SAND2008-1134P

Sandia National Laboratories/New Mexico

Monitoring Well Plug and Abandonment Plan
and
Replacement Well Construction Plan

Decommissioning of
Groundwater Monitoring Well MWL-MW2

Installation of Replacement
Groundwater Monitoring Well MWL-MW9

Environmental Restoration Project

February 2008

United States Department of Energy
Albuquerque Operations Office

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1 Project and Site Information

Task Description: Sandia National Laboratories/New Mexico (SNL/NM) decommissioning with plugging 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: May 1, 2008

Estimated Completion Date: June 30, 2008

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-MW2, with the installation of replacement groundwater monitoring well MWL-MW9.

The U.S. Department of Energy (DOE) and Sandia Corporation (Sandia) received a specific request from the New Mexico Environment Department (NMED) on February 12, 2008 to install a new well (MWL-MW9) as a replacement for MWL-MW2.

Section VIII.C of the Compliance Order on Consent (the Consent 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 regulatory requirements 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" (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 regulations also state 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:

- Submit this P&A Plan to the NMED/HWB and OSE requesting to decommission MWL-MW2 because it no longer provides representative groundwater samples due to declining water levels, insufficient productivity, and corrosion of the stainless-steel screen.
- Use a licensed well driller and approved materials to seal the well so that the well 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-MW2 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-MW2 is a groundwater monitoring well located at the Mixed Waste Landfill (Figure 1). This well was installed with mud rotary drilling techniques 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 (conductor casing), and a concrete well pad.
- Current water level – approximately 464 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 stainless-steel screen is corroding, the well requires excessive time to recover between purging and sampling, and declining water levels in the regional aquifer. There is no evidence that suggests the annular seal is compromised.

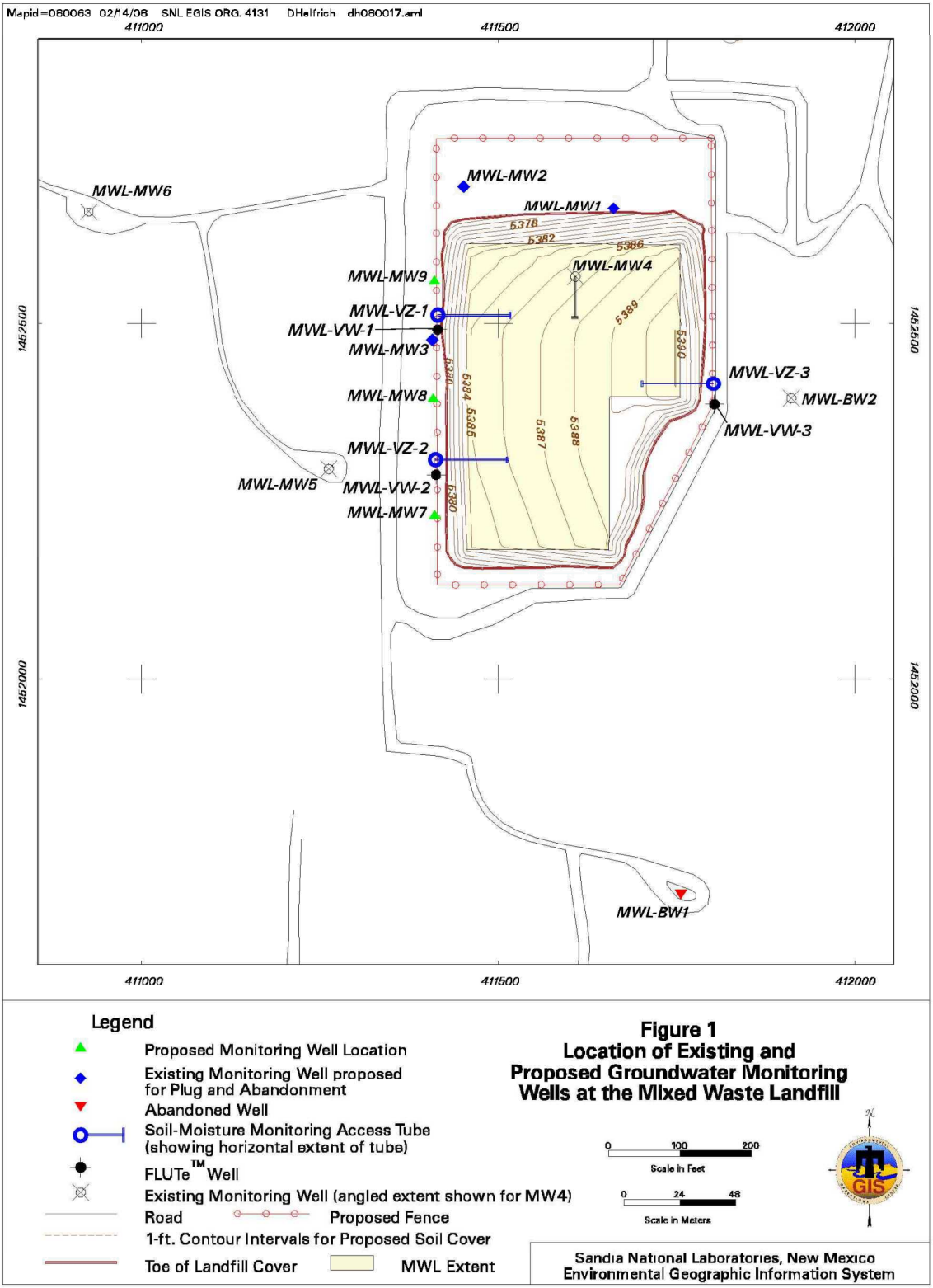
4 Plugging and Abandonment

Based on the requirements established by the NMED/HWB and OSE, groundwater monitoring well MWL-MW2 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.

Table 1. Applicable Operating Procedures

Number of Procedure[a]	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. 02, 3/28/07

Notes:
[a] The most current version will be used.
AOP = Administrative Operating Procedure.
FOP = Field Operating Procedure.
Rev. = Revision


Mapid=080063 02/14/08 SNL EGIS ORG. 4131 DHelfrich dh080017.aml
411000
411500
412000
1452600
1452000
MWL-MW6
MWL-MW2
MWL-MW1
MWL-MW4
MWL-MW9
MWL-VZ-1
MWL-VW-1
MWL-MW3
MWL-MW8
MWL-VZ-2
MWL-MW5
MWL-VW-2
MWL-MW7
MWL-VZ-3
MWL-BW2
MWL-VW-3
MWL-BW1
5378
5380
5382
5384
5386
5387
5388
5389
5390
Legend
Proposed Monitoring Well Location
Existing Monitoring Well proposed for Plug and Abandonment
Abandoned Well
Soil-Moisture Monitoring Access Tube (showing horizontal extent of tube)
FLUTe™ Well
Existing Monitoring Well (angled extent shown for MW4)
Road
Proposed Fence
1-ft. Contour Intervals for Proposed Soil Cover
Toe of Landfill Cover
MWL Extent
Figure 1
Location of Existing and Proposed Groundwater Monitoring Wells at the Mixed Waste Landfill
0 100 200
Scale in Feet
0 24 48
Scale in Meters
N
GIS
Sandia National Laboratories, New Mexico
Environmental Geographic Information System

4.1 Goal

The goal for decommissioning monitoring well MWL-MW2 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 seal 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. The well was installed using mud rotary drilling methods and 20 ft of carbon steel conductor casing was left in place at the well head. The conductor casing (extending to approximately 19 ft bgs) cannot be removed and will remain in place following P&A activities. The PVC casing will be cut off flush with the top of the conductor casing (at approximately 8 to 10 inches above ground surface).

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 approximately 1ft thick with a 2 ft by 2 ft area. A brass marker containing the well name and date of decommissioning will be set in the concrete pad.

5 Monitoring Well Installation

Replacement monitoring well MWL-MW9 will be installed after MWL-MW2 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.

Based on the NMED letter dated February 12, 2008, the replacement well shall be installed at a location west of the landfill in a line with the existing MWL Soil-Moisture Access Tubes. The proposed replacement well location on Figure 1 is shown schematically.

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 depth is anticipated to be approximately 17 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.

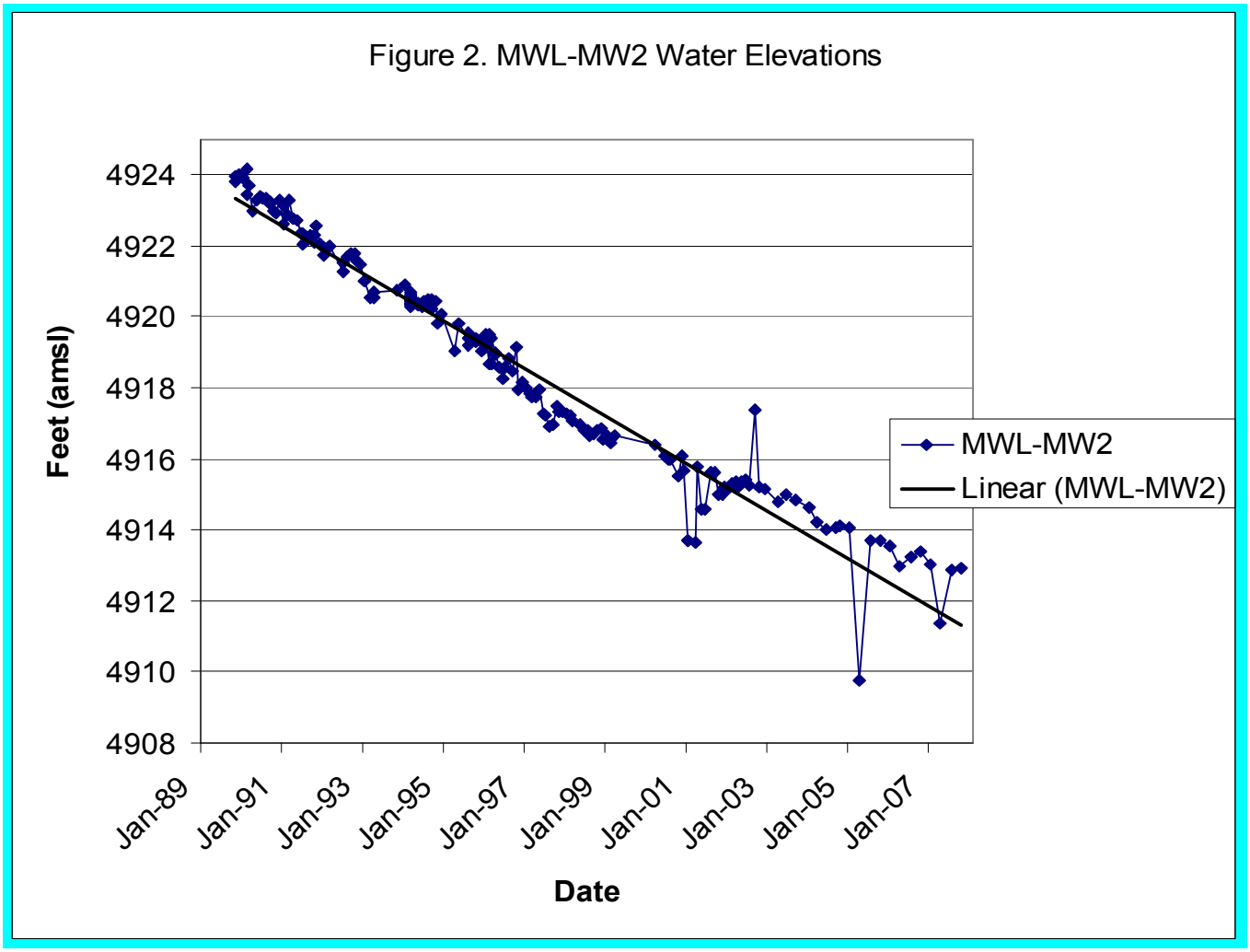
Minimal water (but no other foams/liquids) in the form of “mist” may be introduced into the borehole to aid in the removal of cuttings. Waste generation will be kept to a minimum. Borehole cuttings will be contained within an area adjacent to the well. Water produced from the well during drilling or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

Based on the most recent groundwater level measurements for the MWL Study Area (April 2007), monitoring well MWL-MW9 is anticipated to be drilled to approximately 494 ft bgs. The 30-ft well screen for MWL-MW2 will be set with approximately 5 ft of screen situated above the static water level. The anticipated depth to water at this location is approximately 464 ft bgs; therefore, the screen completion interval is expected to be approximately 459 to 489 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 nominal 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 area is being over-pumped and the water table at MWL-MW2 is declining at a rate of approximately 1 ft/year (Figure 2). Anonymously low water levels (below trend line) may have been taken following a purging event.



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 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 30-ft thick layer of 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 I 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. Per NMED requirements (NMED June 2007), 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 initiated after at least 48 hours following final grout placement. 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 five 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 three consecutive well bore volumes) and the water is visually clear of suspended solids with a target turbidity of less than five 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 and upon completion of the drilling program. Decontamination waste will be kept to a minimum and containerized in drums placed on spill control pallets at the decontamination pad.

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 the well, the P&A Report will document all site activities and provide final as-built Groundwater Well Abandonment Diagram (Attachment 2). The Well Plugging and Abandonment Form (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
- 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 Groundwater Well Abandonment Diagram (Attachment 2)
- Well Plugging and Abandonment Form (Attachment 3)

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 3) 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 OSE 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 the final as-built well completion diagram (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 Construction 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 Consent 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

New Mexico Environment Department (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.

New Mexico Environment Department (NMED) June 2007, “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.” Letter to Patty Wagner (SSO/NNSA) and Francis Nimick (Sandia) from James Bearzi, June 19, 2007.

New Mexico Environment Department (NMED) February 2008, “Location of Monitoring Wells MWL-MW7 and MW8 Sandia National Laboratories, EPA ID#NM5890110518 HWB--016” Letter to Patty Wagner (SSO/NNSA) and Francis Nimick (Sandia) from James Bearzi, February 12, 2008.

New Mexico Office of the State Engineer (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-MW2

WELL DATABASE SUMMARY SHEET

Project Name:	MIXED WASTE LANDFILL	**Geo Location:**	TA III
ER ADS #:	1289	**Well Completion Date:**	01-AUG-1989
Well Name:	MWL-MW2	**Completion Zone:**	SAND
Owner Name:	SNL/NM	**Formation of Completion:**	SANTA FE
Date Drilling Started:	21-JUL-1989	**Well Comment:**	WATER LEVEL MEASURED ON 5/14/90
Drilling Contractor:	STEWART BROTHERS		
Drilling Method:	MUD ROTARY		
Borehole Depth:	521		
Casing Depth:	477		

Survey Data

Survey Date: 12-APR-1990

Surveyed By: SANTIAGO ROMERO AND ASSOCIATES

State Plane Coordinates

(X) Easting: 411451.366

(Y) Northing: 1452692.592

Surveyed Elevations (FAMSL)

Protective Casing:	5378.18
Top of Inner Well Casing:	5377.26
Concrete Pad:	5376.49
Ground Surface:	5375.71

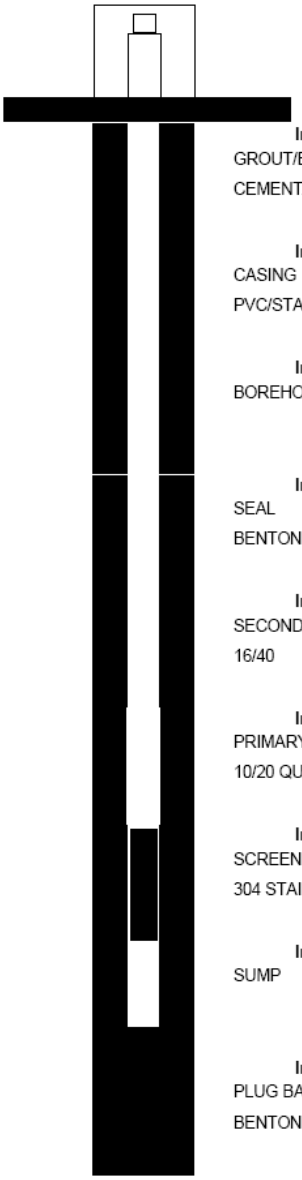
Calculated Depths and Elevations

Initial Water Elevation: (FAMSL)	4923.27
Initial Depth To Water: (FBGS)	453.99

Last measured water level was 4912.85 **FASL**
measured on 12-JUL-2007

Date Updated: 14-MAR-00

Date Printed: 06-NOV-2007



Completion Data Measured Depths (FBGS)

Casing Stickup: .77

Interval	Start	Stop
GROUT/BACKFILL	0'	430'
CEMENT/BENTONITE		

Interval	Start	Stop
CASING	0'	477'
PVC/STAINLESS STEEL	I.D. 5"	

Interval	Start	Stop
BOREHOLE	0'	521'
	O.D. 12.25"	

Interval	Start	Stop
SEAL	430'	442'
BENTONITE		

Interval	Start	Stop
SECONDARY PACK	442'	444'
16/40		

Interval	Start	Stop
PRIMARY PACK	444'	477'
10/20 QUARTZ SAND		

Interval	Start	Stop
SCREEN	452'	472'
304 STAINLESS STEEL		
	Slot Size .01"	

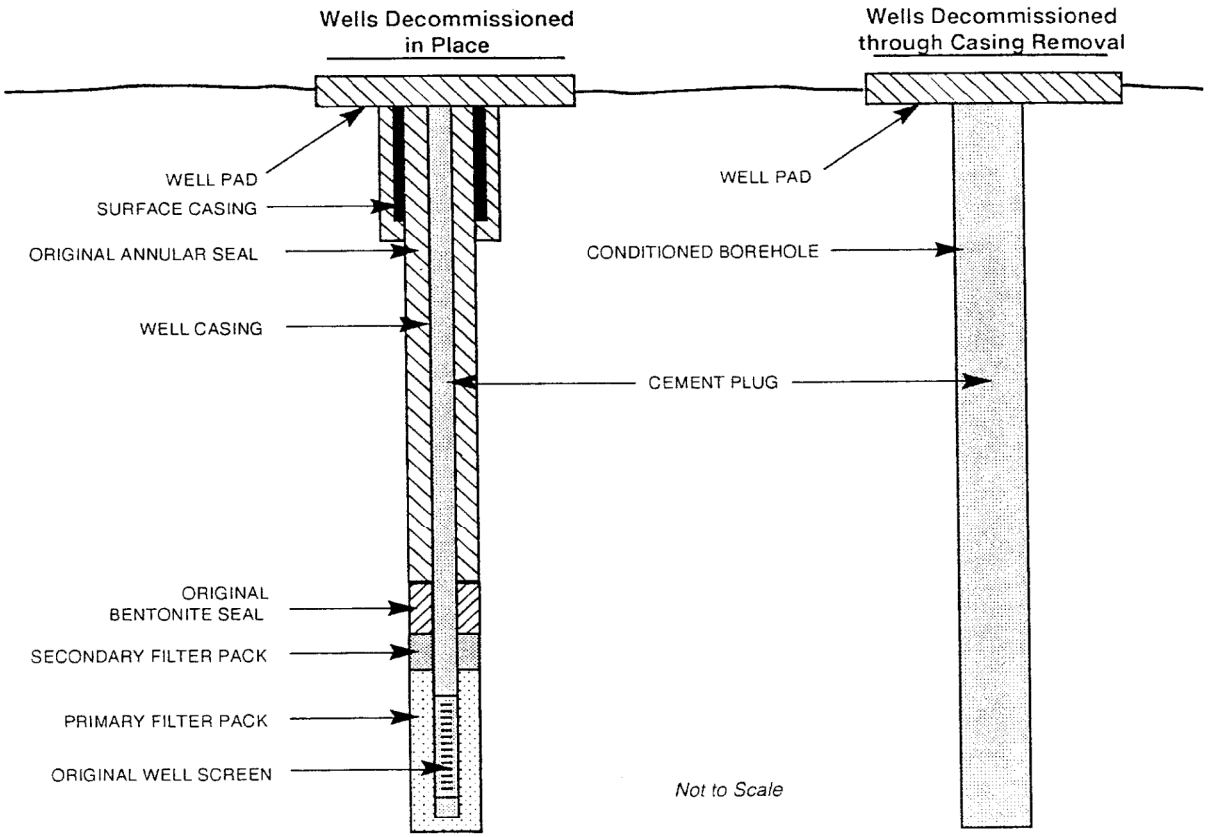
Interval	Start	Stop
SUMP	472'	477'

Interval	Start	Stop
PLUG BACK	477'	521'
BENTONITE		

Attachment 2

Groundwater Well Abandonment Diagram

SNL/NM ER PROJECT
GROUNDWATER MONITORING WELL ABANDONMENT DIAGRAM



WELL NAME _____
LOCATION DESCRIPTIVE _____
STATE PLANE COORDINATE X: _____
Y: _____
SURFACE CASING TYPE _____
SURFACE CASING LENGTH _____
I.D. OF WELL CASING _____
WELL CASING DEPTH _____
SCREEN INTERVAL _____
PLUGGING GROUT TYPE _____
GROUT VOLUME USED _____
DEPTH LIFT 1 _____
DEPTH LIFT 2 _____
DEPTH LIFT 3 _____
DATE OF DECOMMISSIONING _____

WELL NAME _____
LOCATION DESCRIPTIVE _____
STATE PLANE COORDINATE X: _____
Y: _____
CASING REMOVAL METHOD _____
FINAL HOLE DIAMETER _____
FINAL HOLE TOTAL DEPTH _____
PLUGGING GROUT TYPE _____
GROUT VOLUME USED _____
DEPTH LIFT 1 _____
DEPTH LIFT 2 _____
DEPTH LIFT 3 _____
DATE OF DECOMMISSIONING _____

Attachment 3

Well Plugging and Abandonment Form

SNL/NM ER PROJECT
WELL PLUGGING AND ABANDONMENT FORM

1. Preabandonment Well Specifics:
   a. Well Identification _____
   b. Location (geographic description and state plane coordinates) _____
   c. Reported Well Depth (feet) _____
   d. Field Well Depth (feet) _____
   e. Screened Intervals(s) (feet) _____
   f. Screen Diameter(s) (inches) _____
   g. Screen Type(s) (SS or PVC, etc.) _____
   h. Casing Diameter(s) (inches) _____
   i. Casing Type (PVC, steel, etc.) _____
   j. Artesian or Nonartesian Aquifer _____

2. Reason for Abandonment:
   _____
   _____

3. Abandonment Specifics:
   a. Date Abandonment Started _____
   b. Date Abandonment Completed _____
   c. ID Number of Field Log Book Used _____
   d. Site Personnel _____
   e. Drilling Method Used _____
   f. Grout Used _____
   g. Casing Removed (Y or N) _____
   h. Concrete Pad Inscription _____

   j. Briefly Describe Abandonment Method:
   _____
   _____
   _____

   k. Disposition of Materials Removed From Well: _____
   _____
   _____

4. Comments or Problems Encountered: _____
   _____

Completed by: _____
Printed Name Signature Date

Subcontractor: _____

Drilling Contractor: _____ License No.: _____

Attachment 4
Groundwater Monitoring Well Data Sheet

WELL REGISTRY DATA SHEET

PROJECT NAME: _____
ER ADS #: _____
WELL NAME: _____
OWNER: _____
DATE DRILLING BEGAN: _____
DRILLING CONTRACTOR: _____
DRILLING METHOD: _____
BOREHOLE DEPTH: _____
BOREHOLE DIAMETERS: _____

GEOGRAPHIC LOCATION: _____
WELL COMPLETION DATE: _____
COMPLETION ZONE: _____
FORMATION OF COMPLETION: _____
COMMENTS: _____

Survey Data

Survey Date: _____

Surveyed by: _____

State Plane Coordinates

(X) Easting = _____

(Y) Northing = _____

Surveyed Elevations
(feet above sea level)

Protective Casing: _____
(Elev. D - FOP 94-71)

Top of Inner Well Casing: _____
(Elev. C - FOP 94-71)

Concrete Pad: _____
(Elev. B - FOP 94-71)

Ground Surface: _____
(Elev. A - FOP 94-71)

Calculated Elevations
(feet above sea level)

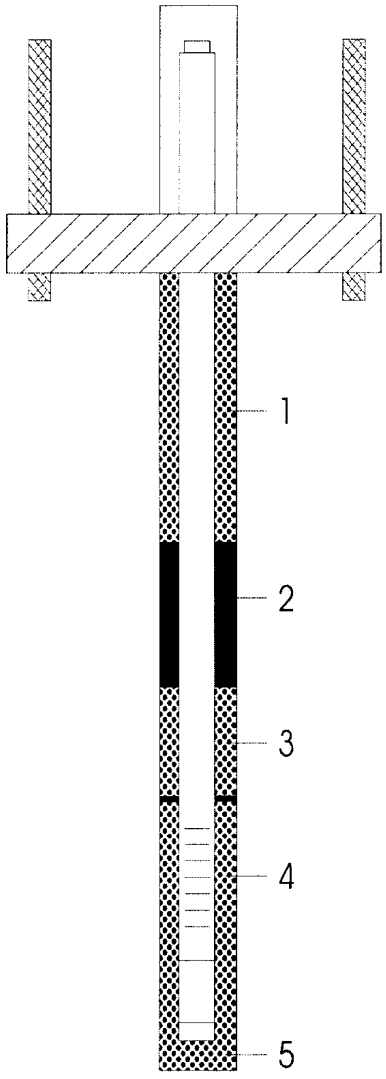
Initial Water Level: _____

Other: _____

Comments: _____

Form Completed by: _____

Verified by: _____



Completion Data

Measured Depths

Depth to Water: _____
(below top of casing)

Casing Stickup: _____
(above ground level)

Casing OD (in.): _____

Casing ID (in.): _____

(Items 1-5 feet below ground surface)

1. Grout/Backfill Interval: _____
   Material: _____
2. Seal Interval: _____
   Material: _____
3. Secondary Pack Interval: _____
   Secondary Pack Size: _____
4. Primary Pack Interval: _____
   Primary Pack Size: _____
   Screen Interval: _____
   Slot Size: _____
   Material: _____
   Sump Interval: _____
   Casing Depth: _____
   Material: _____
5. Plug Back Interval (if used): _____
   Plug Material (if used): _____