BGS). Breathing zone
			analysis (BZA) (mercury) = 0.0 mg/m ³ . BZA (organics) at 5.0 ft
			BGS = 0.0 ppm. No cuttings from 0.0 ft to 5.0 ft BGS. BZA
			(organics) 6.0 ft to 10.0 ft BGS (continuous monitoring) = 0.0 ppm.
			Cuttings from 5.0 ft to 10.4 ft BGS are pale brown (5YR 5/2) to dark
			yellowish-brown (10YR 4/2), wet sandy, silty clay (sand is probably
			from the filter pack).
	1137	1140	Refusal at 10.4 ft BGS. Spin the augers to clean the borehole.
			Trip augers out of the borehold. Tag bottom at 10.2 ft BGS (0.2 ft
			of collapse).
	1140	1148	Slowly pour 3 1/2, 50-lb sacks of 3/8-in. bentonite aggregate into
			the borehole. Unhydrated bentonite level is at 1.0 ft BGS.
	1148	1155	Clean off the augers. Augers and other equipment surveyed
			(uncontaminated) by J. May.
	1155	1205	Remove auger motor from backhoe boom, attach bucket.
			Personnel screen hands and feet as they depart the work site.
	1205	1310	Break for lunch.
	1310	1318	Return to AN:D-10 site. Break down the site. Load augers and
			miscellaneous equipment into the backhoe bucket. Move to next
			well.
	1515	1520	Return to AN:D-10 Site. Cap remaining borehole with clay soil/
			cuttings.
			P&A of well AN:D-10 is complete.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>AN: D-11</u>
WELL PLUGGING AND ABANDONMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 2
LOCATION: <u>East Fork Poplar Creek</u>		DATE: START: <u>12-13-96</u>	
OPERATOR: <u>J. Gallaher - Highland Drilling Co.</u>		FINISH: <u>12-13-96</u>	
HELPERS: <u>H. Hall/J. Monger - Highland Drilling Co.</u>		METHOD: <u>A</u>	
DRILL: <u>Ford 555B Backhoe with McMillen Diggerhead auger motor</u>		LOGGED BY: <u>Timothy Coffey - SAIC</u>	

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-13-96	1400	1415	Arrive at AN:D-11 site. Position backhoe to decommission the well. Erect flagging around the work site. This site is to be a HAZWOPER site. Work at this location will be performed under radiation work permit #Y-RWP-30295-1. Well AN:D-11 consists of 6 5/8-in. outside diameter (OD), locked protective casing (no key available) around the well casing; casing stick-up = 2.5 ft. Background radiological survey of location: alpha = 0 cpm, beta/gamma = 60 cpm. Don personal protection equipment (PPE).
	1415	1421	Wrap a chain around the casing stick-up and attempt to pull out the well: easily pull the entire well assembly out of the ground. Extract 2.1 ft of 9-in. OD steel conductor casing, at least 2.5 ft of 6 5/8-in. OD steel protective casing (one end of the casing still encased in cement), 2.5 ft of 2 3/8-in. OD stainless steel screen (with drive point, included in length), and an estimated 8.6 ft of 2 3/8-in. OD stainless steel casing. Extracted casings/screen are surveyed (uncontaminated) by J. May (MK-F HP Technician). Survey the wellbore collar: organic vapors = 0.0 ppm; mercury vapors = 0.0 mg/m ³ .
	1421	1427	Remove the bucket from the backhoe boom, replace the auger motor.
	1427	1431	Rig up with a 7 7/8-in. diameter, hollow-stem auger; length of lead flyte = 5.4 ft (subsequent flyte is 5.0 ft in length).

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>AN:D-unknown</u>
WELL PLUGGING AND ABANDONMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 1
LOCATION: <u>East Fork Poplar Creek</u>		DATE: START: <u>12-26-96</u>	
SUPERVISOR: <u>S. Gilbert - Highland Drilling Co.</u>		FINISH: <u>12-26-96</u>	
HELPERS: <u>J. Gallaher/J. Gallaher - Highland</u>		METHOD: <u>A</u>	
DRILL: <u>N/A</u>		LOGGED BY: <u>Victor R. Harness - SAIC</u>	

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-26-96	1511	1559	Arrive at unlabeled well behind the car wash on Illinois Avenue.
			Well is similar in construction to the other AN:D-series wells
			decommissioned on this project. This well will be referred to as
			AN:D-unknown. Wrap a chain around the casing stick-up and,
			using the winch truck, pull out the well assembly. Extract 10.0 ft of
			6 5/8-in. outside diameter (OD) steel casing, and 12.0 ft of 2 3/8-in.
			OD stainless steel well casing. Casing broke; approximately 3 ft
			of well casing and all of the screen (unknown length) left in
			wellbore. Extracted casings surveyed (uncontaminated) by J. May
			(MK-F HP Technician). Survey wellbore collar: mercury vapors =
			0.003 mg/m³. Slowly pour 2, 50-lb sacks of 3/8-in. bentonite
			aggregate into the wellbore. Unhydrated bentonite level is at
			about 1 ft below ground surface. Cap remaining wellbore with clay
			soil. Depart site.
			P&A of well AN:D-unknown is complete.
			Note: No intrusive work was performed on this well, hence no
			Cuttings Field Screening/Disposal Sheet or Equipment
			Decontamination Inspection Summary are included in this report.

[illegible]

[illegible]

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-662</u>
WELL PLUGGING AND ABANDONMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 2
LOCATION: <u>East Fork Poplar Creek</u>		DATE: START: <u>12-26-96</u>	
OPERATOR: <u>J. Gallaher - Highland Drilling Co.</u>		FINISH: <u>12-26-96</u>	
HELPERS: <u>S. Gilbert/J. Gallaher - Highland Drilling Co.</u>		METHOD: <u>A</u>	
DRILL: <u>N/A</u>		LOGGED BY: <u>Victor R. Harness - SAIC</u>	

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-26-96	0852	0911	Arrive at GW-662 site. The well consists of 6 5/8-in. outside diameter (OD) protective casing; stick-up = 4.3 ft. Remove the protective posts from around the well. Break up the concrete pad, and remove the fragments.
	0911	0927	Using the backhoe, excavate around the wellhead. Excavation is approximately 4 ft in diameter and to 3.5 ft below ground surface (BGS). Monitoring mercury vapors in excavation: all readings = 0.0 mg/m ³ .
	0927	0949	Use portable band saw to cut the 10 3/4-in. OD conductor casing at 2.5 ft BGS.
	0949	1040	Use gas-powered circular saw (pavement saw) to cut conductor casing longitudinally, and remove. Cut off and remove 5.5 ft of 6 5/8-in. OD steel protective casing. Cut off and remove 5.0 ft of 2 3/8-in. OD stainless steel well casing (includes stick-up). All extracted casings surveyed (uncontaminated) by J. May (MK-F HP Technician).
	1040	1100	Slowly pour about 2, 50-lb sacks of 3/8-in. bentonite aggregate into the remaining well casing and screen to the top (0.8 ft BGS). Backfill the excavation around the wellhead.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-662

**WELL PLUGGING AND ABANDONMENT
ACTIVITY/PROGRESS REPORT - continued**

PAGE 2 of 2

[illegible]

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-665</u>
WELL PLUGGING AND ABANDONMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 2
LOCATION: <u>East Fork Poplar Creek</u>		DATE: START: <u>12-23-96</u>	
OPERATOR: <u>J. Gallaher - Highland Drilling Co.</u>		FINISH: <u>12-23-96</u>	
HELPERS: <u>H. Hall/J. Gallaher - Highland Drilling Co.</u>		METHOD: <u>A</u>	
DRILL: <u>N/A</u>		LOGGED BY: <u>Mike Crenshaw - SAIC</u>	

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-23-96	1040	1110	Arrive at GW-665 site. Begin excavating around the wellhead using the backhoe. Excavation is approximately 4 ft in diameter, and extends to about 3 ft below ground surface (BGS). Monitor mercury vapors in the excavation: all readings = 0.0 mg/m ³ .
	1110	1130	Use portable band saw to cut the surface casing at approximately 2.0 ft BGS.
	1130	1240	Break for lunch.
	1240	1330	Use gas-powered circular saw (pavement saw) to cut the surface casing longitudinally, and remove.
	1330	1350	Use the portable bandsaw to cut off the protective casing (at approximately 1.5 ft BGS) and remove.
	1350	1359	Use the bandsaw to cut off the well casing at approximately 1 ft BGS. Remove well casing.
	1359	1409	Slowly pour 3/8-in. bentonite aggregate into the remaining well casing, filling it to the top (about 1 ft BGS).

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-666</u>
WELL PLUGGING AND ABANDONMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 2
LOCATION: <u>East Fork Poplar Creek</u>		DATE: START: <u>12-20-96</u>	
OPERATOR: <u>J. Gallaher - Highland Drilling Co.</u>		FINISH: <u>12-20-96</u>	
HELPERS: <u>H. Hall/J. Monger - Highland Drilling Co.</u>		METHOD: <u>A</u>	
DRILL: <u>Ford 555 B Backhoe</u>		LOGGED BY: <u>Timothy Coffey - SAIC</u>	

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-20-96	1508	1513	Arrive at GW-666 site. Crew is on site, backhoe is positioned to pull the well out of the ground. The protective posts have already been removed. Uncap the well, organic vapors in the casing headspace = 0.3 ppm (0.0 ppm in breathing zone); mercury vapors in casing headspace = 0.0 mg/m ³ . Measure the water level at 2.5 ft below ground surface (BGS). Tag bottom of the well (solid) at 7.5 ft BGS. Note: The subsurface data base (Y/TS-881/R3) reports the depth of GW-666 to be 7.4 ft.
	1513	1522	Wrap a chain around the casing stick-up and attempt to pull the well out: easily pull out the entire well assembly. Borehole collapses to 2.0 ft BGS. Extract 4.4 ft of 6 5/8-in. outside diameter (OD) steel protective casing, 2.7 ft of 2 3/8-in. OD stainless steel screen, and 8.3 ft of 2 3/8-in. OD stainless steel casing. Extracted screen/casings surveyed (uncontaminated) by J. May (MR-F HP Technician). Survey the borehole collar: organic vapors = 1.0 ppm, mercury vapors = 0.0 mg/m ³ .
	1522	1535	Waiting for bentonite plug material.
	1535	1539	Pour 1, 50-lb sack of 3/8-in. bentonite aggregate into the borehole. Unhydrated bentonite level is at 0.7 ft BGS.
	1539	1544	Cap the remaining borehole with clay soil. Gather up equipment. Depart site.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-666

**WELL PLUGGING AND ABANDONMENT
ACTIVITY/PROGRESS REPORT - continued**

PAGE 2 of 2

[illegible]

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-667</u>
WELL PLUGGING AND ABANDONMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 3
LOCATION: <u>East Fork Poplar Creek</u>		DATE: START: <u>12-16-96</u>	
OPERATOR: <u>J. Gallaher - Highland Drilling Co.</u>		FINISH: <u>12-16-96</u>	
HELPERS: <u>H. Hall/J. Monger - Highland Drilling Co.</u>		METHOD: <u>A</u>	
DRILL: <u>Ford 555 B Backhoe with McMillen Diggerhead auger motor.</u>		LOGGED BY: <u>Timothy Coffey - SAIC</u>	

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-16-96	1004	1015	Arrive at GW-667 site. Position backhoe to decommission the well. Erect flagging around the work site. Work at this location will be performed under radiation work permit #Y-RWP-30295-2. Well GW-667 consists of 6 5/8-in outside diameter (OD) protective casing (with a casing stick-up of 3.1 ft) surrounding a 2 3/8-in OD stainless steel well. Background radiological survey of location: alpha = 0 cpm, beta/gamma = 60 cpm.
	1015	1035	Part of crew departs to get larger diameter augers. Uncap well, survey vapors in casing headspace: organics = 0.0 ppm, mercury = 0.0 mg/m ³ . Measure water level at 2.7 ft below ground surface (BGS). Tag the bottom of the well (solid) at 7.6 ft BGS. Note: The subsurface data base (Y/TS-881/R3) reports the depth of GW-667 to be 7.8 ft.
	1035	1050	Use the backhoe bucket to try and break up the concrete pad: unsuccessful. Wrap a chain around the casing stick-up, and easily pull out the entire well assembly (including the pad). The wellbore collapsed as the well was withdrawn from the wellbore. Extract: 4.0 ft of 6 5/8-in. OD steel protective casing, 2.0 ft of 2 3/8-in. OD stainless steel screen, and 8.7 ft of 2 3/8-in. OD stainless steel casing. Extracted casings/screen are surveyed (uncontaminated) by J. May (MK-F HP Technician).

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-667</u>
WELL PLUGGING AND ABANDONMENT ACTIVITY/PROGRESS REPORT - continued			PAGE 2 of 3
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-16-96	1050	1129	Remove bucket from backhoe boom, replace with auger motor.
(cont.)			Crew returns with clean, larger augers, but still lack a hydraulic fitting for the auger motor.
	1129	1215	Break for lunch; depart to get hydraulic fitting.
	1215	1225	Replace the hydraulic fitting.
	1225	1228	Rig up with a 9-in. diameter, solid-stem auger; length of lead flyte is 5.4 ft (subsequent flytes are 5.0 ft in length).
	1228	1235	Commence reaming the wellbore using the augers. Ream from 0.0 ft to 8.3 ft BGS. Breathing zone analysis (BZA) (mercury) 0.5 ft to 2.0 ft BGS = 0.0 mg/m ³ . BZA (organics) 2.5 ft to 5.0 ft BGS (continuous monitoring) = 0.0 ppm. Cuttings from 0.0 ft to 5.0 ft BGS consist primarily of dusky yellowish-brown (10YR 2/2), moist, silty clay soil. The black (N1) soil horizon, which often contains the mercury contamination on the East Fork Poplar Creek floodplain, is visible in the upper 2 ft of the interval. Cuttings from 5.0 ft to 8.3 ft BGS consist of pale brown (5YR 5/2) to dark yellowish-brown (10YR 4/2), wet, clayey soil.
	1235	1238	Auger refusal at 8.3 ft BGS. Spin augers to clean the borehole. Trip out augers. Tag bottom at 6.8 ft BGS (1.5 ft of collapse).
	1238	1244	Slowly pour 3, 50-lb sacks of 3/8-in. bentonite aggregate into the borehole. Unhydrated bentonite level is at 1.0 ft BGS.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-668</u>
WELL PLUGGING AND ABANDONMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 6
LOCATION: <u>East Fork Poplar Creek</u>		DATE: START: <u>12-17-96</u>	
DRILLER: <u>H. Hall - Highland Drilling Co.</u>		FINISH: <u>12-19-96</u>	
HELPERS: <u>J. Gallaher/J. Monger - Highland Drilling Co.</u>		METHOD: <u>A</u>	
DRILL: <u>Ingersoll-Rand XL-750</u>		LOGGED BY: <u>Timothy Coffey - SAIC</u>	

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-17-96	1125	1150	Arrive at GW-668 site. The drill rig is on site, positioned over the well. The work site boundary has been flagged. Work at this location will be performed under radiation work permit #Y-RWP-30295-2. Background radiological survey of the location: alpha = 0 cpm, beta/gamma = 50 cpm. Uncap well, organic vapors in casing headspace = 0.0 ppm. Measure water level at 2.7 ft below ground surface (BGS). Tag bottom of well (solid) at 23.8 ft BGS. Note: The Subsurface Data Base (Y/TS-881/R3) reports the depth of GW-668 to be 23.1 ft.
	1150	1235	Break for lunch.
	1235	1250	Cut off 2.3 ft of the casing stick-up using a portable bandsaw. Raise the mast of the drill rig.
	1250	1306	Rig up with 5 3/4-in. outside diameter (OD) washover pipe. Thread the shoe onto the washover pipe. Shoe dimensions: 6 1/2-in. OD, 4 3/4-in. inside diameter (ID). Total length of washover pipe, shoe, and sub-adapter = 27.5 ft; table height = 2.7 ft.
	1306	1318	Connection made. Commence over wash. Overwash well casing from +0.4 ft to 11.0 ft BGS using compressed air only. Cut through the concrete pad from +0.4 ft to 0.0 ft BGS. Breathing zone analysis (BZA) at 1.8 ft, 6.8 ft, and 9.8 ft read 0.0 ppm, 0.1 ppm, and 0.0 ppm, respectively. Cuttings from 0.0 ft to 10.5 ft BGS consist of medium light gray (N6) to medium gray (N5) cement

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-668</u>
WELL PLUGGING AND ABANDONMENT ACTIVITY/PROGRESS REPORT - continued			PAGE 2 of 6
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-17-96	1306	1318	fragments with rare stainless steel wires and shavings. Encounter
(cont.)			annular bentonite seal at 10.5 ft BGS. Cuttings from 10.5 ft
			to 11.0 ft BGS consist predominantly of light greenish-gray
			(5GY 8/1) and greenish-gray (5GY 6/1), soft, moist bentonite.
	1318	1426	At 11.0 ft BGS, stop over wash. Break washover pipe loose from
			drill head; trip out washover pipe, and attempt to rig down: the well
			casing and screen are jammed inside the washover pipe, and
			there is too much length to pull the well assembly out of the
			borehole. Try unthreading screen from casing: unsuccessful.
			Eventually free the well assembly inside the washover pipe, and
			cut into sections for removal. Extract 10.3 ft of 4 1/2-in. OD
			stainless steel screen (length includes end cap) and 14.8 ft of
			4 1/2-in. OD stainless steel casing (added to 2.3 ft of casing cut-
			off to raise mast for a total of 17.1 ft). Extracted casing/screen
			surveyed (uncontaminated) by J. May (MK-F HP Technician). Rig
			down the washover pipe.
	1426	1446	Waiting on arrival of bit and stabilizer.
	1446	1505	Drill bit (a 10 7/8-in. diameter tri-cone bit) arrives on site. Stabilizer
			arrives (diameter of stabilizer and attached bit are unknown). Off-
			load stabilizer.
	1505	1517	Rig up with the stabilizer; length (including bit) = 17.0 ft, table
			height = 2.9 ft. Will try this, but the bit (and the stabilizer) appear
			to be too big to fit inside the 11-in. ID surface casing reportedly
			used on this well.
	1517	1536	Commence reaming the wellbore using compressed air only. Drill
			through the concrete pad; the pad is now loose. Interrupt drilling
			to drag the pad out of the way.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-668</u>
WELL PLUGGING AND ABANDONMENT ACTIVITY/PROGRESS REPORT - continued			PAGE 3 of 6
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-17-96	1536	1644	Just as suspected: the bit is too big to fit inside the surface casing.
(cont.)			Attempt to break bit loose from stabilizer (to put on a smaller one):
			all attempts unsuccessful. Plan to over wash the surface casing,
			remove it from the borehole, then ream the completion interval of
			the wellbore. Secure site and depart.
12-18-96	0815	0849	Arrive at GW-668 site. Complete rigging down the stabilizer/bit
			assembly.
	0849	0913	Rig up with 13 1/2-in. OD, 12-in. ID (shoe dimensions) washover
			pipe; total length of washover pipe, shoe, and sub-adapter =
			13.4 ft; table height remains at 2.9 ft.
	0913	0930	Connection made. Discover that the washover pipe will not fit
			around the surface casing: there appears to be a collar on the top
			of the surface casing.
	0930	0946	Rig down the washover pipe.
	0946	1008	Discuss options with drill crew. Plan to expose the collar and try
			to remove from the casing, then over wash the casing and remove.
			Lower the mast on the drill rig.
	1008	1045	Use the backhoe to dig around the casing collar. Monitor excavation
			for mercury vapors: all readings are 0.0 mg/m ³ . Chip the annular
			cement from around the collar.
	1045	1136	Use the gas-powered saw to cut the side of the collar through to
			the threads. Unthread the collar from the rest of the casing.
	1136	1221	Break for lunch.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-668</u>
WELL PLUGGING AND ABANDONMENT ACTIVITY/PROGRESS REPORT - continued			PAGE 4 of 6
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-18-95	1221	1229	Push the excavated material back into pit around the surface casing.
(cont.)			
	1229	1240	Raise the mast. Rig back up with the washover pipe. Table height = 2.7 ft.
	1240	1320	Connection made. Commence over wash. Over wash the surface casing from 0.0 ft to 6.7 ft BGS. BZA (mercury) at 0.7 ft BGS = 0.0 mg/m ³ . BZA (organics) at 1.0 ft BGS = 0.0 ppm. BZA (organics) at 3.5 ft BGS = 0.5 ppm (maximum), 0.2 ppm (sustained). Cuttings from 0.0 ft to 6.7 ft BGS consist primarily of medium dark gray (N4) to medium gray (N5) cement fragments; abundant metal shavings; and dusky yellowish-brown (10YR 2/2) to grayish-brown (5YR 4/1), moist silty, clayey topsoil.
	1320	1333	Stop over wash. Washover pipe is rubbing on the drilling table, impeding progress. Skid drill rig ahead 0.2 ft.
	1333	1402	Continue over wash. Over wash surface casing from 6.7 ft to 10.5 ft BGS using compressed air only. BZA (organics) at 6.7 ft BGS = 0.2 ppm. Encounter weathered rock at 8.5 ft BGS. Cuttings from 6.7 ft to 8.5 ft BGS are a continuation of the 0.0 - 6.7-ft interval, but with much rarer metal shavings. BZA (organics) at 9.5 ft BGS = 0.0 ppm. Cuttings from 8.5 ft to 10.5 ft BGS are very pale orange (10YR 8/6) to light greenish-gray (5GY 8/1), massive, weathered dolostone.
	1402	1424	At 10.5 ft BGS. Trip out washover pipe. Surface casing is loose, and drops into borehole. Top of casing is approximately 3 ft BGS. Finish rigging down the washover pipe.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-668</u>
WELL PLUGGING AND ABANDONMENT ACTIVITY/PROGRESS REPORT - continued			PAGE 5 of 6
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-18-96	1424	1430	Wrap a chain around the loose casing and recover from the
(cont.)			borehole. Extract 8.0 ft (includes collar removed earlier) of
			11 3/4-in. OD, 11-in. ID steel surface casing. Casing surveyed
			(uncontaminated) by J. May.
	1430	1436	Rig back up with the stabilizer/bit assembly (bit is determined to be
			12 1/2-in. diameter); length = 17.0 ft, table height = 2.5 ft.
	1436	1527	Commence reaming. Ream completion interval from approximately
			10.0 ft to 24.8 ft BGS using compressed air only. BZA (organics)
			at 11.5 ft BGS = 0.0 ppm. BZA (mercury) at 12.0 ft BGS =
			0.0 mg/m ³ . Drilling tools bouncing at 13.5 ft BGS (competent
			bedrock). Cuttings from 10.0 ft to 13.5 BGS consist of very pale
			orange (10YR 8/6), weathered dolostone plus dusky yellow
			(5Y 6/4), moist clay and cement fragments, and metal shavings
			that obviously have fallen in from above. BZA (organics) at 19.0
			ft BGS = 0.0 ppm. Cuttings from 13.5 ft to 24.8 ft BGS consist
			predominantly of brownish-gray (5YR 4/1), massive micrite with
			lesser amounts of: brownish-black (5YR 2/1) pelmicrite/biomicrite
			with pink calcite vein material; minor medium bluish-gray (5B 5/1),
			thickly laminated shale; and fine grained quartz-feldspathic sand
			(filter pack).
	1527	1556	At 24.8 ft BGS. Clean out borehole. The borehole is making water
			now, which is aiding in cleaning out the cuttings. Trip out the tools.
			Tag bottom of the borehole at 24.3 ft BGS (0.5 ft of fill).
	1556	1608	Slowly pour 17, 50-lb sacks of 3/8-in. bentonite aggregate into the
			borehole. Unhydrated bentonite level is at 7.7 ft BGS.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-668</u>
WELL PLUGGING AND ABANDONMENT ACTIVITY/PROGRESS REPORT - continued			PAGE 6 of 6
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-18-96	1608	1656	Try again to break bit loose from the stabilizer: unsuccessful. Will
(cont.)			have parts for p-tong wrench express-mailed here tomorrow at noon;
			hope this will aid in breaking the bit loose. Secure site and depart.
12-19-96	1310	1351	Arrive at GW-668 site. Start drill rig (difficult due to cold temperatures),
			and let warm up. Assemble p-tong wrench.
	1351	1451	Trying to break the bit loose from the stabilizer.
	1451	1520	Take a break to warm up.
	1520	1544	Resume bit breaking efforts: bit will not come loose, nor will the
			stabilizer break from the drill head. Plan to demobilize drill rig.
	1544	1602	Secure carousel and lower the mast. S. Jones (ECO) approves P&A
			deviation to refrain from reaming cased portion of borehole any
			more.
	1602	1606	Pour 10, 50-lb sacks of 3/8-in. bentonite aggregate into the borehole.
			Unhydrated bentonite level is 1.0 ft BGS.
	1606	1645	Cap the remaining borehole with clay soil/cuttings. Finish readying
			drill rig and other equipment for demobilization. Depart site.
			P&A of well GW-668 is complete.

APPENDIX B
P&A DIAGRAMS

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. AN:D-1

WELL PLUGGING AND ABANDONMENT DIAGRAM

LOCATION: East Fork Poplar CreekDATE: START: 12-26-96COORDINATES: N34088 E62440 (est.)FINISH: 12-26-96REFERENCE POINT FOR MEASUREMENTS: Ground SurfacePREPARED BY: Timothy Coffey - SAICDRILLING COMPANY: Highland Drilling CompanyDRILL: N/AOPERATOR: James GallaherHELPERS: Scott Gilbert/Jerry GallaherREASON FOR P&A: Obsolete well.P&A METHOD: A DEVIATIONS FROM METHOD: All casing was physically pulled from the ground. No drilling or borehole conditioning performed.

WELL CONSTRUCTION SUMMARY*

P&A SUMMARY

Note: Some of the information in this section obtained from field observations.

REAMED DIA: -N/A-

DRILLED/REAMED
DEPTH: -N/A-

Bentonite
PLUG MATERIAL: aggregate

CAP MATERIAL: Clay soil

*Information Source: Original installation log.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. AN:D-2

WELL PLUGGING AND ABANDONMENT DIAGRAM

LOCATION: East Fork Poplar CreekDATE: START: 12-24-96COORDINATES: N33990 E62402 (est.)FINISH: 12-24-96REFERENCE POINT FOR MEASUREMENTS: Ground SurfacePREPARED BY: Timothy Coffey - SAICDRILLING COMPANY: Highland Drilling CompanyDRILL: N/ASUPERVISOR: Scott GilbertHELPERS: Jim Gallaher/Hubert Hall/Jerry GallaherREASON FOR P&A: Obsolete well.P&A METHOD: A DEVIATIONS FROM METHOD: All casing was physically pulled from the ground. No drilling or borehole conditioning performed.

WELL CONSTRUCTION SUMMARY*

P&A SUMMARY

Note: Some of the information in this section obtained from field observations.

REAMED DIA: -N/A-
 DRILLED/REAMED DEPTH: -N/A-
 BENTONITE
 PLUG MATERIAL: Aggregate
 CAP MATERIAL: Clay soil

*Information Source: Original installation log.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. AN:D-3

WELL PLUGGING AND ABANDONMENT DIAGRAM

LOCATION: East Fork Poplar CreekDATE: START: 12-24-96COORDINATES: N33900 E62358 (est.)FINISH: 12-24-96REFERENCE POINT FOR MEASUREMENTS: Ground SurfacePREPARED BY: Timothy Coffey - SAICDRILLING COMPANY: Highland Drilling CompanyDRILL: N/ASUPERVISOR: Scott GilbertHELPERS: Jim Gallaher/Hubert Hall/Jerry GallaherREASON FOR P&A: Obsolete well.P&A METHOD: A DEVIATIONS FROM METHOD: All casing was physically pulled from the ground. No drilling or borehole conditioning performed.

WELL CONSTRUCTION SUMMARY*

P&A SUMMARY

Note: Some of the information in this section obtained from field observations.

*Information Source: Original installation log.

REAMED DIA: -N/A-

DRILLED/REAMED
DEPTH: -N/A-

Bentonite
PLUG MATERIAL: Aggregate

CAP MATERIAL: Clay soil

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM		WELL NO. <u>AN:D-4</u>
WELL PLUGGING AND ABANDONMENT DIAGRAM		
LOCATION: <u>East Fork Poplar Creek</u>	DATE: START: <u>12-24-96</u>	
COORDINATES: <u>N33810 E62321 (est.)</u>	FINISH: <u>12-24-96</u>	
REFERENCE POINT FOR MEASUREMENTS: <u>Ground Surface</u>	PREPARED BY: <u>Timothy Coffey - SAIC</u>	
DRILLING COMPANY: <u>Highland Drilling Company</u> DRILL: <u>N/A</u>		
SUPERVISOR: <u>Scott Gilbert</u> HELPERS: <u>Jim Gallaher/Hubert Hall/Jerry Gallaher</u>		
REASON FOR P&A: <u>Obsolete well.</u>		
P&A METHOD: <u>A</u> DEVIATIONS FROM METHOD: <u>All casing was physically pulled from the ground. No drilling or borehole conditioning performed.</u>		
WELL CONSTRUCTION SUMMARY*	P&A SUMMARY	
Note: Some of the information in this section obtained from field observations.
<div style="margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px; display: inline-block;">CONDUCTOR HOLE DIA: <u>12-in. dia.</u></div> <div style="margin-left: 20px;">DEPTH <u>2.5 ft</u></div> </div> <div style="margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px; display: inline-block;">SURFACE CONDUCTOR TYPE: <u>Steel</u> DIA: <u>9-in. OD</u></div> <div style="margin-left: 20px;">TOP <u>0.0 ft</u> BOTTOM <u>2.5 ft</u></div> </div> <div style="margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px; display: inline-block;">BOREHOLE DIA.: <u>6 in.</u></div> <div style="margin-left: 20px;">TOP <u>0.0 ft</u> BOTTOM <u>4.9 ft</u></div> </div> <div style="margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px; display: inline-block;">FILLER: <u>Cement</u></div> </div> <div style="margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px; display: inline-block;">CASING TYPE: <u>Stainless steel</u> DIA: <u>2 3/8-in. OD</u></div> <div style="margin-left: 20px;">TOP <u>+2.7 ft</u> BOTTOM <u>2.3 ft</u></div> </div> <div style="margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px; display: inline-block;">SEAL: <u>Bentonite</u></div> <div style="margin-left: 20px;">TOP <u>1.3 ft</u> BOTTOM <u>1.8 ft</u></div> </div> <div style="margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px; display: inline-block;">FILTER PACK: <u>Sand</u></div> <div style="margin-left: 20px;">TOP <u>1.8 ft</u> BOTTOM <u>4.9 ft</u></div> </div> <div style="margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px; display: inline-block;">SCREEN TYPE: <u>Stainless steel</u> DIA: <u>2 3/8-in. OD</u></div> <div style="margin-left: 20px;">TOP <u>2.3 ft</u> BOTTOM <u>4.9 ft</u></div> </div> <div style="margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px; display: inline-block;">TOTAL DEPTH: <u>4.9</u></div> </div>	<div style="margin-bottom: 10px;"> REAMED DIA: <u>-N/A-</u> DRILLED/REAMED DEPTH: <u>-N/A-</u> Bentonite PLUG MATERIAL: <u>Aggregate</u> CAP MATERIAL: <u>Clay soil</u> </div> <div style="text-align: center;"> </div> <div style="margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px; display: inline-block;">CAP</div> <div style="margin-left: 20px;">DEPTH: <u>1.0 ft</u></div> </div> <div style="margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px; display: inline-block;">PLUG</div> <div style="margin-left: 20px;">DIA: <u>9 in.</u> DEPTH: <u>2.5 ft</u></div> </div> <div style="margin-top: 10px;"> <div style="margin-left: 20px;">DIA: <u>2 3/8 in.</u></div> </div> <div style="margin-top: 10px;"> <div style="margin-left: 20px;">DEPTH: <u>4.9 ft</u></div> </div>	

*Information Source: Original installation log.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM		WELL NO. <u>AN:D-5</u>
WELL PLUGGING AND ABANDONMENT DIAGRAM		
LOCATION: <u>East Fork Poplar Creek</u>		DATE: START: <u>12-24-96</u>
COORDINATES: <u>N33760 E62265 (est.)</u>		FINISH: <u>12-24-96</u>
REFERENCE POINT FOR MEASUREMENTS: <u>Ground Surface</u>		PREPARED BY: <u>Timothy Coffey - SAIC</u>
DRILLING COMPANY: <u>Highland Drilling Company</u>		DRILL: <u>N/A</u>
SUPERVISOR: <u>Scott Gilbert</u>		HELPERS: <u>Jim Gallaher/Hubert Hall/Jerry Gallaher</u>
REASON FOR P&A: <u>Obsolete well.</u>		
P&A METHOD: <u>A</u> DEVIATIONS FROM METHOD: <u>All casing was physically pulled from the ground. No drilling or borehole conditioning performed.</u>		
WELL CONSTRUCTION SUMMARY*		P&A SUMMARY
Note: Some of the information in this section obtained from field observations.		REAMED DIA: <u>-N/A-</u>
DRILLED/REAMED DEPTH: <u>-N/A-</u> PLUG MATERIAL: <u>Bentonite Aggregate</u> CAP MATERIAL: <u>Clay soil</u>

*Information Source: Original installation log.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. AN:D-6

WELL PLUGGING AND ABANDONMENT DIAGRAM

LOCATION: East Fork Poplar CreekDATE: START: 12-26-96COORDINATES: N33680 E62197 (est.)FINISH: 12-26-96REFERENCE POINT FOR MEASUREMENTS: Ground SurfacePREPARED BY: Timothy Coffey - SAICDRILLING COMPANY: Highland Drilling CompanyDRILL: N/ASUPERVISOR: Scott GilbertHELPERS: James Gallaher/Jerry GallaherREASON FOR P&A: Obsolete well.P&A METHOD: A DEVIATIONS FROM METHOD: All casing was physically pulled from the ground. No drilling or borehole conditioning performed.

WELL CONSTRUCTION SUMMARY*

P&A SUMMARY

Note: Some of the information in this section obtained from field observations.

*Information Source: Original installation log.

REAMED DIA: -N/A-

DRILLED/REAMED
DEPTH: -N/A-

Bentonite
PLUG MATERIAL: aggregate

CAP MATERIAL: Clay soil

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. AN: D-7

WELL PLUGGING AND ABANDONMENT DIAGRAM

LOCATION: East Fork Poplar CreekDATE: START: 12-16-96COORDINATES: N 40, 355 E 53, 400 (est.)FINISH: 12-16-96REFERENCE POINT FOR MEASUREMENTS: Ground SurfacePREPARED BY: Timothy Coffey - SAICDRILLING COMPANY: Highland Drilling CompanyDRILL: Ford 555B Backhoe with
McMillen DiggerheadOPERATOR: J. GallaherHELPER: H. HallREASON FOR P&A: Obsolete well that impedes remediation effort.P&A METHOD: A DEVIATIONS FROM METHOD: None

WELL CONSTRUCTION SUMMARY*

P&A SUMMARY

Note: Some of the information in the following section obtained from field observations.

REAMED DIA: 9 in.DRILLED/REAMED
DEPTH: 9.0 ftPLUG MATERIAL: Bentonite
aggregateCAP MATERIAL: Clay soil/cuttings

*Information Source: Original well installation log.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM		WELL NO. <u>AN: D-8</u>
WELL PLUGGING AND ABANDONMENT DIAGRAM		
LOCATION: <u>East Fork Poplar Creek</u>		DATE: START: <u>12-16-96</u>
COORDINATES: <u>N 40, 295 E 53, 360 (est.)</u>		FINISH: <u>12-16-96</u>
REFERENCE POINT FOR MEASUREMENTS: <u>Ground Surface</u>		PREPARED BY: <u>Timothy Coffey - SAIC</u>
DRILLING COMPANY: <u>Highland Drilling Company</u>		DRILL: <u>Ford 555B Backhoe with McMillen Diggerhead</u>
OPERATOR: <u>J. Gallaher</u> HELPER: <u>H. Hall</u>		
REASON FOR P&A: <u>Obsolete well that impedes remediation effort.</u>		
P&A METHOD: <u>A</u> DEVIATIONS FROM METHOD: <u>None</u>		

WELL CONSTRUCTION SUMMARY*	P&A SUMMARY	
<p>Note: Some of the information in the following section obtained from field observations.</p> <div style="display: flex; align-items: center;"> <div style="margin-left: 20px;"> <p>CONDUCTOR HOLE DIA: <u>12 in.</u> DEPTH <u>3.5 ft</u></p> <p>SURFACE CONDUCTOR TYPE: <u>Steel</u> DIA: <u>9.0-in. OD</u> TOP <u>0.0 ft</u> BOTTOM <u>3.5 ft</u></p> <p>BOREHOLE DIA.: <u>6 in.</u> TOP <u>0.0 ft</u> BOTTOM <u>8.4 ft</u></p> <p>FILLER: <u>Cement</u></p> <p>CASING TYPE: <u>Stainless Steel</u> DIA: <u>2 3/8-in. OD</u> TOP <u>+2.4 ft</u> BOTTOM <u>4.1 ft</u></p> <p>SEAL: <u>Bentonite</u> TOP <u>3.0 ft</u> BOTTOM <u>3.6 ft</u></p> <p>FILTER PACK: <u>Sand</u> TOP <u>3.6 ft</u> BOTTOM <u>8.4 ft</u></p> <p>SCREEN TYPE: <u>Stainless Steel</u> DIA: <u>2 3/8-in. OD</u> TOP <u>4.1 ft</u> BOTTOM <u>8.4 ft</u></p> <p>TOTAL DEPTH: <u>8.4 ft</u></p> </div> </div>		<p>REAMED DIA: <u>9 in.</u></p> <p>DRILLED/REAMED DEPTH: <u>8.4 ft</u></p> <p>PLUG MATERIAL: <u>Bentonite aggregate</u></p> <p>CAP MATERIAL: <u>Clay soil/cuttings</u></p>
	<div style="display: flex; align-items: center;"> <div style="margin-left: 20px;"> <p>CAP DEPTH: <u>0.9 ft</u> DIA: <u>9-in.</u></p> <p>PLUG DEPTH: <u>6.7 ft</u></p> <p>COLLAPSE/FILL DEPTH: <u>8.4 ft</u></p> </div> </div>	

*Information Source: Original well installation log.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. AN: D-9

WELL PLUGGING AND ABANDONMENT DIAGRAM

LOCATION: East Fork Poplar CreekDATE: START: 12-13-96COORDINATES: N 40, 242 E 53, 284 (est.)FINISH: 12-13-96REFERENCE POINT FOR MEASUREMENTS: Ground SurfacePREPARED BY: Timothy Coffey - SAICDRILLING COMPANY: Highland Drilling CompanyDRILL: Ford 555B Backhoe with
McMillen DiggerheadOPERATOR: J. GallaherHELPERS: H. Hall/J. MongerREASON FOR P&A: Obsolete well that impedes remediation effort.P&A METHOD: A DEVIATIONS FROM METHOD: None

WELL CONSTRUCTION SUMMARY*

P&A SUMMARY

Note: Some of the information in the following section obtained from field observations.

REAMED DIA: 7 7/8 in.DRILLED/REAMED
DEPTH: 11.0 ftPLUG MATERIAL: Bentonite
aggregateCAP MATERIAL: Clay soil/cuttings

*Information Source: Original well installation log.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. AN: D-10

WELL PLUGGING AND ABANDONMENT DIAGRAM

LOCATION: East Fork Poplar CreekDATE: START: 12-13-96COORDINATES: N 40, 191 E 53, 237 (est.)FINISH: 12-13-96REFERENCE POINT FOR MEASUREMENTS: Ground SurfacePREPARED BY: Timothy Coffey - SAICDRILLING COMPANY: Highland Drilling CompanyDRILL: Ford 555B Backhoe with
McMillen DiggerheadOPERATOR: J. GallaherHELPERS: H. Hall/J. MongerREASON FOR P&A: Obsolete well that impedes remediation effort.P&A METHOD: A DEVIATIONS FROM METHOD: None

WELL CONSTRUCTION SUMMARY*

Note: Some of the information in the following section obtained from field observations.

P&A SUMMARY

REAMED DIA: 7 7/8 in.DRILLED/REAMED
DEPTH: 10.4 ftPLUG MATERIAL: Bentonite
aggregateCAP MATERIAL: Clay soil/cuttings

*Information Source: Original well installation log.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. AN: D-11

WELL PLUGGING AND ABANDONMENT DIAGRAM

LOCATION: East Fork Poplar CreekDATE: START: 12-13-96COORDINATES: N 40, 015 E 53, 061 (est.)FINISH: 12-13-96REFERENCE POINT FOR MEASUREMENTS: Ground SurfacePREPARED BY: Timothy Coffey - SAICDRILLING COMPANY: Highland Drilling CompanyDRILL: Ford 555B Backhoe with
McMillen DiggerheadOPERATOR: J. GallaherHELPERS: H. Hall/J. MongerREASON FOR P&A: Obsolete well that impedes remediation effort.P&A METHOD: A DEVIATIONS FROM METHOD: None

WELL CONSTRUCTION SUMMARY*

Note: Some of the information in the following section obtained from field observations.

P&A SUMMARY

REAMED DIA: 7 7/8 in.DRILLED/REAMED
DEPTH: 9.4 ftPLUG MATERIAL: Bentonite
aggregateCAP MATERIAL: Clay soil/cuttings

*Information Source: Original well installation log.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM		WELL NO. <u>AN:D-unknown</u>
WELL PLUGGING AND ABANDONMENT DIAGRAM		
LOCATION: <u>East Fork Poplar Creek</u>	DATE: START: <u>12-26-96</u>	
COORDINATES: <u>N32,502 E63,738 (est.)</u>	FINISH: <u>12-26-96</u>	
REFERENCE POINT FOR MEASUREMENTS: <u>Ground Surface</u>	PREPARED BY: <u>Timothy Coffey - SAIC</u>	
DRILLING COMPANY: <u>Highland Drilling Company</u> DRILL: <u>N/A</u>		
SUPERVISOR: <u>Scott Gilbert</u> HELPERS: <u>James Gallaher/Jerry Gallaher</u>		
REASON FOR P&A: <u>Obsolete well.</u>		
P&A METHOD: <u>A</u> DEVIATIONS FROM METHOD: <u>Well assembly was physically pulled from the ground. Left all of the screen and a portion of the well casing in the wellbore. No drilling or borehole conditioning performed.</u>		
WELL CONSTRUCTION SUMMARY *	P&A SUMMARY	
Note: Some of the information in this section obtained from field observations.
<div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 45%;"> <p>CONDUCTOR HOLE DIA: <u>-NA-</u></p> <p>SURFACE CONDUCTOR TYPE: <u>Steel</u> DIA: <u>6 5/8-in. OD</u></p> <p>BOREHOLE DIA.: <u>-NA-</u></p> <p>FILLER: <u>Cement</u></p> <p>CASING TYPE: <u>Stainless steel</u> DIA: <u>2 3/8-in. OD</u></p> <p>SEAL: <u>Bentonite</u></p> <p>FILTER PACK: <u>Sand</u></p> <p>SCREEN TYPE: <u>Stainless steel</u> DIA: <u>2 3/8-in. OD</u></p> <p>TOTAL DEPTH: <u>-NA-</u></p> </div> <div style="width: 45%;"> <p>DEPTH <u>-NA-</u></p> <p>TOP <u>-NA-</u> BOTTOM <u>-NA-</u></p> <p>TOP <u>-NA-</u> BOTTOM <u>-NA-</u></p> <p>TOP <u>-NA-</u> BOTTOM <u>-NA-</u></p> <p>TOP <u>-NA-</u> BOTTOM <u>-NA-</u></p> <p>TOP <u>-NA-</u> BOTTOM <u>-NA-</u></p> <p>TOP <u>-NA-</u> BOTTOM <u>-NA-</u></p> </div> </div>	<p>REAMED DIA: <u>-N/A-</u></p> <p>DRILLED/REAMED DEPTH: <u>-N/A-</u></p> <p>PLUG MATERIAL: <u>Bentonite aggregate</u></p> <p>CAP MATERIAL: <u>Clay soil</u></p>	
<div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="width: 60%;"> <p style="text-align: center; margin-bottom: 10px;">CAP</p> <p>DEPTH: <u>1.0 ft</u></p> <p style="text-align: center; margin-top: 10px;">PLUG</p> <p>DIA: <u>2 3/8 in.</u></p> <p style="text-align: center; margin-top: 10px;">PLUG</p> <p>DEPTH: <u>-NA-</u></p> </div> </div>		

-NA-: Not Applicable/Not Available

APPENDIX C
WASTE MANAGEMENT PLAN

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. The Y-12 Plant philosophy has been and continues to be consistent with the U.S. Environmental Protection Agency (EPA) and Lockheed Martin Energy Systems, Inc., (Energy Systems) guidance for managing investigation-derived wastes. 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 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, Inc. 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 1 h at 70°F or the ambient temperature, whichever is higher. 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
pH	ESP-307-1 Rev. 1	4.0-10.5
Specific conductivity ^a	ESP-307-1 Rev. 1	< 1000 μ mhos/cm
Organic vapors	ESP-307-6 Rev. 1	< 5 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 one quart of 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. This pH will be 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 management 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 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, Inc. 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 1 h at 70°F or the ambient temperature, whichever is higher. 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 management 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 BMP 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

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

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

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

APPENDIX D

DISPOSAL AND SCREENING RECORDS

Y-12 PLANT GWPP WELL CUTTINGS FIELD SCREENING/DISPOSAL SHEET

WELL/BOREHOLE NO. AN: D-7 SITE: East Fork Poplar CreekAPPROX. VOLUME OF CUTTINGS: -NA-

CALIBRATION OF INSTRUMENTS (check those instruments calibrated to manufacturer's specifications):

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter with Scintillation Tube Probe</u>
Mercury vapor meter	<u>X</u>	(model)	<u>Jerome Model 431-X</u>

FIELD SCREENING RESULTS (background/maximum observed values):

pH	<u>8.1</u>	Date/Time	<u>12-16-96/1703</u>	(4.0 - 10.5)
Organic vapors	<u>0.0 ppm/0.2 ppm</u>	Date/Time	<u>12-16-96/1701</u>	(<5.0 ppm above background)
Beta/gamma	<u>50 cpm/50 cpm</u>	Date/Time	<u>12-16-96/1556</u>	(<100 cpm above background)
Alpha	<u>0 cpm/0 cpm</u>	Date/Time	<u>12-16-96/1555</u>	(<500 cpm above background)
Mercury vapors	<u>0.0 mg/m³/0.0 mg/m³</u>	Date/Time	<u>12-16-96/1702</u>	(<0.05 mg/m ³)

Weather: Cloudy with scattered light rain.Temp.: Low-30s to mid-40s °FDISPOSITION: Drill-site Disposal XContainerization
(Labeled?) y/n

Describe: Some of the cuttings used to cap reamed wellbore. Remaining cuttings scattered around the location.

Onsite Geologist (print): Timothy Coffey - SAICSignature: Date: 12-16-96

Y-12 PLANT GWPP WELL CUTTINGS FIELD SCREENING/DISPOSAL SHEET

WELL/BOREHOLE NO. AN: D-8 SITE: East Fork Poplar CreekAPPROX. VOLUME OF CUTTINGS: -NA-

CALIBRATION OF INSTRUMENTS (check those instruments calibrated to manufacturer's specifications):

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter with Scintillation Tube Probe</u>
Mercury vapor meter	<u>X</u>	(model)	<u>Jerome Model 431-X</u>

FIELD SCREENING RESULTS (background/maximum observed values):

pH	<u>8.9</u>	Date/Time	<u>12-16-96/1742</u>	(4.0 - 10.5)
Organic vapors	<u>0.0 ppm/0.0 ppm</u>	Date/Time	<u>12-16-96/1740</u>	(<5.0 ppm above background)
Beta/gamma	<u>50 cpm/80 cpm</u>	Date/Time	<u>12-16-96/1656</u>	(<100 cpm above background)
Alpha	<u>0 cpm/0 cpm</u>	Date/Time	<u>12-16-96/1655</u>	(<500 cpm above background)
Mercury Vapor	<u>0.0 mg/m³/0.006 mg/m³</u>	Date/Time	<u>12-16-96/1741</u>	(<0.05 mg/m ³)

Weather: Cloudy with scattered light rain. Temp.: Low-30s to mid-40s °FDISPOSITION: Drill-site Disposal X Containerization
(Labeled?) y/n

Describe: Some of the cuttings used to cap reamed wellbore. Remaining cuttings scattered around the location.

Onsite Geologist (print): Timothy Coffey - SAICSignature: Date: 12-16-96

Y-12 PLANT GWPP WELL CUTTINGS FIELD SCREENING/DISPOSAL SHEET

WELL/BOREHOLE NO. AN: D-9 SITE: East Fork Poplar CreekAPPROX. VOLUME OF CUTTINGS: -NA-

CALIBRATION OF INSTRUMENTS (check those instruments calibrated to manufacturer's specifications):

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter with Scintillation Tube Probe</u>
Mercury vapor meter	<u>X</u>	(model)	<u>Jerome Model 431-X</u>

FIELD SCREENING RESULTS (background/maximum observed values):

pH	<u>8.4</u>	Date/Time	<u>12-13-96/1151</u>	(4.0 - 10.5)
Organic vapors	<u>0.0 ppm/12 ppm*</u>	Date/Time	<u>12-13-96/1149</u>	(<5.0 ppm above background)
Beta/gamma	<u>60 cpm/70 cpm</u>	Date/Time	<u>12-13-96/1033</u>	(<100 cpm above background)
Alpha	<u>0 cpm/0 cpm</u>	Date/Time	<u>12-13-96/1031</u>	(<500 cpm above background)
Mercury vapors	<u>0.0 mg/m³/0.0 mg/m³</u>	Date/Time	<u>12-13-96/1150</u>	(<0.05 mg/m ³)

*Elevated headspace reading from unknown source. Sample resealed and tested at 1302 hrs at 4.5 ppm.

Weather: Partly cloudy to mostly clear, dry. Temp.: Low-40s to upper-50s °FDISPOSITION: Drill-site Disposal X Containerization
(Labeled?) y/n

Describe: Some of the cuttings used to cap reamed wellbore. Remaining cuttings scattered around the location.

Onsite Geologist (print): Timothy Coffey - SAICSignature: Date: 12-13-96

Y-12 PLANT GWPP WELL CUTTINGS FIELD SCREENING/DISPOSAL SHEET

WELL/BOREHOLE NO. AN: D-10 SITE: East Fork Poplar CreekAPPROX. VOLUME OF CUTTINGS: -NA-

CALIBRATION OF INSTRUMENTS (check those instruments calibrated to manufacturer's specifications):

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter with Scintillation Tube Probe</u>
Mercury vapor meter	<u>X</u>	(model)	<u>Jerome Model 431-X</u>

FIELD SCREENING RESULTS (background/maximum observed values):

pH	<u>7.7</u>	Date/Time	<u>12-13-96/1312</u>	(4.0 - 10.5)
Organic vapors	<u>0.0 ppm/3.0 ppm</u>	Date/Time	<u>12-13-96/1310</u>	(<5.0 ppm above background)
Beta/gamma	<u>60 cpm/70 cpm</u>	Date/Time	<u>12-13-96/1157</u>	(<100 cpm above background)
Alpha	<u>0 cpm/0 cpm</u>	Date/Time	<u>12-13-96/1155</u>	(<500 cpm above background)
Mercury vapors	<u>0.0 mg/m³/0.0 mg/m³</u>	Date/Time	<u>12-13-96/1311</u>	(<0.05 mg/m ³)

Weather: Partly cloudy to mostly clear, dry.Temp.: Low-40s to upper-50s °FDISPOSITION: Drill-site Disposal XContainerization
(Labeled?) y/n

Describe: Some of the cuttings used to cap reamed wellbore. Remaining cuttings scattered around the location.

Onsite Geologist (print): Timothy Coffey - SAICSignature: Date: 12-13-96

Y-12 PLANT GWPP WELL CUTTINGS FIELD SCREENING/DISPOSAL SHEET

WELL/BOREHOLE NO. AN: D-11 SITE: East Fork Poplar CreekAPPROX. VOLUME OF CUTTINGS: -NA-

CALIBRATION OF INSTRUMENTS (check those instruments calibrated to manufacturer's specifications):

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter with Scintillation Tube Probe</u>
Mercury vapor meter	<u>X</u>	(model)	<u>Jerome Model 431-X</u>

FIELD SCREENING RESULTS (background/maximum observed values):

pH	<u>8.4</u>	Date/Time	<u>12-13-96/1521</u>	(4.0 - 10.5)
Organic vapors	<u>0.0 ppm/0.2 ppm</u>	Date/Time	<u>12-13-96/1519</u>	(<5.0 ppm above background)
Beta/gamma	<u>60 cpm/60 cpm</u>	Date/Time	<u>12-13-96/1449</u>	(<100 cpm above background)
Alpha	<u>0 cpm/0 cpm</u>	Date/Time	<u>12-13-96/1448</u>	(<500 cpm above background)
Mercury vapors	<u>0.0 mg/m³/0.0 mg/m³</u>	Date/Time	<u>12-13-96/1520</u>	(<0.05 mg/m ³)

Weather: Partly cloudy to mostly clear, dry.Temp.: Low-40s to upper-50s °FDISPOSITION: Drill-site Disposal XContainerization
(Labeled?) y/n

Describe: Some of the cuttings used to cap reamed wellbore. Remaining cuttings scattered around the location.

Onsite Geologist (print) Timothy Coffey - SAICSignature: Date: 12-13-96

Y-12 PLANT GWPP WELL CUTTINGS FIELD SCREENING/DISPOSAL SHEET

WELL/BOREHOLE NO. GW-667 SITE: East Fork Poplar CreekAPPROX. VOLUME OF CUTTINGS: -NA-

CALIBRATION OF INSTRUMENTS (check those instruments calibrated to manufacturer's specifications):

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter with Scintillation Tube Probe</u>
Mercury vapor meter	<u>X</u>	(model)	<u>Jerome Model 431-X</u>

FIELD SCREENING RESULTS (background/maximum observed values):

pH	<u>8.4</u>	Date/Time	<u>12-16-96/1352</u>	(4.0 - 10.5)
Organic vapors	<u>0.0 ppm/0.0 ppm</u>	Date/Time	<u>12-16-96/1350</u>	(<5.0 ppm above background)
Beta/gamma	<u>60 cpm/60 cpm</u>	Date/Time	<u>12-16-96/1245</u>	(<100 cpm above background)
Alpha	<u>0 cpm/0 cpm</u>	Date/Time	<u>12-16-96/1244</u>	(<500 cpm above background)
Mercury vapors	<u>0.0 mg/m³/0.0 mg/m³</u>	Date/Time	<u>12-16-96/1351</u>	(<0.05 mg/m ³)

Weather: Cloudy with scattered light rain. Temp.: Low-30s to mid-40s °FDISPOSITION: Drill-site Disposal X Containerization _____
(Labeled?) y/n

Describe: Some of the cuttings used to cap the reamed wellbore. Remaining cuttings scattered around the location.

Onsite Geologist (print): Timothy Coffey - SAICSignature: Date: 12-16-96

Y-12 PLANT GWPP WELL CUTTINGS FIELD SCREENING/DISPOSAL SHEET

WELL/BOREHOLE NO. GW-668 SITE: East Fork Poplar CreekAPPROX. VOLUME OF CUTTINGS: -NA-

CALIBRATION OF INSTRUMENTS (check those instruments calibrated to manufacturer's specifications):

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter with Scintillation Tube Probe</u>
Mercury vapor meter	<u>X</u>	(model)	<u>Jerome Model 431-X</u>

FIELD SCREENING RESULTS (background/maximum observed values):

pH	<u>11.8*</u>	Date/Time	<u>12-17-96/1509</u>	(4.0 - 10.5)
Organic vapors	<u>0.0 ppm/1.2 ppm</u>	Date/Time	<u>12-17-96/1508</u>	(<5.0 ppm above background)
Beta/gamma	<u>40 cpm/60 cpm</u>	Date/Time	<u>12-18-96/1609</u>	(<100 cpm above background)
Alpha	<u>0 cpm/0 cpm</u>	Date/Time	<u>All Readings</u>	(<500 cpm above background)
Mercury vapors	<u>0.0 mg/m³/0.005 mg/m³</u>	Date/Time	<u>12-18-96/1714</u>	(<0.05 mg/m ³)

*Elevated pH reading due to cement fragments in the cuttings composite.

Weather: Refer to field logbook Temp.: Refer to field logbookDISPOSITION: Drill-site Disposal X Containerization
(Labeled?) y/n

Describe: Some of the cuttings used to cap the reamed wellbore. Remaining cuttings scattered around the location.

Onsite Geologist (print): Timothy Coffey - SAICSignature: Date: 12-19-96

APPENDIX E

EQUIPMENT DECONTAMINATION SUMMARIES

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>AN: D-7</u>	
EQUIPMENT DECONTAMINATION INSPECTION SUMMARY			INSTALLATION ☐ P&A ☒ REDEVELOPMENT ☐	
LOCATION: <u>East Fork Poplar Creek</u>			DATE: START: <u>12-16-96</u>	
DECONTAMINATION CREW: <u>J. Monger/S. Gilbert</u>			FINISH: <u>12-16-96</u>	

EQUIPMENT	DECON DATE	INSPECTION DATE	INSPECTION (PASS/FAIL)	INSPECTOR'S INITIALS
DRILL RIG <u>Ford 555B Backhoe</u> (Mast, Chassis, Cables, Carousel, Hoses, Etc.)	12-12-96	2-13-96	Pass	TJC
DRILLING TOOLS (Pipe Wrenches, Hand Tools, Lifting Bells, Clevis, Chains, Etc.)	12-12-96	2-13-96	Pass	TJC
DOWN HOLE TOOLS (Drilling Rods, Stabilizers, Washover Pipe, Bits, Etc.)	12-12-96	2-13-96	Pass	TJC
WELL CONSTRUCTION MATERIALS (Casing, Screen, Centralizers, Etc.)	-NA-	—	—	—
WORKOVER RIG _____ (Mast, Chassis, Cables, Hoses, Etc.)	-NA-	—	—	—
DEVELOPMENT TOOLS (Tubing, Bailers, Pumps, Etc.)	-NA-	—	—	—
OTHER EQUIPMENT OR RE-INSPECTIONS (SPECIFY)				
Augers: 9-in. diameter, solid-stem	12-16-96	12-16-96	Pass	TJC

COMMENTS: Initial decontamination of rig, augers, and tools on 12-12-96. Second set of augers (used 12-16-96)
decontaminated on 12-16-96. S. Jones (ECO) waives decontamination requirement between wells.

WELL NO. AN: D-8

EQUIPMENT DECONTAMINATION INSPECTION SUMMARY

INSTALLATION ☐

P&A ☒

REDEVELOPMENT ☐

LOCATION: East Fork Poplar Creek

DATE: START: 12-16-96

DECONTAMINATION CREW: J. Monger/S. Gilbert

FINISH: 12-16-96

EQUIPMENT	DECON DATE	INSPECTION DATE	INSPECTION (PASS/FAIL)	INSPECTOR'S INITIALS
DRILL RIG <u>Ford 555B Backhoe</u> (Mast, Chassis, Cables, Carousel, Hoses, Etc.)	12-12-96	2-13-96	Pass	TJC
DRILLING TOOLS (Pipe Wrenches, Hand Tools, Lifting Bells, Clevis, Chains, Etc.)	12-12-96	2-13-96	Pass	TJC
DOWN HOLE TOOLS (Drilling Rods, Stabilizers, Washover Pipe, Bits, Etc.)	12-12-96	2-13-96	Pass	TJC
WELL CONSTRUCTION MATERIALS (Casing, Screen, Centralizers, Etc.)	-NA-	—	—	—
WORKOVER RIG _____ (Mast, Chassis, Cables, Hoses, Etc.)	-NA-	—	—	—
DEVELOPMENT TOOLS (Tubing, Bailers, Pumps, Etc.)	-NA-	—	—	—
OTHER EQUIPMENT OR RE-INSPECTIONS (SPECIFY)				
Augers: 9-in. diameter, solid-stem	12-16-96	12-16-96	Pass	TJC
COMMENTS: Initial decontamination of rig, augers, and tools on 12-12-96. Second set of augers (used 12-16-96) decontaminated on 12-16-96. S. Jones (ECO) waives decontamination requirement between wells.				

EQUIPMENT DECONTAMINATION INSPECTION SUMMARY

P&A ☒

REDEVELOPMENT ☐

DATE: START: 12-13-96

FINISH: 12-13-96

COMMENTS: Initial decontamination of rig, augers, and tools on 12-12-96. S. Jones (ECO) waives decontamination requirement between wells.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>AN: D-10</u>	
EQUIPMENT DECONTAMINATION INSPECTION SUMMARY			INSTALLATION ☐ P&A ☒ REDEVELOPMENT ☐	
LOCATION: <u>East Fork Poplar Creek</u>			DATE: START: <u>12-13-96</u>	
DECONTAMINATION CREW: <u>J. Monger</u>			FINISH: <u>12-13-96</u>	

EQUIPMENT	DECON DATE	INSPECTION DATE	INSPECTION (PASS/FAIL)	INSPECTOR'S INITIALS
DRILL RIG <u>Ford 555B Backhoe</u> (Mast, Chassis, Cables, Carousel, Hoses, Etc.)	12-12-96	2-13-96	Pass	TJC
DRILLING TOOLS (Pipe Wrenches, Hand Tools, Lifting Bells, Clevis, Chains, Etc.)	12-12-96	2-13-96	Pass	TJC
DOWN HOLE TOOLS (Drilling Rods, Stabilizers, Washover Pipe, Bits, Etc.)	12-12-96	2-13-96	Pass	TJC
WELL CONSTRUCTION MATERIALS (Casing, Screen, Centralizers, Etc.)	-NA-	—	—	—
WORKOVER RIG _____ (Mast, Chassis, Cables, Hoses, Etc.)	-NA-	—	—	—
DEVELOPMENT TOOLS (Tubing, Bailers, Pumps, Etc.)	-NA-	—	—	—
OTHER EQUIPMENT OR RE-INSPECTIONS (SPECIFY)				

COMMENTS: Initial decontamination of rig, augers, and tools on 12-12-96. S. Jones (ECO) waives decontamination requirement between wells.

EQUIPMENT DECONTAMINATION INSPECTION SUMMARY

P&A	☒
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LOCATION: East Fork Poplar Creek

DATE: START: 12-13-96

DECONTAMINATION CREW: J. Monger

FINISH: 12-13-96

COMMENTS: Initial decontamination of rig, augers, and tools on 12-12-96. S. Jones (ECO) waives decontamination requirement between wells.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM		WELL NO. <u>GW-667</u>	
EQUIPMENT DECONTAMINATION INSPECTION SUMMARY		INSTALLATION ☐ P&A ☒ REDEVELOPMENT ☐	
LOCATION: <u>East Fork Poplar Creek</u>		DATE: START: <u>12-16-96</u>	
DECONTAMINATION CREW: <u>J. Monger/ S. Gilbert</u>		FINISH: <u>12-16-95</u>	

EQUIPMENT	DECON DATE	INSPECTION DATE	INSPECTION (PASS/FAIL)	INSPECTOR'S INITIALS
DRILL RIG <u>Ford 555 B Backhoe</u> (Mast, Chassis, Cables, Carousel, Hoses, Etc.)	12-12-96	12-13-96	Pass	TJC
DRILLING TOOLS (Pipe Wrenches, Hand Tools, Lifting Bells, Clevis, Chains, Etc.)	12-12-96	12-13-96	Pass	TJC
DOWN HOLE TOOLS (Drilling Rods, Stabilizers, Washover Pipe, Bits, Etc.)	12-12-96	12-13-96	Pass	TJC
WELL CONSTRUCTION MATERIALS (Casing, Screen, Centralizers, Etc.)	NA	--	--	--
WORKOVER RIG _____ (Mast, Chassis, Cables, Hoses, Etc.)	NA	--	--	--
DEVELOPMENT TOOLS (Tubing, Bailers, Pumps, Etc.)	NA	--	--	--
OTHER EQUIPMENT OR RE-INSPECTIONS (SPECIFY)				
Augers: 9-in. diam., solid-stem	12-16-96	12-16-96	Pass	TJC

COMMENTS: Initial decontamination of rig, augers, and tools on 12-12-96. Second set of augers (used 12-16-96)
decontaminated on 12-16-96. S. Jones (ECO) waives decontamination requirement between wells.

EQUIPMENT DECONTAMINATION INSPECTION SUMMARY

P&A ☒

REDEVELOPMENT ☐

DATE: START: 12-17-96

FINISH: 12-19-95

COMMENTS: *The drill rig, all the washover pipe, shoes, drill bits, drill rods, stabilizer, and miscellaneous tools were steam cleaned after their last use, the date of which is unknown.

APPENDIX F

WELL REHABILITATION/REDEVELOPMENT REPORTS

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-142</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 5
LOCATION: <u>Kerr Hollow Quarry</u>		DATE: START: <u>5-23-97</u>	
OPERATOR: <u>G. Shillings - Highland Drilling Co.</u>		FINISH: <u>6-9-97</u>	
HELPER: <u>D. Williford - Highland Drilling Co.</u>		LOGGED BY: <u>Timothy Coffey - SAIC</u>	
WORK-OVER RIG: <u>Smeal Swab Rig</u>			

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
5-23-97	0758	0808	Arrive at GW-142 site. Note: Well GW-142 to be redeveloped because samplers claim well produces water too muddy to pump each time they sample. Measure water level at 134.95 ft below top of casing (BTOC). Tag bottom of well (firm) at 299.21 ft BTOC. Casing stick-up = 1.95 ft. Calculate a well volume of 278.4 gallons of water.
	0808	0914	Position Smeal Rig over the well. Raise the mast. Run 2-in. inside diameter (ID), 2 3/8-in. outside diameter (OD) steel swab tubing with check valve into the well to 298.7 ft BTOC.
	0914	0925	Begin swabbing the well. Swab tool hangs up inside the tubing while coming out with the first pull. Swab tool will not move up or down.
	0925	1100	Trip the tubing back out of the well to try and find the stuck swab tool (swab tool stuck just below a connection approximately 160-170 ft below ground surface (BGS). G. Shillings (Highland) departs to try and get some help to free the swab tool. Oversight departs for the day.
5-27-97	0844	0923	Arrive at GW-142 site. The swab tool is out of the tubing. G. Shillings (Highland) was able to free the swab tool by using a torch to melt the rubber on the swab cups. Disconnect the cable from the wire-line reel and pull through all the tubing on the ground.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-142</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			
			PAGE 2 of 5
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
5-27-97	0923	0945	Trip the remaining tubing out of the well.
(cont.)			
	0945	0958	Steam clean the check valve housing to remove the burnt rubber fragments. Re-steam clean all the tubing inside and out; replace the swab cups.
	0958	1042	Re-run the steel swab tubing (with check valve) back into the well to 298.7 ft BTOC.
	1042	1110	Lower the mast on the swab rig. Re-spool the cable onto the wire-line reel.
	1110	1156	Commence swabbing the well. Swab 55 gallons of water out of the well: water sample is slightly turbid, and has a slight petroliferous odor.
	1156	1202	Screen the water sample. Readings: pH = 8.1, specific conductance = 388 μ mhos/cm, temperature = 16.8°C.
	1202	1252	Break for lunch.
	1252	1426	Continue swabbing the well. Swab another 82 gallons of water out of the well (well swabbed to dryness): water sample is slightly turbid. Note: For some reason, the well dried up prior to removing 1 well volume of water. Tried measuring water level, but unable to get water level indicator probe past approximately 200 ft BGS because probe cable is clinging to well casing wall.
	1426	1436	Screen the water sample. Readings: pH = 8.0, specific conductance = 394 μ mhos/cm, temperature = 17.1°C. Depart site.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-142</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			
			PAGE 3 of 5
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
5-29-97	0810	0823	Arrive at GW-142 site. D. Williford (Highland) will operate the
(cont.)			swab rig for the remainder of the development. Start the Smeal rig,
			and let it warm up.
5-27-97	0823	0950	Swab the well. Swab 165 gallons of water out of the well (well is
			not completely dry, but it is producing so little with each pull that
			it is not practical to continue redevelopment at this time): water
			sample is fairly clear.
	0950	0956	Screen the water sample. Readings: pH = 8.0, specific conductance
			= 360 μ mhos/cm, temperature = 14.9°C.
	0956	1007	Try to measure the water level in the well: water level indicator
			cable is clinging to inside of casing, but no water to 209 ft BTOC.
			Depart site.
6-2-97	1303	1340	Arrive at GW-142 site. Begin swabbing the well. The Smeal rig
			runs out of fuel after having swabbed approximately 80 gallons of
			water (no sample obtained at this time).
	1340	1430	Waiting for fuel to be brought to location.
	1430	1434	Fuel is on site. Gas-up the Smeal rig.
	1434	1501	Continue swabbing the well. Swab a total of 165 gallons of water
			out of the well: water sample is fairly clear.
	1501	1506	Screen the water sample. Readings: pH = 8.0, specific conductance
			= 388 μ mhos/cm, temperature = 18.1°C. Depart site.
6-4-97	0812	0825	Arrive at GW-142 site. Add more fuel to Smeal rig. Hydraulic fluid
			is low, add 3 quarts transmission fluid to reservoir.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-142</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			
			PAGE 4 of 5
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
6-4-97	0825	0921	Begin swabbing the well. Swab 165 gallons of water out of the well:
(cont.)			water sample is fairly clear.
	0921	0932	Screen the water sample. Readings: pH=8.0, specific conductance
			= 374 μ mhos/cm, temperature = 15.9°C. Depart site.
6-6-97	0819	0945	Arrive at GW-142 site. Begin swabbing the well. Swab 165 gallons
			of water out of the well: water sample is fairly clear.
	0945	0953	Screen the water sample. Readings: pH=7.7, specific conductance
			= 371 μ mhos/cm, temperature = 15.9°C. Depart site.
6-9-97	0813	0903	Arrive at GW-142 site. Begin swabbing the well. Swab 130 gallons
			of water out of the well (well swabbed to dryness): water sample
			is fairly clear, and has a slight petroliferous odor.
	0903	0915	Screen the water sample. Readings: pH=7.8, specific conductance
			=370 μ mhos/cm, temperature = 15.5°C. Have removed a minimum
			of 3 well volumes from the well. There has been no significant
			fluctuation in water quality parameters, and there has been no
			improvement in water clarity over the last 5 samples.
			Redevelopment of GW-142 is complete.
	0915	0925	Begin tripping the swab tubing out of the well. The Smeal rig runs
			out of fuel with only 3 sections of tubing out of the well.
	0925	1023	D. Williford (Highland) departs to get more fuel.
	1023	1059	D. Williford returns. Fuel Smeal rig, and continue tripping the swab
			tubing out of the well.

[illegible]

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-142

MONITORING WELL REDEVELOPMENT SUMMARY

METHOD OF DEVELOPMENT: Swab

DEVELOPMENT DATE:

DEVELOPMENT OBSERVED BY: Timothy Coffey - SAICSTART: 5-23-97FINISH: 6-9-97ONE WELL VOLUME: 278.4 GALLONSTOTAL GALLONS PUMPED: 927 TOTAL WELL VOLUMES PUMPED: 3.3INITIAL pH: 8.1 FINAL pH: 7.8INITIAL SPECIFIC CONDUCTANCE: 388 μ mhos/cm FINAL: 370 μ mhos/cmDESCRIPTION OF INITIAL TURBIDITY: Slightly TurbidDESCRIPTION OF FINAL TURBIDITY: Fairly clearFINAL MEASURED TURBIDITY: Not MeasuredWELL APPROVED BY: W.K. Jago - ECOODOR OF WATER: Slight petroliferous odor.WATER DISCHARGED TO: ☒ GROUND SURFACE☐ TANK TRUCK☐ STORM SEWERS☐ STORAGE TANKS☐ DRUMS☐ OTHER _____

INITIAL PRE-DEVELOPMENT

WATER DEPTH: 133.0 ft BGS on 5-23-97

DEVELOPMENT OBSERVATIONS: Well is a fair to poor producer (well normally gave up approximately 0.6 well volume each development session). Redevelopment water was turbid only at start of redevelopment and at one other time during redevelopment.

OBSERVER SIGNATURE: Timothy CoffeyDATE: 6-9-97

Y-12 PLANT GWPP DEVELOPMENT WATER FIELD SCREENING/DISPOSAL SHEET

WELL NO. GW-142 SITE: Kerr Hollow QuarryAPPROX. VOLUME OF DEVELOPMENT WATER: 927 Gallons

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

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Sp. Cond. meter	<u>X</u>	(model)	<u>YSI S-C-T Meter Model 33</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS:

Date	Time	pH	Sp. Cond.	Organic Vapors	Beta/Gamma	Alpha
<u>5-27-97</u>	<u>1156</u>	<u>8.1</u>	<u>388 µmhos/cm</u>	<u>0.6 ppm</u>	<u>20 cpm</u>	<u>0 cpm</u>
<u>5-27-97</u>	<u>1426</u>	<u>8.0</u>	<u>394 µmhos/cm</u>	<u>0.6 ppm</u>	<u>20 cpm</u>	<u>0 cpm</u>
<u>5-29-97</u>	<u>0950</u>	<u>8.0</u>	<u>360 µmhos/cm</u>	<u>0.5 ppm</u>	<u>20 cpm</u>	<u>0 cpm</u>
<u>6-2-97</u>	<u>1501</u>	<u>8.0</u>	<u>388 µmhos/cm</u>	<u>0.1 ppm</u>	<u>20 cpm</u>	<u>0 cpm</u>
<u>6-4-97</u>	<u>0921</u>	<u>8.0</u>	<u>374 µmhos/cm</u>	<u>0.2 ppm</u>	<u>20 cpm</u>	<u>0 cpm</u>
<u>6-6-97</u>	<u>0945</u>	<u>7.7</u>	<u>371 µmhos/cm</u>	<u>1.0 ppm</u>	<u>20 cpm</u>	<u>0 cpm</u>
<u>6-9-97</u>	<u>0903</u>	<u>7.8</u>	<u>370 µmhos/cm</u>	<u>0.3 ppm</u>	<u>20 cpm</u>	<u>0 cpm</u>
		(4.0-10.5)	(<1000 µmhos/cm)	(<5 ppm)	(<100 cpm)	(<500 cpm)

Weather: Refer to field logbook.Temp.: Refer to field logbookDISPOSITION: Drill-site Disposal XContainerization
(Labeled?) y/n

Describe: Development water discharged to the ground surface.

Onsite Geologist (print): Timothy Coffey - SAICSignature: Date: 6/9/97

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-156</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 3
LOCATION: <u>Sediment Disposal Basin</u>		DATE: START: <u>9-23-96</u>	
OPERATOR: <u>H. Hall - Highland Drilling Co.</u>		FINISH: <u>9-26-96</u>	
HELPER: <u>R.M. Collins - Highland Drilling Co.</u>		LOGGED BY: <u>Timothy Coffey - SAIC</u>	
WORKOVER RIG: <u>N/A</u>			

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
9-23-96	1131	1209	Oversight arrives at GW-156 site. Water level measured on 9-20-96 at 143.2 ft below the top of casing (BTOC). Bottom of well also tagged on 9-20-96 (solid) at 157.7 ft BTOC. Note: The Subsurface Data Base (Y/TS-881/R3) reports the total depth of GW-156 at 157.0 ft. Well volume = 9.5 gallons. Begin setting up: development will be by bailing, using a wire-line on a hose reel to run the bailer up and down the well.
	1209	1249	Crew arrives, break for lunch.
	1249	1311	Begin bailing water out of the well. Bail 5 gallons of water out of the well: water sample is fairly clear, can read bold text through the water sample.
	1311	1340	Screen water sample. Readings: pH = 7.5, conductance = 550 μ hos/cm, temperature = 17.7°C. Using the wire-line to move bailer up and down the well will not work; the hose reel is too flimsy to stand up to the constant reeling.
	1340	1440	Crew departs to get some rope to run bailer in and out of the well by hand.
	1440	1500	Crew returns. Continue bailing the well. Bail another 10 gallons of water out of the well: water sample is slightly turbid, with a slight milky appearance.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-156</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			
			PAGE 2 of 3
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
9-23-96	1500	1509	Screen water sample. Readings: pH = 7.4, conductance =
(cont.)			530 μ hos/cm, temperature = 17.3°C.
	1509	1521	Continue bailing the well. Bail another 5 gallons of water out of the
			well (well bailed to dryness). Water sample is slightly turbid.
	1521	1544	Screen water sample. Readings: pH = 7.4, conductance =
			505 μ hos/cm, temperature = 17.1°C. Secure wellhead. Depart
			site.
9-24-96	1038	1103	Arrive at GW-156 site. Begin bailing the well. Bail 10 gallons of
			water out of the well. Water sample is fairly clear.
	1103	1125	Screen water sample. Readings: pH = 7.5, conductance =
			500 μ hos/cm, temperature = 16.8°C.
	1125	1205	Break for lunch.
	1205	1221	Continue bailing the well. Bail another 7 gallons of water out of the
			well (well bailed to dryness). Water sample is turbid.
	1221	1258	Screen water sample. Readings: pH = 7.5, conductance =
			500 μ hos/cm, temperature = 17.1°C. Secure wellhead. Depart
			site.
9-25-96	0941	1011	Arrive at GW-156 site. Begin bailing the well. Bail 10 gallons of
			water out of the well. Water sample is slightly turbid.
	1011	1016	Screen water sample. Readings: pH = 7.4, conductance =
			490 μ hos/cm, temperature = 15.2°C.
	1016	1148	Wait for well to recharge.

PAGE 3 of 3

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Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-156

MONITORING WELL REDEVELOPMENT SUMMARY

METHOD OF DEVELOPMENT: Bailing

DEVELOPMENT DATE:

DEVELOPMENT OBSERVED BY: Timothy Coffey - SAICSTART: 9-23-96FINISH: 9-26-96ONE WELL VOLUME: 9.5 GALLONSTOTAL GALLONS PUMPED: 65 TOTAL WELL VOLUMES PUMPED: 6.8INITIAL pH: 7.5 FINAL pH: 7.4INITIAL SPECIFIC CONDUCTANCE: 550 μ mhos/cm FINAL: 497 μ mhos/cmDESCRIPTION OF INITIAL TURBIDITY: Fairly ClearDESCRIPTION OF FINAL TURBIDITY: Slightly TurbidFINAL MEASURED TURBIDITY: Not AnalyzedWELL APPROVED BY: W.K. Jago - HSEAODOR OF WATER: None Discernable

WATER DISCHARGED TO: ☒ GROUND SURFACE ☐ TANK TRUCK
☐ STORM SEWERS ☐ STORAGE TANKS
☐ DRUMS ☐ OTHER _____

INITIAL PRE-DEVELOPMENT
WATER DEPTH: 143.2 ft BTOC on 9-20-96DEVELOPMENT OBSERVATIONS: Well is a moderately good producing well. Well consistently yielded approximately 2 well volumes of water each day of redevelopment with minimum wait for recharge.Water clarity did not improve significantly. Water quality parameters remained fairly consistent throughout redevelopment.OBSERVER SIGNATURE: DATE: 9-26-96

Y-12 PLANT GWPP DEVELOPMENT WATER FIELD SCREENING/DISPOSAL SHEET

WELL NO. GW-156 SITE: Sediment Disposal BasinAPPROX. VOLUME OF DEVELOPMENT WATER: 65 Gallons

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

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Sp. Cond. meter	<u>X</u>	(model)	<u>YSI S-C-T Meter Model 33</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS:

Date	Time	pH	Sp. Cond.	Organic Vapors	Beta/Gamma	Alpha
<u>9-23-96</u>	<u>1311</u>	<u>7.5</u>	<u>550 μmhos/cm</u>	<u>0.0 ppm</u>	<u>50 cpm</u>	<u>0 cpm</u>
<u>9-23-96</u>	<u>1500</u>	<u>7.4</u>	<u>530 μmhos/cm</u>	<u>0.0 ppm</u>	<u>50 cpm</u>	<u>0 cpm</u>
<u>9-23-96</u>	<u>1521</u>	<u>7.4</u>	<u>505 μmhos/cm</u>	<u>0.0 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>9-24-96</u>	<u>1103</u>	<u>7.5</u>	<u>500 μmhos/cm</u>	<u>0.0 ppm</u>	<u>50 cpm</u>	<u>0 cpm</u>
<u>9-24-96</u>	<u>1221</u>	<u>7.5</u>	<u>500 μmhos/cm</u>	<u>0.0 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>9-25-96</u>	<u>1011</u>	<u>7.4</u>	<u>490 μmhos/cm</u>	<u>0.0 ppm</u>	<u>50 cpm</u>	<u>0 cpm</u>
<u>9-25-96</u>	<u>1204</u>	<u>7.4</u>	<u>484 μmhos/cm</u>	<u>0.9 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
		<u>(4.0-10.5)</u>	<u>(<1000 μmhos/cm)</u>	<u>(<5 ppm)</u>	<u>(<100 cpm)</u>	<u>(<500 cpm)</u>

Weather: Refer to field logbook.Temp.: Refer to field logbookDISPOSITION: Drill-site Disposal XContainerization
(Labeled?) y/n

Describe: Development water discharged to the ground surface.

Onsite Geologist (print): Timothy Coffey - SAICSignature: Date: 9/26/96

Y-12 PLANT GWPP DEVELOPMENT WATER FIELD SCREENING/DISPOSAL SHEET

WELL NO. GW-156 SITE: Sediment Disposal BasinAPPROX. VOLUME OF DEVELOPMENT WATER: 65 Gallons

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

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Sp. Cond. meter	<u>X</u>	(model)	<u>YSI S-C-T Meter Model 33</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS:

Date	Time	pH	Sp. Cond.	Organic Vapors	Beta/Gamma	Alpha
<u>9-26-96</u>	<u>1021</u>	<u>7.4</u>	<u>497 μmhos/cm</u>	<u>0.0 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
		(4.0-10.5)	(<1000 μ mhos/cm)	(<5 ppm)	(<100 cpm)	(<500 cpm)

Weather: Refer to field logbookTemp.: Refer to field logbookDISPOSITION: Drill-site Disposal XContainerization
(Labeled?) y/n

Describe: Development water discharged to the ground surface.

Onsite Geologist (print): Timothy Coffey - SAICSignature: Date: 9/26/96

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-159</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 4
LOCATION: <u>Sediment Disposal Basin</u>		DATE: START: <u>9-19-96</u>	
OPERATOR: <u>H. Hall - Highland Drilling Co.</u>		FINISH: <u>9-30-96</u>	
HELPER: <u>R.M. Collins - Highland Drilling Co.</u>		LOGGED BY: <u>Timothy Coffey - SAIC</u>	
WORKOVER RIG: <u>Smeal Swab Rig</u>			

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
9-19-96	1237	1250	Oversight arrives at GW-159 site. The Smeal swab rig is on site, positioned over the well. B. McMaster (UT/HSEA) has just measured the water level at 117.2 ft below top of casing (BTOC) and tagged the bottom (solid) at 155.9 ft BTOC = 153.5 ft below ground surface (BGS). Note: The subsurface data base (Y/TS-881/R3) reports the total depth of GW-159 at 157.0 ft. Calculate a well volume of 25.3 gallons.
	1250	1320	Crew arrives. Break for lunch.
	1320	1357	Start swab rig, raise mast. Begin running tubing. Run 2-in. inside diameter (ID), 2 3/8-in. outside diameter (OD) steel swab tubing with check valve into the well to 154.9 ft BTOC.
	1357	1411	Commence swabbing the well. Swab 27 gallons of water out of the well. Water sample is slightly turbid.
	1411	1417	Screen water sample. Readings: pH = 7.8, conductance = 312 µmhos/cm, temperature = 17.5°C.
	1417	1430	Continue swabbing the well. Swab another 8 gallons of water out of the well (well swabbed to dryness). Water sample is slightly turbid and milky in appearance.
	1430	1440	Screen water sample. Readings: pH = 7.9, conductance = 306 µmhos/cm, temperature = 17.5°C.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-159</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			PAGE 2 of 4
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
9-19-96	1440	1500	Retract mast to a shorter length. Secure site and depart.
(cont.)			
9-20-96	0900	0904	Arrive at GW-159 site. Crew conducts pre-work equipment inspection.
	0904	0924	Start the swab rig and begin swabbing the well. Swab 17 gallons of water out of the well (well swabbed to dryness). Water sample is slightly turbid.
	0924	0929	Screen water sample. Readings: pH = 8.5, conductance = 287 μ mhos/cm, temperature = 15.4°C.
	0929	0933	Lower mast on swab rig as a safety precaution. Secure site and depart.
9-23-96	0848	0855	Arrive at GW-159 site. Conduct pre-work equipment inspection. Start Smeal rig; raise the mast.
	0855	0909	Begin swabbing the well. Swab 18 gallons of water out of the well (well swabbed to dryness). Water sample is slightly turbid, and has a milky appearance. Well did not fully recharge, even over the weekend.
	0909	0922	Screen water sample. Readings: pH = 8.4, conductance = 293 μ mhos/cm, temperature = 15.9°C. Secure site and depart.
9-24-96	0858	0904	Arrive at GW-159 site. Conduct pre-work equipment inspection. Start Smeal rig. Lower swab tubing to the bottom of the well (155.9 ft BTOC).

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-159</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			PAGE 3 of 4
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
9-24-96	0904	0922	Begin swabbing the well. Swab 15 gallons of water out of the well
(cont.)			(well swabbed to dryness). Water sample is moderately turbid.
	0922	0938	Screen water sample. Readings: pH = 8.4, conductance =
			296 μ mhos/cm, temperature = 16.0°C. Secure site and depart.
9-25-96	0901	0909	Arrive at GW-159 site. Crew replaces battery in Smeal rig (was
			used to jump-start support vehicle yesterday). Conducts pre-work
			equipment inspection.
	0909	0932	Start Smeal rig. Begin swabbing the well. Swab 15 gallons of water
			out of the well (well swabbed to dryness). Water sample is turbid
			and seems to contain more sediment (fine-grained sand) than
			previously.
	0932	0941	Screen water sample. Readings: pH = 8.3, conductance =
			298 μ mhos/cm, temperature = 16.6°C. Secure site and depart.
9-26-96	0902	0914	Arrive at GW-159 site. Crew conducts pre-work equipment
			inspection.
	0914	0930	Start Smeal rig. Swab 10 gallons of water out of the well (well
			swabbed to dryness—well is recharging less and less as
			development continues). Water sample is moderately turbid and
			still contains a small amount of fine-grained sand.
	0930	0957	Screen water sample. Readings: pH = 8.3, conductance =
			303 μ mhos/cm, temperature = 17.1°C. Report status to K. Jago
			(HSEA) who suggests letting the well recharge for 3 to 4 days
			before resuming development. Lower mast on Smeal rig as safety
			precaution. Secure site and depart.

[illegible]

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-159

MONITORING WELL REDEVELOPMENT PROGRESS

LOCATION: Sediment Disposal Basin

WELL INSTALLATION

WELL INSTALLATION
COMPLETION DATE: 10-18-85

ONE WELL VOLUME: 25.3 GALLONS

[illegible]

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-159

MONITORING WELL REDEVELOPMENT SUMMARY

METHOD OF DEVELOPMENT: Swab

DEVELOPMENT DATE:

DEVELOPMENT OBSERVED BY: Timothy Coffey - SAICSTART: 9-19-96FINISH: 9-30-96ONE WELL VOLUME: 25.3 GALLONSTOTAL GALLONS PUMPED: 127 TOTAL WELL VOLUMES PUMPED: 5.0INITIAL pH: 7.8 FINAL pH: 8.4INITIAL SPECIFIC CONDUCTANCE: 312 μ mhos/cm FINAL: 285 μ mhos/cmDESCRIPTION OF INITIAL TURBIDITY: Slightly TurbidDESCRIPTION OF FINAL TURBIDITY: Slightly TurbidFINAL MEASURED TURBIDITY: Not AnalyzedWELL APPROVED BY: W.K. Jago - HSEAODOR OF WATER: None Discernable

WATER DISCHARGED TO: ☒ GROUND SURFACE ☐ TANK TRUCK
☐ STORM SEWERS ☐ STORAGE TANKS
☐ DRUMS ☐ OTHER _____

INITIAL PRE-DEVELOPMENT
WATER DEPTH: 117.2 ft BTOC on 9-19-96

DEVELOPMENT OBSERVATIONS: Well is a poorly producing well. Well recharges to yield approximately 1/2 well volume daily, even less after extended daily development. The water failed to clear up at all. In fact, the water clarity became more turbid approximately 3/4 of the way through redevelopment. Water quality parameters remained fairly constant throughout redevelopment.
Fine grained sand was observed in discharge water on 9/25 and 9/26.

OBSERVER SIGNATURE: DATE: 9-30-96

Y-12 PLANT GWPP DEVELOPMENT WATER FIELD SCREENING/DISPOSAL SHEET

WELL NO. GW-159 SITE: Sediment Disposal BasinAPPROX. VOLUME OF DEVELOPMENT WATER: 127 Gallons

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

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Sp. Cond. meter	<u>X</u>	(model)	<u>YSI S-C-T Meter Model 33</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS:

Date	Time	pH	Sp. Cond.	Organic Vapors	Beta/Gamma	Alpha
<u>9-19-96</u>	<u>1411</u>	<u>7.8</u>	<u>312 μmhos/cm</u>	<u>0.1 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>9-19-96</u>	<u>1430</u>	<u>7.9</u>	<u>306 μmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>9-20-96</u>	<u>0924</u>	<u>8.5</u>	<u>287 μmhos/cm</u>	<u>0.0 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>9-23-96</u>	<u>0909</u>	<u>8.4</u>	<u>293 μmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>9-24-96</u>	<u>0922</u>	<u>8.4</u>	<u>296 μmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>9-25-96</u>	<u>0932</u>	<u>8.3</u>	<u>298 μmhos/cm</u>	<u>0.0 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>9-26-96</u>	<u>0930</u>	<u>8.3</u>	<u>303 μmhos/cm</u>	<u>0.0 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
		<u>(4.0-10.5)</u>	<u>(<1000 μmhos/cm)</u>	<u>(<5 ppm)</u>	<u>(<100 cpm)</u>	<u>(<500 cpm)</u>

Weather: Refer to field logbookTemp.: Refer to field logbookDISPOSITION: Drill-site Disposal XContainerization
(Labeled?) y/n

Describe: Development water discharged to the ground surface.

Onsite Geologist (print): Timothy Coffey - SAICSignature: Date: 9/30/96

Y-12 PLANT GWPP DEVELOPMENT WATER FIELD SCREENING/DISPOSAL SHEET

WELL NO. GW-159 SITE: Sediment Disposal BasinAPPROX. VOLUME OF DEVELOPMENT WATER: 127 Gallons

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

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Sp. Cond. meter	<u>X</u>	(model)	<u>YSI S-C-T Meter Model 33</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Rate meter with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS:

Date	Time	pH	Sp. Cond.	Organic Vapors	Beta/Gamma	Alpha
<u>9-30-96</u>	<u>0936</u>	<u>8.4</u>	<u>285 µmhos/cm</u>	<u>0.1 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
		(4.0-10.5)	(<1000 µmhos/cm)	(<5 ppm)	(<100 cpm)	(<500 cpm)

Weather: Refer to field logbookTemp.: Refer to field logbookDISPOSITION: Drill-site Disposal XContainerization
(Labeled?) y/n _____Describe: Development water discharged to the ground surface.Onsite Geologist (print): Timothy Coffey - SAICSignature: Date: 9/30/96

EQUIPMENT DECONTAMINATION INSPECTION SUMMARY

LOCATION: Sediment Disposal Basin

DATE: START: 9-19-96

DECONTAMINATION CREW: H. Hall/R.M. Collins

FINISH: 9-30-96

COMMENTS:

APPENDIX G
WELL LOCATION MAPS

LEGEND:

- BUILDING
- POND, LAKE, & IMPOUNDMENT
- ROAD
- STREAM OR CREEK
- CONTOUR (100 FT. INTERVAL)
- CONTOUR (1000 FT. INTERVAL)
- OGP-6 FY 1997 TEMPORARY PIEZOMETER LOCATION
- GW-156 FY 1997 REHABILITATED WELL LOCATION
- + GW-665 FY 1997 WELL P & A LOCATION

PLATE 1 FY 1997 MONITORING WELL LOCATIONS NORTHERN SECTION

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0	P. HOLM	T. COFFEY	08/08/97
0	P. HOLM	T. COFFEY	08/24/97

REFERENCES	PLOT FILES
BASE/0RR/S16A/S16RDS BASE/0RR/S16A/S16BLDG BASE/0RR/S16A/S16TOPO BASE/0RR/S16A/S16HYD	96030/PLOT/773Y12-N.PLT

96030/DWGS/773Y12-N
CAD FILE #

LEGEND:

- BUILDING
- POND, LAKE, & IMPOUNDMENT
- ROAD
- STREAM OR CREEK
- CONTOUR (100 FT. INTERVAL)
- CONTOUR (1000 FT. INTERVAL)
- GP-6 FY 1997 TEMPORARY PIEZOMETER LOCATION
- GW-156 FY 1997 REHABILITATED WELL LOCATION
- P GW-665 FY 1997 WELL P & A LOCATION

**PLATE 2 FY 1997
MONITORING WELL
LOCATIONS
SOUTHERN SECTION**

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1	P. HOLM	T. COFFEY	09/24/97

XREFERENCES	PLOT FILES
BASE/ORR/S16A/S16RDS BASE/ORR/S16A/S16BLDG BASE/ORR/S16A/S16TOPO BASE/ORR/S16A/S16HYD	96030/PL07/773-Y12.PLT

96030/DWGS/773Y12-S
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