

SNL MWL 07

07-03



National Nuclear Security Administration
Sandia Site Office
P.O. Box 5400
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AUG 03 2007

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

Mr. James Bearzi
Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Road, Bldg. E
Santa Fe, New Mexico 87505



Dear Mr. Bearzi:

On behalf of Sandia Corporation and the Department of Energy (DOE), DOE is submitting two enclosed documents:

- 1) Response to NMED's "Notice of Disapproval: Monitoring Well Plug and Abandonment Plan and Replacement Well Construction Plan; Decommissioning of Groundwater Monitoring Wells MWL-BW1; Installation of Replacement Groundwater Monitoring Wells MWL-BW2, April 9, 2007" (Enclosure 1); and
- 2) Monitoring Well Plug and Abandonment Plan and Replacement Well Construction Plan; Decommissioning of Groundwater Monitoring Wells MWL-BW1; Installation of Replacement Groundwater Monitoring Wells MWL-BW2, Revision 1" (Enclosure 2).

This Plug and Abandonment Plan is required under Section VIII.C of the Compliance Order on Consent.

In order to be efficient and save limited funding, we have scheduled the replacement of monitoring well MWL-BW1 for August 2007 to coincide with other field work scheduled for August. If possible, we would very much appreciate it if your office could notify us within two weeks of receipt of this letter if the enclosed documents meet your requirements.

If you have any questions regarding this submittal, please contact me at (505) 845-6036, or Dan Pellegrino of my staff at (505) 845-5398.

Sincerely,

Patty Wagner
Manager

James Bearzi

(2)

JUL 30 2007

Enclosures (2)

cc w/enclosures:

W. Moats, NMED-HWB (Via Certified Mail)

L. King, EPA, Region 6 (Via Certified Mail)

T. Skibitski, NMED-OB-DOE

cc w/o enclosures:

A. Blumberg, SNL/NM, Org. 11100, MS 0141

D. Miller, SNL/NM, Org. 6765, MS 0718

P. Freshour, SNL/NM, Org. 6765, MS 1089

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T. Longo, HQ/GTN, NA-56

M. Reynolds, SSO, MS 0184

J. Estrada, SSO, MS 0184

CERTIFICATION STATEMENT FOR APPROVAL AND FINAL RELEASE OF DOCUMENTS

Document title: DOE/Sandia Response to NMED's "Notice of Disapproval: Monitoring Well Plug and Abandonment Plan and Replacement Well Construction Plan, Decommissioning of Groundwater Monitoring Well MWL-BW1, Installation of Replacement Groundwater Monitoring Well MWL-BW2, April 9, 2007"; and Revised Plan, July 2007

Document author: Mike Skelly, Dept. 6765

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment for knowing violations.

Signature: *Francis B. Nimick* Date: 7/19/07
Francis B. Nimick
Deputy to the
Nuclear Energy and Global Security Technologies
Center 6700
Sandia National Laboratories/New Mexico
Albuquerque, New Mexico 87185
Operator

and

Signature: *Patty Wagner* Date: 7/30/07
Patty Wagner
Manager
U.S. Department of Energy
National Nuclear Security Administration
Sandia Site Office
Owner and Co-Operator

ENCLOSURE 1

July 9, 2007

DOE/Sandia Responses to NMED's

“Notice of Disapproval: Monitoring Well Plug and Abandonment Plan and Replacement Well Construction Plan, Decommissioning of Groundwater Monitoring Well MWL-BW1, Installation of Replacement Groundwater Monitoring Well MWL-BW2, April 9, 2007”

INTRODUCTION

This document responds to the comments received in a Notice of Disapproval (NOD) letter from the New Mexico Environment Department (NMED) to the U.S. Department of Energy (DOE) and Sandia Corporation (Sandia) on June 19th, 2007 regarding the plug and abandonment of a groundwater monitoring well with the installation of a replacement well at the Mixed Waste Landfill (MWL) at Sandia National Laboratories (SNL). The letter is entitled *“Notice of Disapproval: Monitoring Well Plug and Abandonment Plan and Replacement Well Construction Plan Decommissioning of Groundwater Monitoring Well MWL-BW1, Installation of Replacement Groundwater Monitoring Well MWL-BW2, April 9, 2007; Sandia National Laboratories NM5890110518; HWB-SNL-07-014.”*

The NMED NOD letter contained 13 comments. This document lists each NMED comment in boldface, followed by the DOE/Sandia response, written in normal font under “Response”. Attached to this response to comments is a revised version of the *“Monitoring Well Plug and Abandonment Plan and Replacement Well Construction Plan, Decommissioning of Groundwater Monitoring Well MWL-BW1, Installation of Replacement Groundwater Monitoring Well MWL-BW2, Revision 1”*

Sandia National Laboratories is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under Contract DE-AC04-94AL85000.

1. Page 5, Section 5 – the one sentence in this paragraph references well TAV-MW10. This appears to be a typographical error and likely should refer to proposed replacement well MWL-BW2. If in error, modify the plan to correct the error.

Response: The typographical error in the referenced sentence has been corrected. The sentence in the revised *“Monitoring Well Plug and Abandonment Plan and Replacement Well Construction Plan, Decommissioning of Groundwater Monitoring Well MWL-BW1, Installation of Replacement Groundwater Monitoring Well MWL-BW2, Revision 1”* (hereafter referred to as the plan) now reads: “A replacement monitoring well (MWL-BW2) will be installed after MWL-BW1 has been decommissioned.”

2. Page 5, Section 5.1 – this section states that MWL-BW2 will be installed a minimum of 25 feet away from the existing well (MWL-BW1) location. Later, the text states that MWL-BW2 will be located about 700 feet northeast of MWL-BW1, but that the actual location will be selected with concurrence from NMED. The proposed location for MWL-BW2 as shown on Figure 1 is acceptable to the NMED. A location about 200 feet east of the Mixed Waste Landfill (MWL) should be sufficient. Modify the plan to more precisely indicate the location of proposed well MWL-BW2.

Response: This section of the plan has been clarified and now reads: “MWL-BW2 will be installed at a location approximately 710 ft northeast of MWL-BW1, and approximately 140 ft east of the MWL (Figure 1).” Also, please note that the proposed location for MWL-BW2 has been adjusted slightly to the north from the location shown in the original Figure 1. The new proposed location is now due east of the center of the MWL footprint.

3. Page 5, Section 5.2.1 – This section states that the total depth of the borehole in which MWL-BW2 is to be constructed will be determined by a field geologist. The anticipated well screen depth as discussed in the subject plan is 472-502 feet below ground surface. NMED expects MWL-BW2 to be screened in the uppermost part of the saturated zone, with about 5 feet of screen above the water table. Because of the proposal to use 30 feet of screen, instead of 20 feet, and because of the significant vertical gradient that exists at the MWL site, the water level in MWL-BW2 is expected to be significantly lower than that observed in existing well MWL-BW1. This will need to be considered when generating future water-level maps. Modify the plan to indicate that the well screen for MWL-BW2 will be set with about 5 feet of screen situated above the water table.

Response: The third paragraph in this section of the plan has been clarified and now reads: “Based on current conditions in MWL-BW1 and the most recent groundwater level measurements (March 2007), monitoring well MWL-BW2 is anticipated to be drilled to approximately 502 ft bgs. The well screen for MWL-BW2 will be set with approximately 5 ft of screen situated above the static water level. The anticipated depth to water at this location is 472 ft bgs, therefore, the screen completion interval is expected to be approximately 467 to 497 ft bgs with a 5-foot sump placed below the screen.”

4. Page 5, Section 5.2.1 – The Permittees shall log the geology of the borehole during drilling, given that MWL-BW2 is to be located a substantial distance from the well it will replace. Modify the plan to state that the geology of the borehole will be logged during drilling.

Response: The Field Operating Procedure (FOP) 94-05 “Borehole Lithologic Logging” was referenced in Table 1 of the plan; this reference represented the intent of DOE/Sandia to describe the geology of the borehole during drilling. This reference remains in the revised plan, and to clarify, a sentence has been added to the first paragraph of this section that reads: “The geology of the borehole will be logged during drilling.”

5. Page 5, Section 5.2.1 – The Permittees shall log the depth of the first encounter with regional groundwater and any perched groundwater, during drilling. Modify the plan to state that the depth of regional groundwater and the depth of any perched groundwater will be logged during drilling.

Response: As with Comment 4, by referencing Field Operating Procedure (FOP) 94-05 “Borehole Lithologic Logging” in Table 1 of the plan, DOE/Sandia indicated the intent to describe the depth of regional groundwater and the depth of any perched groundwater encountered during drilling. To clarify our intent, a sentence has been added to the first paragraph of this section that reads: “The depth of the first encounter with regional groundwater and any perched groundwater will be logged during drilling.”

6. Page 6, Section 5.2.2 – The screen shall be constructed of slotted schedule 80 polyvinyl chloride (PVC). Although the transmittal letter implies that the screen will be made of PVC, the plan does not. Modify the plan to state that the screen will be made of PVC.

Response: The second sentence of the second paragraph in Section 5.2.2 has been changed to read: “To accommodate the rapidly declining water table, a 30-ft length of PVC screen with a 0.010-inch or 0.020-inch slot size will be used for the replacement well.”

7. Page 6, Section 5.2.2 – At the MWL, sediments making up the uppermost part of the saturated zone are fine-grained. The subject plan calls for the use of 10-20 silica sand for the primary filter pack and 0.020 inch slotted screen. The Permittees need to ensure that the screen slot size and gradation of the filter pack material is of proper size to prevent water samples collected from the well from exhibiting high turbidity. Modify the plan to state that primary filter pack and screen slot size will be changed in the field if necessary based on the gradation of sediments actually encountered in the interval to be monitored.

Response: The first sentence of the third paragraph in Section 5.2.2 has been replaced with the following sentences: “The appropriate screen slot size and gradation of the filter pack

material will be based on the gradation of the sediments in the screen interval as determined in the field by the geologist logging the borehole. If the predominant water-bearing interval consists mostly of clay and silt, a 0.010-inch screen slot and a primary filter pack of clean 20-40 silica sand will be placed in the annulus. However, if the predominant water-bearing interval consists mostly of silt and sand, a 0.020-inch screen slot and a primary filter pack of clean 10-20 silica will be placed in the annulus.”

8. Page 6, Section 5.2.2 – The plan calls for the installation of grout in at least two lifts. Please note that during the installation of well MWL-MW5, grout intruded the well screen. Although there are several possible explanations for what caused this grout intrusion to occur, the emplacement of grout in lifts that were too long may have led to this problem. Modify the plan to place grout using more lifts, with a minimum of 24 hours of setting time between the first two lifts.

Response: The fifth and sixth sentences of the fourth paragraph in Section 5.2.2 have been replaced with the following sentences: “To prevent overloading, the bentonite grout will be installed in multiple lifts. The first bentonite grout lift will be approximately 100 ft thick and will be allowed to set a minimum of 24 hours before installation of the next lift. Subsequent bentonite grout lifts will each be approximately 200 ft thick.”

Also, please note that the first sentence of the fourth paragraph in Section 5.2.2 of plan has been changed from “A 30-ft thick layer of ¼-inch bentonite pellets or 3/8-inch bentonite chips will be placed above the filter pack . . .” to now read “A 10-ft thick layer of ¼-inch bentonite pellets or 3/8-inch bentonite chips . . .”. This change was made based on consultations with experienced well drillers who pointed out that a 30-ft thick layer of bentonite pellets/chips was difficult to confidently install inside the drive casing. A 10-ft thickness reflects current standard industry practice for a bentonite pellet/chip plug.

9. Page 6, Section 5.2.2 – The plan states that PVC centralizers will be placed at the top and bottom of the screen. Modify the plan to state that additional centralizers will be added from the top of the screen to the surface, not to exceed an interval of 100 feet.

Response: The following text has been added to the fourth sentence of the second paragraph in Section 5.2.2: “. . . and then at intervals not to exceed 100 feet up to the ground surface.”

10. Page 6, Section 5.2.2 – Modify the plan to indicate that the well location (easting/northing or latitude/longitude and top of casing) will be surveyed. Indicate also the degree of accuracy for the survey.

Response: The well location survey requirements are identified in Section 10.2 “Well Installation Records”. To clarify, the tenth bulleted item in Section 10.2 now reads:

"Surveyed elevations and location in New Mexico state plane coordinates (with a degree of accuracy of ± 0.01 feet)."

11. Page 8, Section 5.2.3 – Modify the plan to state the parameters that are to be measured during well development.

Response: The third sentence of this section now reads: "During development, the groundwater field parameters (pH, specific conductivity, temperature, and turbidity) will be continuously monitored, and development will continue until parameters have stabilized."

12. Page 8, Section 5.2.3 – Modify the plan to indicate that the method of development, the volume of water added or removed, the parameters measured, the results of the measurements, and the time these activities take place are to be documented in writing during well development. Indicate in the plan that only potable water shall be used to develop the well.

Response: By referencing Field Operating Procedure (FOP) 94-41 "Well Development" in Table 1 of the plan, DOE/Sandia intended to document the well development activities. To clarify our intent, the following sentences have been added to the end of the first paragraph in this section: "The method of development, the volume of water added or removed, the parameters measured, the results of the measurements, and the time these activities take place will be documented in writing during well development. If required, only potable water shall be added to the well during development."

13. Modify the plan to specify in detail the criteria for which well development will be considered adequate and complete.

Response: The well development criteria are specified in FOP 94-41 "Well Development". To clarify our intent, the following paragraph has been added to the end of Section 5.2.3: "During development of this water-table completion well, a minimum of 5 well bore volumes will be removed. After the minimum well bore volume has been removed, development will continue until representative water is obtained. Representative water is assumed to be obtained when pH, temperature, turbidity, and specific conductivity readings stabilize (less than 10% variability over 3 consecutive well bore volumes) and the water is visually clear of suspended solids with a target turbidity of less than 5 Nephelometric Turbidity Units (NTUs)."

ENCLOSURE 2

**Monitoring Well Plug and Abandonment Plan
and
Replacement Well Construction Plan**

**Decommissioning of
Groundwater Monitoring Well MWL-BW1**

**Installation of Replacement
Groundwater Monitoring Well MWL-BW2**

Revision 1

**Environmental Restoration Project
Sandia National Laboratories, New Mexico**

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Table of Contents

	Page:
Documentation:	
1 Project and Site Information	1
2 Regulatory Criteria	1
3 Existing Well Information	2
4 Plugging and Abandonment	2
4.1 Goal	4
4.2 Objective	4
4.3 Implementation	4
5 Monitoring Well Installation	5
5.1 Objective	5
5.2 Implementation	5
5.2.1 Borehole Drilling	5
5.2.2 Well Construction	6
5.2.3 Well Development	7
6 Equipment Decontamination	7
7 Health and Safety	9
8 Pre-field Activities	9
9 Mobilization and Site Setup	9
10 Reporting	9
10.1 Decommissioning Records	9
10.2 Well Installation Records	10
11 References	11
Figures:	
Figure 1 Location of MWL-BW1 and proposed well MWL-BW2	3
Figure 2 MWL-BW1 Groundwater Elevations Over Time	8
Tables:	
Table 1 Applicable Operating Procedures	4
Attachments:	
Attachment 1--Monitoring Well Completion Diagram for MWL-BW1	
Attachment 2--Groundwater Well Abandonment Diagram	
Attachment 3--Well Plug and Abandonment Form	
Attachment 4--Groundwater Monitoring Well Data Sheet	

1 Project and Site Information

Task Description: Sandia National Laboratories/New Mexico (SNL/NM) decommissioning with plug and abandonment of one groundwater monitoring well, and installation of one replacement groundwater monitoring well

Case No.: 98026.01.08

Project Leader/Department No.: Paul Freshour/6765

Scheduled Start Date: June 2007

Estimated Completion Date: August 2007

Operations/Technical Area: Mixed Waste Landfill/Technical Area III

2 Regulatory Criteria

This Plug and Abandonment (P&A) Plan outlines the activities and procedures to decommission existing groundwater monitoring well MWL-BW1, and install replacement groundwater monitoring well MWL-BW2.

Regulatory guidance for well plug and abandonment can be found in New Mexico Environment Department, Hazardous Waste Bureau (NMED/HWB) requirements. Section VIII.C of the Compliance Order on Consent (the Order) discusses well abandonment (NMED April 2004):

"Wells shall be abandoned when they are no longer required in the monitoring network, no longer provide representative groundwater samples because of falling water levels or insufficient productivity, or become damaged beyond repair. The goal of well abandonment is to seal the well in such a manner that it cannot act as a conduit for the migration of contaminants from either the ground surface to the saturated zone or between saturated zones. Respondents shall prepare an abandonment plan for any and all wells that are to be plugged and abandoned, and shall submit the plan to the Department for approval. Respondents shall not abandon any groundwater monitoring well without prior written approval of the Department."

Further guidance for well P&A procedures can be found in the New Mexico Office of the State Engineer (OSE) "Rules and Regulations Governing Well Driller Licensing; Construction, Repair and Plugging of Wells" (NM OSE August 2005):

"To plug a well, the entire well shall be filled from the bottom upwards to land surface using a tremie pipe. The well shall be plugged with neat cement slurry, bentonite based plugging material, or other sealing material approved by the state engineer for use in the plugging of non-artesian wells"

The OSE guidance also states that:

"Wells encountering contaminated water or soil may require coordination between the office of the state engineer and the New Mexico environment department (or other authorized agency or department) prior to the plugging of the well."

And,

“A licensed well driller shall keep a record of each well plugged as the work progresses. The well driller shall file a complete plugging record with the state engineer and the permit holder no later than twenty (20) days after completion of the plugging. The plugging record shall be on a form prescribed by the state engineer . . .”

To meet these regulatory requirements, the following tasks will be completed at SNL/NM:

- Decommission well MWL-BW1 because it no longer provides representative groundwater samples due to falling water levels and insufficient productivity.
- Submit this P&A Plan to the NMED/HWB and OSE for review and approval.
- Use a licensed well driller and approved materials to seal the well so that it cannot act as a conduit for the migration of potential contaminants from the ground surface to the saturated zone.
- Upon completion of the P&A activities, submit a plugging record to the OSE and submit a P&A Report describing the field activities to the NMED/HWB.

3 Existing Well Information

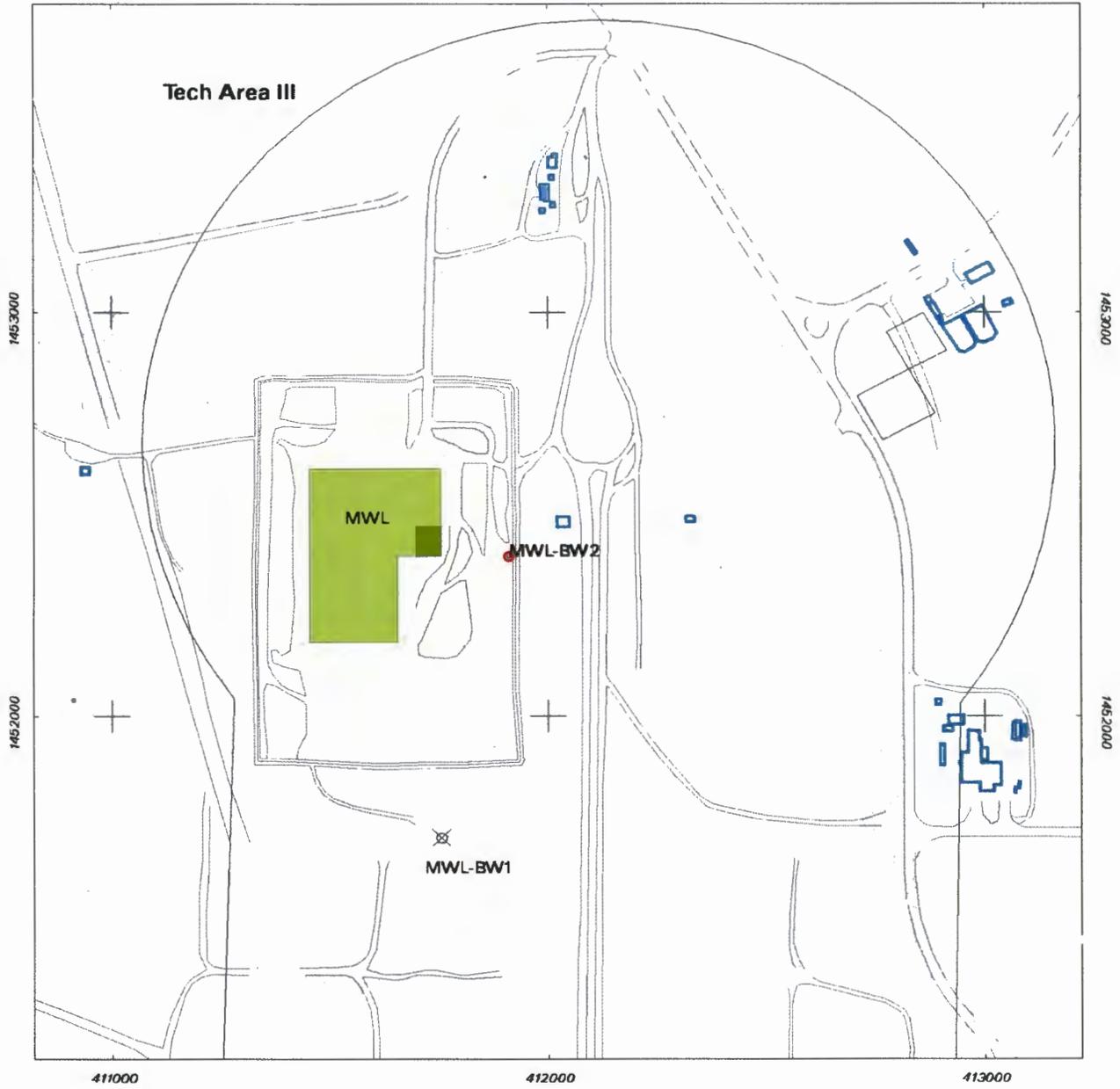
Groundwater monitoring well MWL-BW1 is proposed for decommissioning in this P&A Plan. The monitoring well completion diagram is presented in Attachment 1, and the pertinent well completion information is summarized below.

MWL-BW1 is a background groundwater monitoring well located at the Mixed Waste Landfill (Figure 1). This well was installed in July 1989 and is completed in the regional aquifer with the following well completion details:

- Total depth of the well – 477 feet (ft) below ground surface (bgs).
- Screened interval – 452 to 472 ft bgs.
- Construction materials – Polyvinyl chloride (PVC) riser pipe, stainless steel screen, carbon steel protective surface casing and guard posts, and a concrete well pad.
- Current water level – approximately 472 ft bgs.
- Water-bearing strata – Groundwater occurs in unconsolidated silts and sands (alluvial fan facies) of the upper Santa Fe Group that have relatively low hydraulic conductivities.
- Reason for decommissioning – The regional water table has dropped to the lowest portion of the screened interval and the well requires excessive time to recover between purging and sampling. There is no evidence that suggests the annular seal is compromised.

4 Plugging and Abandonment

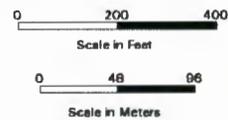
Based on the requirements established by the NMED/HWB and OSE, the groundwater monitoring well MWL-BW1 will be decommissioned. Applicable Field Operating Procedures (FOPs) and Administrative Operating Procedures (AOPs) are listed in Table 1; however, this site-specific P&A Plan should be used as the primary guidance in the field.



Legend

-  Existing Groundwater Monitoring Well Proposed for Plug and Abandonment
-  Replacement Groundwater Monitoring Well (location shown schematically)
-  Building / Structure
-  Paved and unpaved Road
-  SWMU 240 / (Long Sled Track) boundary
-  SWMU 76 (MWL)

Figure 1
Location of MWL-BW1 and Proposed Well MWL-BW2



Sandia National Laboratories, New Mexico
Environmental Geographic Information System

Table 1. Applicable Operating Procedures

Number of Procedure	Title of Procedure
FOP 94-01	Safety Meetings, Inspections, and Pre-Entry Briefings Rev. 1, 12/16/96
FOP 94-05	Borehole Lithologic Logging, Rev. 0, 2/10/94
FOP 94-25	Documentation of Field Activities, Rev. 0, 11/4/94
FOP 94-26	General Equipment Decontamination, Rev. 1, 2/20/97
FOP 94-28	Health and Safety Monitoring of Organic Vapors (FID and PID), Rev. 2, 4/27/97
FOP 94-38	Drilling Methods and Drill Site Management, Rev. 0, 4/14/94
FOP 94-41	Well Development, Rev. 0, 11/21/94
FOP 94-42	Integration of the design, Installation, Rehabilitation, and Decommissioning of Environmental Restoration Wells, Rev. 1, 5/31/94
FOP 94-43	Decommissioning Of Wells, Rev 0, 5/31/94
FOP 94-45	Designing and Installing Groundwater Monitoring Wells, Rev. 0, 5/31/94
FOP 94-57	Decontaminating Drilling and Other Field Equipment, Rev. 0, 5/31/94
FOP 94-68	Field Change Control, Rev. 2 (in revision)
FOP 94-69	Personnel Decontamination (Level D, C, and B Protection), Rev. 1, 1/23/98
AOP 94-24	System and Performance Audits, Rev. 0, 1/12/95
AOP 94-25	Deficiency Reporting, Rev. 0, 1/12/95
AOP 95-16	Administrative Operating Procedure for Sample Management and Custody, Rev. 1, 4/18/96

4.1 Goal

The goal for decommissioning monitoring well MWL-BW1 is to eliminate the potential of this well to act as a conduit for the migration of potential contamination to groundwater. The well materials and annular seals are not believed to pose a threat to groundwater, and therefore will be backfilled in place with proper sealing materials.

4.2 Objective

The objective is to seal this monitoring well in such a manner that there is reasonable certainty that the abandonment has adequately eliminated the potential for cross-communication between the land surface and the aquifer, and the potential for downward migration of potential contaminants through the borehole annulus to the aquifer. All grouting techniques and grout mixtures used during decommissioning will minimize grout intrusion into the native formation.

4.3 Implementation

General activities for the implementation of the P&A include:

- 1) Remove all monitoring well surface completion features,
- 2) Backfill the casing with well-plugging materials, and
- 3) Construct a new surface pad/monument.

SNL/NM personnel and the selected drilling contractor will remove all surface completion features, such as guard posts, concrete well pads, and surface protective casing. Care will be taken to prevent materials from falling down the well casing and possibly causing a downhole obstruction. The well will be abandoned with casing left in place, and the well casing will be cut off at approximately 5 ft bgs.

The well screen and blank well casing will be sealed by lowering a tremie pipe to the base of the well casing (below the base of the screen) and injecting the plug material (bentonite grout) using a diaphragm or equivalent pump system. The plug material will be filled to within 5 ft of the ground surface and allowed to set overnight. If the level of the plug material in the well casing drops overnight, additional bentonite grout will be added to again reach within 5 ft of ground level.

Once the well has been properly plugged, the decommissioning process will be completed by placing concrete in the upper 5 ft of the well/borehole and installing a concrete slab on the surface. The concrete pad will be 4 inches thick with a 2 ft by 2 ft area, constructed in the ground so that the surface of the finished concrete slab will be 1 to 2 inches above the natural ground surface. A brass marker containing the well name and date of decommissioning will be set in the concrete pad.

5 Monitoring Well Installation

A replacement monitoring well (MWL-BW2) will be installed after MWL-BW1 has been decommissioned.

5.1 Objective

Install a 5-inch nominal diameter PVC casing replacement monitoring well to provide representative groundwater samples. The replacement monitoring well borehole will be drilled using Air-Rotary Casing-Hammer (ARCH) drilling methods.. MWL-BW1 will be installed at a location approximately 710 ft northeast of MWL-BW1, and 140 ft east of the MWL (Figure 1). The proposed replacement well location on Figure 1 is shown schematically; the actual location may vary due to utility clearance and land use issues.

5.2 Implementation

Applicable FOPs and AOPs are listed in Table 1; however, this site-specific plan should be used as the primary guidance in the field.

5.2.1 Borehole Drilling

The ARCH drilling method will use environmentally-friendly lubricants and will be able to penetrate highly variable lithologies such as cobbles, boulders, gravel, sand, clay, and caliche while maintaining an open, competent borehole. The geology of the borehole will be logged during drilling. The total depth of the borehole will be determined by the SNL/NM field geologist, but the depths are anticipated to be 30 to 35 ft deeper than the original well. The depth of the first encounter with regional groundwater and any perched groundwater will be logged during drilling. After reaching total depth, the cased borehole will be logged using natural gamma and neutron wire-line geophysical methods.

Minimal water (but no other foams/liquids) in the form of "mist" may be introduced into the borehole to aid in the removal of cuttings. Waste generation will be kept to a minimum. Borehole cuttings will be contained within an area adjacent to the well. Water produced from the well during drilling or development will be contained in 55-gallon drums and placed on spill control pallets.

Based on current conditions in MWL-BW1 and the most recent groundwater level measurements (March 2007), monitoring well MWL-BW2 is anticipated to be drilled to approximately 502 ft bgs. The well screen for MWL-BW2 will be set with approximately 5 ft of screen situated above the static water level. The anticipated depth to water at this location is 472 ft bgs; therefore, the screen completion interval is expected to be approximately 467 to 497 ft bgs with a 5-ft sump placed below the screen.

5.2.2 Well Construction

The monitoring well will be completed as specified in this plan. The water-table monitoring well will be installed through the temporary steel drive casing (nominal 10-inch diameter), and completed using 5-inch inner diameter, flush threaded, PVC Schedule-80 water well casing. No solvents, cleaners, or lubricants will be used for construction of the monitoring well. The casing will be delivered pre-cleaned and bagged, or steam-cleaned on site prior to installation. To preserve the integrity of the well materials, the well screen and riser pipe will be suspended in the borehole until the primary filter pack, bentonite pellet seal and annular seal are installed.

The regional aquifer in the study area is being over-pumped and the water table at MWL-BW1 is rapidly declining with a decline rate of 1.14 ft/year over the last several years (Figure 2). To accommodate the rapidly declining water table, a 30-ft length of PVC screen with a 0.010-inch or 0.020-inch slot size will be used for the replacement well. A 5-ft sump will be placed at the base of the screen and sealed with a threaded end cap. PVC centralizers will be placed at the base and top of the well screen and then at intervals not to exceed 100 ft up to the land surface. The screen for this water-table well will be placed so that the top of the screen is approximately 5 ft above the static water level.

The appropriate screen slot size and gradation of the filter pack material will be based on the gradation of the sediments in the screen interval as determined in the field by the geologist logging the borehole. If the predominant water-bearing interval consists mostly of clay and silt, a 0.010-inch screen slot and a primary filter pack of clean 20-40 silica sand will be placed in the annulus. However, if the predominant water-bearing interval consists mostly of silt and sand, a 0.020-inch screen slot and a primary filter pack of clean 10-20 silica will be placed in the annulus. The primary filter pack will extend from the bottom of the sump to at least 5 ft above the top of the screen. A 5-ft thick layer of clean 40-60 sand will be placed above the primary filter pack. Both sand packs will be tagged using a tag line to verify their depth. Preliminary well development using a surge block will be performed at this time to help settle the filter pack.

A 10-ft thick layer of 1/4-inch bentonite pellets or 3/8-inch bentonite chips will be placed above the filter pack prior to emplacement of the bentonite-grout annular seal. Each 5 ft thickness of bentonite pellets/chips added will be hydrated before adding the next 5-ft thickness of

bentonite pellets/chips. The final lift of bentonite pellets/chips will be allowed to set for a time adequate for hydration (at least 1 hour). The remaining annular space to ground surface will then be filled with bentonite grout. To prevent overloading, the bentonite grout will be installed in multiple lifts. The first bentonite grout lift will be approximately 100 ft thick and will be allowed to set a minimum of 24 hours before installation of the next lift. Subsequent bentonite grout lifts will each be approximately 200 ft thick. The bentonite grout will be topped off to within 6-inches to 1-ft bgs.

The well casing will extend approximately 30 inches above ground surface with a water-tight cap. The monitoring well will be completed with protective steel casing with a hinged locking cap. The protective casing will be primed and painted yellow. A 3-ft by 3-ft, sloped concrete pad will be constructed around the casing. The pad will contain a 3-in brass cap stamped with the well identification. Three, 4-inch diameter concrete-filled, steel guard posts (also primed and painted yellow) will be placed around the pad, equidistant from the well.

5.2.3 Well Development

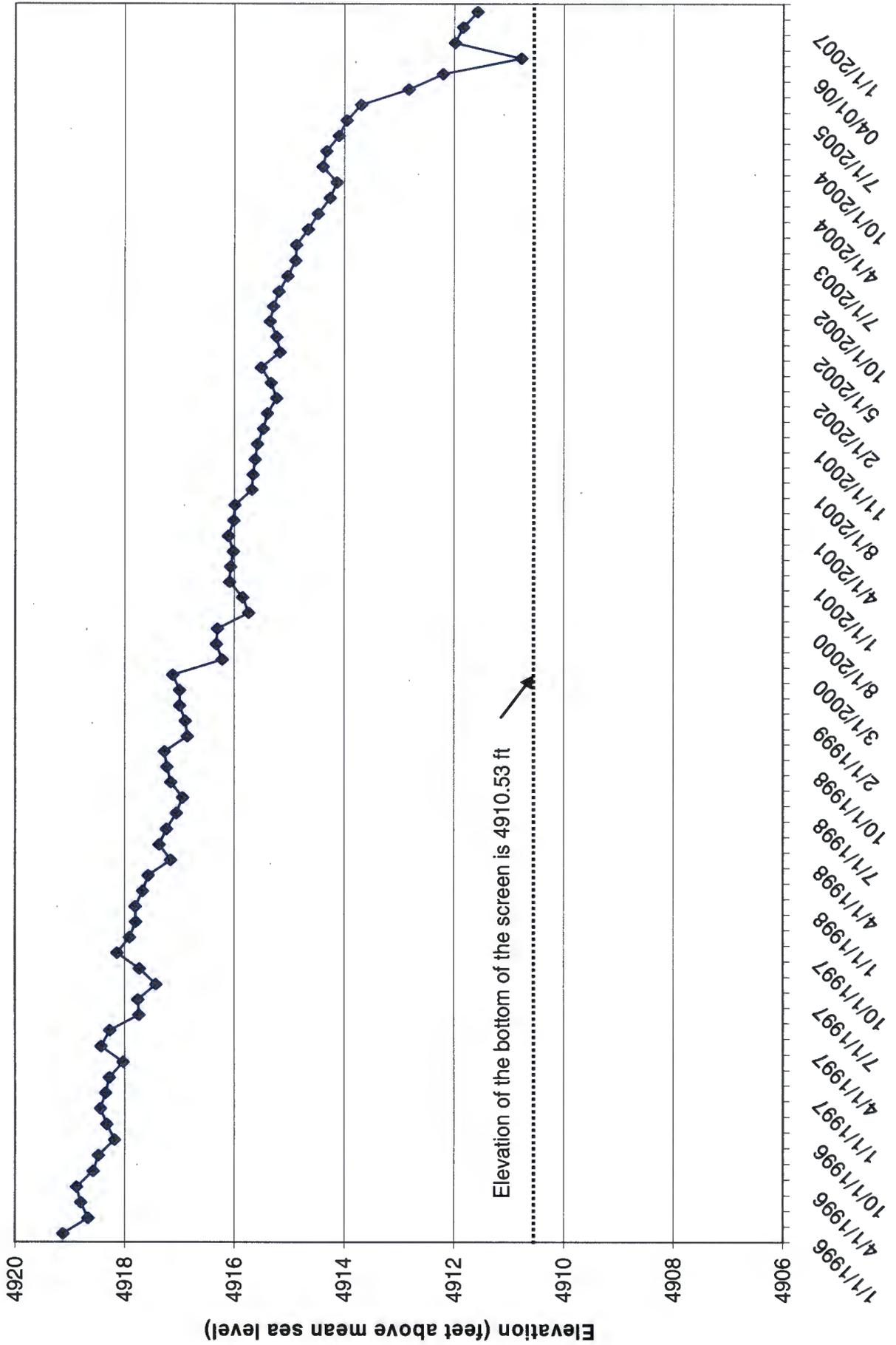
Well development will be completed at least 48 hours after grouting. The well will be developed for approximately 10 hours, and will consist of pumping, surge-block, swabbing, and/or bailing techniques. During development, the groundwater field parameters (pH, specific conductivity, temperature, and turbidity) will be continuously monitored, and development will continue until parameters have stabilized. All development water will be contained in drums and will not be allowed to discharge to the ground surface. The method of development, the volume of water added or removed, the parameters measured, the results of the measurements, and the time these activities take place will be documented in writing during well development. If required, only potable water shall be added to the well during development.

During development of this water-table completion well, a minimum of 5 well bore volumes will be removed. After the minimum volume has been removed, development will continue until representative water is obtained. Representative water is assumed to be obtained when pH, temperature, turbidity, and specific conductivity readings stabilize (less than 10% variability over 3 consecutive well bore volumes) and the water is visually clear of suspended solids with a target turbidity of less than 5 Nephelometric Turbidity Units (NTUs).

6 Equipment Decontamination

The drilling rig and related equipment will be decontaminated at the decontamination pad in Technical Area III prior to the beginning of drilling operations. Decontamination of equipment will also be required after completing the well. Decontamination waste will be kept to a minimum and containerized in drums placed on spill control pallets at the decontamination pad.

Figure 2 MWL-BW1 Groundwater Elevations Over Time



7 Health and Safety

Level D personal protective equipment is required for all drilling operations. Health and Safety records associated with drilling and development personnel will be maintained on site and will be available at the commencement of drilling activities. All field personnel will operate under an SNL/NM Health and Safety Plan (HASP) and will have SNL/NM-required training including 40-Hr OSHA HAZWOPER and subsequent yearly refresher courses. An SNL/NM Subject Matter Expert will perform a safety inspection of the drill rig before drilling commences.

8 Pre-field activities

Pre-field activities that must be completed prior to drilling include:

- Preparation of the Statement of Work for drilling and monitoring well installation;
- SNL/NM digging permit request and approval;
- HASP preparation, review, and signatures;
- National Environmental Policy Act (NEPA) review and signatures;
- Sample bottle order for waste samples through Sample Management Office;
- Waste Management Plan preparation;
- Field checklist completion, review, and approval; and
- Readiness review meeting.

9 Mobilization and Site Setup

SNL/NM personnel will ensure that containers for cuttings have been obtained and are ready for drilling operations. Roll-off bins supplied by SNL/NM will be used to collect drill cuttings for waste management purposes.

10 Reporting

Based on the requirements established by the NMED/HWB, OSE and SNL/NM FOPs, the field activities associated with decommissioning and installation of the monitoring wells will be documented.

10.1 Decommissioning Records

All decommissioning field activities will be documented in a field log book per guidance in FOP 94-25. Upon completion of decommissioning of a well, the P&A Report will document all site activities and provide final as-built well decommissioning diagram (Attachment 2). Attachment 3 will be used to assure that all records are completed, approved, and submitted for proper records management. The following list of documents and records that are generated as part of the decommissioning process will be provided to the SNL/NM Well File Coordinator who, in turn, will submit them to the SNL/NM Customer-Funded Records Center:

- Monitoring Well Plugging and Abandonment Request
- Well Plugging and Abandonment Form
- Site-Specific Well Plugging and Abandonment Work Plan
- Site-Specific Well Plugging and Abandonment Report
- Plugging and Abandonment Documentation and Approval Checklist
- Waste Management Plan
- Field Log Book
- Detailed as-built diagram (Attachment 2)

All decommissioning activities performed at SNL/NM will be accurately and concisely documented in a final P&A Report to be submitted to the NMED/HWB and the OSE. The P&A Report will contain a brief narrative describing actual work performed at the site and any variances to the site-specific P&A Plan. Information to be contained in the P&A Report include: (1) daily field activity notes, (2) all materials used, (3) a final "as-built" plugging and abandonment diagram, and (4) documentation of notification of SNL/NM GIS group and the appropriate regulatory agencies. The Well Plugging and Abandonment Form (Attachment 2) will be completed and included as part of the P&A Report.

Further P&A reporting elements are required by the OSE (OSE August 2005). SNL/NM personnel and the licensed well driller (contractor) will submit a plugging record with the state engineer no later than twenty (20) days after completion of the plugging. The record will include the following elements:

- Name and address of the well owner
- Well driller's name and license number
- Name of each drill rig supervisor that supervised the well plugging
- State engineer file number for the well (if available)
- Location of the well (reported in New Mexico state plane coordinates to ± 0.01 ft)
- Dates when plugging began/concluded
- Plugging material(s) used
- Depth of the well
- Size and type of casing
- Location of perforations
- Location of the sanitary seal
- Completed well log with depth and thickness of all strata plugged, including whether each stratum was water bearing

10.2 Well Installation Records

All well installation field activities will be documented in a field log book per guidance in FOP 94-45. Upon completion of the well installation, the Field Report will document all site activities and provide final as-built well completion diagrams (Attachment 4). The Field Report will contain a brief narrative describing actual work performed at the site and any variances to the site-specific Well Installation Plan. Information to be contained in the Field Report include: (1) daily field activity notes, (2) all materials used, (3) a final "as-built" well completion diagram, and (4) documentation of notification of SNL/NM GIS group and the appropriate regulatory agencies. The documentation will also include the 37 information elements required in Section VIII.D of the Order (NMED April 2004). The following list of documents and records that are generated as part of the well installation process will be provided to the SNL/NM Well File Coordinator who, in turn, will submit them to the SNL/NM Customer-Funded Records Center:

- Well permit agreement
- Well file contents checklist
- Well data summary sheet
- Statement of work for drilling the well
- Drilling permit
- Lithologic (boring) log

- Well construction diagram and completion parameters
- Well development data and groundwater parameters
- Copies of field logbook (geologist, driller)
- Surveyed elevations and location in New Mexico state plane coordinates (with a degree of accuracy of ± 0.01 ft)
- Location map
- Water level measurements
- Aquifer test data
- Analytical data
- Waste management documentation
- Photographs

11 References

NMED April 2004, "Compliance Order on Consent Pursuant to the New Mexico Hazardous Waste Act 74-4-10: Sandia National Laboratories Consent Order," New Mexico Environment Department, April 24, 2004.

OSE August 2005, "Rules and Regulations Governing Well Driller Licensing; Construction, Repair and Plugging of Wells" New Mexico Office of the State Engineer, August 2005.

Attachment 1

Monitoring Well Completion Diagram for MWL-BW1 WELL DATABASE SUMMARY SHEET

Project Name:	MIXED WASTE LANDFILL	Geo Location:	TA III
ER ADS #:	1289	Well Completion Date:	01-JUL-1989
Well Name:	MWL-BW1	Completion Zone:	SAND AND GRAVEL
Owner Name:	SNL/NM	Formation of Completion:	SANTA FE
Date Drilling Started:	24-JUN-1989	Well Comment:	WATER LEVEL MEASURED ON 5/14/90
Drilling Contractor:	STEWART BROTHERS		
Drilling Method:	MUD ROTARY		
Borehole Depth:	519		
Casing Depth:	477.17		

Survey Data

Survey Date: 12-APR-1990
Surveyed By: SANTIAGO ROMERO AND ASSOCIATES

State Plane Coordinates

(X) Easting: 411756.001
(Y) Northing: 1451698.73

Surveyed Elevations (FAMSL)

Protective Casing: 5385.05
Top of Inner Well Casing: 5384.51
Concrete Pad: 5383.35
Ground Surface: 5382.7



Calculated Depths and Elevations

Initial Water Elevation (FAMSL): 4923.3
Initial Depth To Water (FBGS): 461.21

Last measured water level was measured on: 17-OCT-2006

Date Updated: 14-MAR-00

Date Printed: 12-MAR-2007

FASL

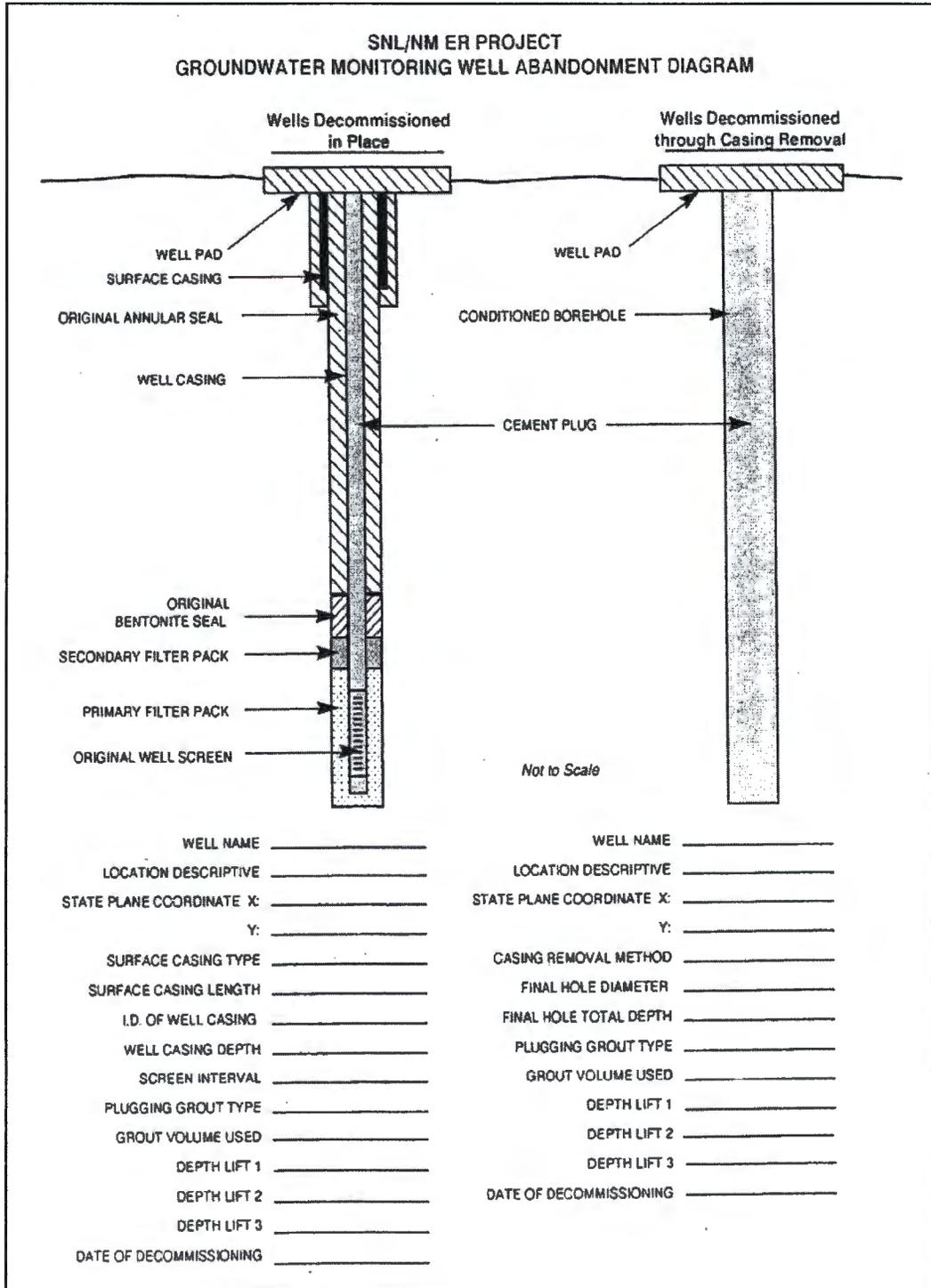
Completion Data Measured Depths (FBGS)

Casing Stickup:	1.16		
Interval	Start	Stop	
GROUT/BACKFILL	0'	433'	
NEAT CEMENT			
Interval	Start	Stop	
CASING	0'	477.17'	
PVC	I.D. 5"		
Interval	Start	Stop	
BOREHOLE	0'	519'	
		O.D. 12.25"	
Interval	Start	Stop	
SECONDARY PACK	441'	443'	
16/40			
Interval	Start	Stop	
PRIMARY PACK	443'	478'	
10/20 SAND			
Interval	Start	Stop	
SCREEN	452.17'	472.17'	
304 STAINLESS STEEL			
	Slot Size	.01"	
Interval	Start	Stop	
SUMP	472.17'	477.17'	
Interval	Start	Stop	
PLUG BACK	477.17'	519'	



Attachment 2

Groundwater Well Abandonment Diagram

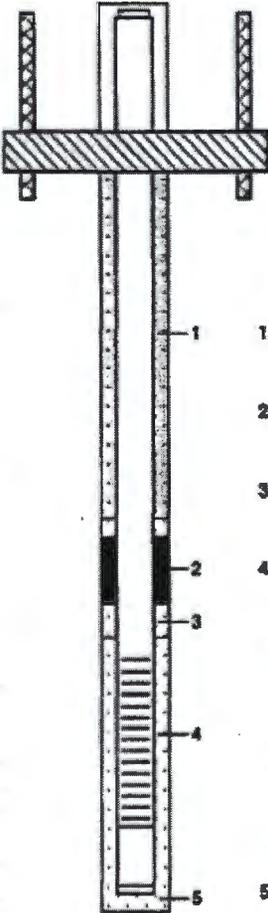


Attachment 4

Groundwater Monitoring Well Data Sheet

SNL/NM Groundwater Monitoring Well Data Sheet	
PROJECT NAME: _____	GEOGRAPHIC LOCATION: _____
ER ADS #: _____	WELL COMPLETION DATE: _____
WELL NAME: _____	COMPLETION ZONE: _____
OWNER: _____	FORMATION OF COMPLETION: _____
DATE DRILLING BEGAN: _____	REMARKS: _____
DRILLING CONTRACTOR: _____	_____
DRILLING METHOD: _____	_____
BOREHOLE DEPTH: _____	_____
BOREHOLE DIAMETERS: _____	_____



<p>Survey Data</p> <p>Survey Date: _____</p> <p>Surveyed by: _____</p> <p>State Plane Coordinates (X) Easting = _____ (Y) Northing = _____</p> <p>Surveyed Elevations (feet above sea level)</p> <p>Protective Casing: _____ (Elev. D - FOP 94-71)</p> <p>Top of Inner Well Casing: _____ (Elev. C - FOP 94-71)</p> <p>Concrete Pad: _____ (Elev. B - FOP 94-71)</p> <p>Ground Surface: _____ (Elev. A - FOP 94-71)</p> <p>Calculated Elevations (feet above sea level)</p> <p>Initial Water Level: _____</p> <p>Other: _____</p> <p>Comments: _____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>Form Completed by: _____</p> <p>Verified by: _____</p>		<p>Completion Data</p> <p>Measured Depths (feet below ground surface)</p> <p>Initial Water Level: _____</p> <p>Casing Stickup: _____ (above ground level)</p> <p>Casing OD (in.): _____ Casing ID (in.): _____</p> <p>1. Grout/Backfill Interval: _____ Material: _____</p> <p>2. Seal Interval: _____ Material: _____</p> <p>3. Secondary Pack Interval: _____ Secondary Pack Size: _____</p> <p>4. Primary Pack Interval: _____ Primary Pack Size: _____</p> <p>Screen Interval: _____ Slot Size: _____ Material: _____</p> <p>Sump Length: _____</p> <p>Casing Depth: _____ Material: _____</p> <p>5. Plug Back Interval (if used): _____ (Casing TD-Hole TD) _____ Plug Material (if used): _____</p>
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