CERTIFIED MAIL – RETURN RECEIPT REQUESTED

James Bearzi
Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Road East, Bldg. 1
Santa Fe, NM 87505

Dear Mr. Bearzi:

On behalf of Sandia Corporation (Sandia) and the Department of Energy (DOE), DOE is submitting the Summary Report for Mixed Waste Landfill Monitoring Well Plug and Abandonment and Installation: Decommissioning of Groundwater Monitoring Well MWL-BW1 and Installation of Groundwater Monitoring Well MWL-BW2.

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

Sincerely,

[Signature]
Patty Wagner
Manager

Enclosure

cc w/enclosure:
W. Moats, NMED (Via Certified Mail)
L. King, EPA, Region 6 (Via Certified Mail)
T. Skibitski, NMED-OB
B. Birch, NMED-OB
cc w/o enclosure:
A. Blumberg, SNL/NM, Org. 11100, MS 0141
D. Miller, SNL/NM, Org. 6765, MS 0718
P. Freshour, SNL/NM, Org. 6765, MS 1089
S. Griffith, SNL/NM, Org. 6765, MS 1089
M. Skelly, SNL/NM, Org. 6765, MS 1089
B. Langkopf, SNL/NM, Org. 6765, MS 1089
M. Davis, SNL/NM, Org. 6765, MS 1089
Records Center, SNL/NM, Org. 6765, MS 1089
T. Longo, HQ/GTN, NA-56
J. Estrada, SSO, MS 0184
CERTIFICATION STATEMENT FOR APPROVAL AND FINAL RELEASE OF DOCUMENTS


Document author: Stacy Griffith, Department 06765

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: [Signature]
Francis B. Wilmick
Deputy to the
Nuclear Energy and Global Security Technologies
Center 6700
Sandia National Laboratories/New Mexico
Albuquerque, New Mexico 87185
Operator

and

Signature: [Signature]
Patty Wagner
Manager
U.S. Department of Energy
National Nuclear Security Administration
Sandia Site Office
Owner and Co-Operator

Date: 4/11/08

Date: 4/23/08
SUMMARY REPORT FOR MIXED WASTE LANDFILL MONITORING WELL PLUG AND ABANDONMENT AND INSTALLATION Decommissioning of Groundwater Monitoring Well MWL-BW1 Installation of Groundwater Monitoring Well MWL-BW2

April 2008

Environmental Restoration Project

United States Department of Energy Albuquerque Operations Office

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.
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ACRONYMS AND ABBREVIATIONS

AOP
 administrational operating procedure
ARCH
 air rotary casing hammer
bgs
 below ground surface
cm
 centimeter(s)
°C
 degrees Celsius
DOE
 U.S. Department of Energy
ER
 Environmental Restoration
ft
 feet
FOP
 field operating procedure
ID
 inside diameter
Jet West
 Jet West Geophysical Services
µmhos
 micromhos
NNSA
 National Nuclear Safety Administration
NTU
 nephelometric turbidity unit
NMED
 New Mexico Environment Department
NMOSE
 New Mexico Office of State Engineer
NOD
 Notice of Deficiency
MWL
 Mixed Waste Landfill
OD
 outside diameter
pH
 potential of hydrogen
P&A
 plug and abandon
PVC
 polyvinyl chloride
Sandia
 Sandia Corporation
SNL/NM
 Sandia National Laboratories/New Mexico
TD
 total depth
WDC
 Water Development Corporation, Incorporated.
1.0 INTRODUCTION

This report documents the activities for the plugging and abandoning (P&A) and the installation of groundwater monitoring wells at the Mixed Waste Land (MWL) at Sandia National Laboratories/New Mexico (SNL/NM). The activities were performed in January through March 2008 by the SNL/NM Environmental Restoration (ER) Project personnel and the drilling contractor Water Development Corporation, Incorporated. (WDC).

1.1 Regulatory Action

On March 23, 2007, the New Mexico Environment Department (NMED) required that the U. S. Department of Energy (DOE) National Nuclear Security Administration (NNSA) and Sandia Corporation (Sandia) replace monitoring well MWL-BW1 (Bearzi March 2007). In April 2007, the NNSA/Sandia submitted a Plug and Abandonment/Replacement Plan for MWL-BW1 (SNL/NM April 2007).

However, in June 2007, the NMED issued a Notice of Disapproval (NOD) regarding this plan (Bearzi June 2007). The NOD listed 13 items that needed to be addressed in a revised plan. In July 2007, NNSA/Sandia submitted the revised Monitoring Well Plug and Abandonment Plan and Replacement Well Construction Plan: Decommissioning of Groundwater Monitoring Well MWL-BW1 and Installation of Replacement Groundwater Monitoring Well MWL-BW2 (the Plan) to the NMED (SNL/NM July 2007). The revised plan addressed the issues listed in the NOD. The NMED issued a Notice of Approval on October 10, 2007 (Bearzi October 2007a) followed by a date correction to the Notice of Approval on October 12, 2007 (Bearzi October 2007b).

1.2 Site Description and History

The MWL is an inactive landfill, designated as a Solid Waste Management Unit, at SNL/NM. The SNL facility is owned by the DOE/NNSA. The MWL is located in Technical Area III of SNL/NM which is within the boundaries of the federally-owned Kirtland Air Force Base, south of the city of Albuquerque (Figure 1-1).

The MWL groundwater monitoring well network consists of seven wells completed within interfingering alluvial fan deposits of the Santa Fe Group (Goering et al. 2002). The network (Figure 1-2) included one background well (MWL-BW1), one on-site well (MWL-MW4), and five downgradient or cross-gradient wells (MWL-MW1, MWL-MW2, MWL-MW3, MWL-MW5, and MWL-MW6). All seven wells are constructed of nominal 5-inch, Schedule 80 polyvinyl chloride (PVC) casing. Wells MWL-BW1, MWL-MW1, MWL-MW2, and MWL-MW3 have screens composed of slotted Type 304 stainless steel. Wells MWL-MW4, MWL-MW5, and MWL-MW6 have screens composed of slotted Schedule 80 PVC.

Groundwater levels have been declining in the regional aquifer and monitoring well MWL-BW1, installed in 1989, was no longer useful for sampling. At the time for annual groundwater sampling (April 2007), there was approximately 1 foot of water within the well screen of MWL-BW1, and the well could not be sampled.
Figure 1-2. Location of Existing and Proposed Groundwater Monitoring Wells at the Mixed Waste Landfill
1.3 Objective

The objective of this project was to successfully P&A MWL-BW1 by grouting the well in situ and to install a new background well, MWL-BW2. This report is organized in chronologic order of activities; the drilling and installation of MWL-BW2, the P&A of MWL-BW1, and the development of MWL-BW2.

The report meets the reporting requirements of the NMED and the New Mexico Office of the State Engineer (NMOSE). The NMED Compliance Order on Consent (the Order) specifies the required elements for reporting on installation of monitoring wells (NMED April 2004) (Attachment A). The NMOSE requirements and guidance can be found in Rules and Regulations Governing Well Driller Licensing; Construction, Repair and Plugging of Wells (NMOSE August 2005).
2.0 DRILLING AND WELL INSTALLATION

All drilling, well installation, and well development operations were performed by WDC and were supervised by SNL/NM ER Project personnel. Geophysical logging services were performed by Jet West Geophysical Services (Jet West). The borehole for MWL-BW2 was drilled using the air rotary casing hammer (ARCH) method.

The following sections describe the borehole drilling, lithologic and geophysical logging, and well construction. Complete field documentation, field forms, daily driller reports, and lithologic and geophysical logs, are on file at the SNL/NM Customer-Funded Records Center.

2.1 Drilling Operations

The WDC equipment and crew arrived at SNL/NM on January 7, 2008. The drilling equipment (a Speedstar 50K drilling rig and associated equipment) was decontaminated at the ER Project decontamination pad in TA-III prior to the start of drilling operations. Drilling of the borehole for well MWL-BW2, located east of the MWL (Figure 1-2), commenced on January 14, 2008. The first 300 feet (ft) of borehole was advanced with a tricone bit and with 11 3/4-inch outside diameter (OD) drive casing to accommodate drilling through caliche and gravel zones. At 300 ft below ground surface (bgs), the bit and drive casing was switched to 9 5/8-inch OD and the smaller drive casing was telescoped into the borehole. The borehole was initially advanced to a depth of 509 ft. The drilling was suspended at 509 ft bgs to allow for geophysical logging of the borehole (Section 2.3). Following the geophysical logging, the borehole was advanced to a total depth (TD) of 519 ft bgs on January 16, 2008. Field notes are included as Attachment B.

2.2 Lithologic Logging

A lithologic log based on the cuttings returned from the borehole was generated by the ER Project geologist. A combination diagram showing lithologic and geophysical logs, and well construction details is included as Attachment C.

The lithology of the borehole consisted of unconsolidated alluvial and fluvial deposits of the late Pleistocene post-Santa Fe Group alluvium and late Pliocene to Pleistocene upper Santa Fe Group (Goering et al. 2002). The upper Santa Fe Group consists of two first-order sediment types: an alluvial fan sequence derived from uplifts on the basin flanks, and a fluvial sequence derived from the north and deposited by an axial river, the ancestral Rio Grande. The alluvial fan deposits consist of poorly-sorted, weakly-stratified, discontinuous layers of sand with a silt/clay matrix. The lower ancestral Rio Grande sequence was not encountered in this borehole.

From the surface to 80 ft bgs, a sand and gravel mixture of the late Pleistocene post-Santa Fe Group alluvium was encountered. From 80 to 420 ft bgs there was a heterogeneous mixture of silt, sand, and gravel of the upper Santa Fe Group. In general, the sediments were fining downward to 420 ft bgs. A clayey-silt was encountered from 420 to 435 ft bgs. Below that, to the total depth of the borehole (519 ft bgs), there were interfingering units of silty sand with some gravel and silts and clays.
2.3 Downhole Geophysical Logging

On January 15, 2008 the cased borehole was logged with downhole wireline geophysical tools supplied by Jet West to help determine the lithologic characteristics of sediments penetrated in the borehole. Geophysical logs run in the borehole included combination natural gamma ray, thermal neutron, and 1-arm caliper. Although the caliper instrument is located on the same tool, the caliper log is not informative as the logging was completed within the steel drive casing. The geophysical log is provided in Attachment C. The Jet West report and logs are on file in the SNL/NM Customer-Funded Records Center.

The neutron log reveals the telescoped drill casing with a significant signal increase at 300 ft bgs. The gamma ray and neutron readings are attenuated approximately 30 percent by the steel casing and approximately 50-60 percent in dual casing. A notable shift in the neutron signal occurs at 494 ft bgs indicating the level of groundwater in the borehole at the time of the logging. This represents a temporarily depressed water level, due to the drilling activities earlier in the day. The neutron logging continued another 12 ft below the water. The gamma signal is unaffected by the presence of water in the borehole. Due to the position of the gamma detector on the logging tool, the gamma signal ends at approximately 496 ft bgs.

The log indicated that the formation is composed of interbedded clays, silts, and sands. The region of concern, from the groundwater level (approximately 472 ft bgs) downward, was comprised predominately of "dirty" sands with silts and clays (Jet West January 2008). Dirty sand refers to sediment with relatively coarse sand grains mixed with silt and clay that have relatively low hydraulic conductivity and low transmissivity.

2.4 Initial Groundwater Level and Well Construction

On January 15, 2008 the cased borehole had been advanced to 509 ft bgs and initial groundwater was encountered during drilling at approximately 472 ft bgs. During the geophysical logging (occurring later that same day), the groundwater level was at approximately 494 ft bgs within the steel drive casing. The following morning, the groundwater level had risen to approximately 485 ft bgs within the steel drive casing. The water level had not risen to the expected level (472 ft bgs) after allowing the well to recover overnight. The borehole was advanced another 10 ft to approximately 519 ft bgs in an effort to access more transmissive units of sand and/or gravel. It did not appear that any such units were encountered. The sands with silts and clays encountered in the lower portion of the borehole below the static water level are indicative of relatively low-water volume producing units.

Following a telephone consultation with NMED concerning the well construction, it was determined to build the well at the depth proposed in the Plan, assuming the water level would eventually equilibrate to the anticipated level of 472 ft bgs.

Well installation began on January 16, 2008 and was completed on January 18, 2008. The well was constructed of nominal 5-inch diameter (inside diameter of 4.767 inches and OD of 5.563 inches) Schedule 80 PVC flush-threaded blank casing and a 30-foot length of 0.010-inch slot schedule-80 PVC screen. This screen slot size was specified in the Plan to accommodate the low transmissive sand, silts, and clays encountered in the borehole. The sump consisted of a 5-ft length of nominal 5-inch diameter Schedule 80 PVC flush-threaded blank casing with a threaded end cap placed at the bottom. A volclay coarse chip product was used to backfill the
borehole from 510 to 519 ft bgs. Approximately 8 ft of #20-40 sand (Colorado Silica Sand) was used to backfill the borehole from 502 to 510 ft bgs.

The bottom of the well MWL-BW2 was placed at 502 ft bgs and the 30-ft screen section was placed from 467 to 497 ft bgs. The #20-40 sand was used as the primary sand pack in the annulus around the screen and extended approximately 5.5 ft above the top of the screen to 461.5 ft bgs. A secondary sand pack using #60 Colorado Silica sand was placed from 456 to 461.5 ft bgs (the #40-60 sand specified in the Plan is no longer commercially available). A 30-ft volclay coarse chip plug was placed from 426 to 456 ft bgs. The first 18 ft of chips were hydrated and allowed to set overnight. The next day, chips were added up to 426 ft bgs, hydrated, and allowed to set for approximately 2 hours. The Well Construction Diagram is provided in Attachment D.

A bentonite grout (SmoothGrout20™ One Step Grouting System) mixture was used to fill the remainder of the annulus (12 to 426 ft bgs). The first lift of 121 ft of grout was placed and allowed to set for 24 hours. The subsequent lifts of grout were placed in approximately 100-ft lifts and allowed to set for one hour. The final grout lift was brought to 12 ft bgs.

2.5 Wellhead Construction

A 10-ft length of nominal 12-inch diameter steel casing was used as the protective casing at the surface. The casing was placed approximately 7-ft below ground and 3-ft above and was equipped with a hinged locking cap. A fitted locking well cap was also placed on the PVC casing. Concrete was placed in the annulus from the top of the grout at 12 ft bgs to the surface. A 3-ft by 3-ft pad was built around the casing and a brass marker cap was placed in the pad denoting the well name. Three steel guard posts were placed around the pad, and the posts and the protective casing were painted yellow.
3.0 PLUG AND ABANDONMENT

The monitoring well MWL-BW1 was plugged in situ on January 23 and 24, 2008. A Groundwater Well Abandonment Diagram is included as Attachment E. A grout mix (Quick-Grout™) was placed in the well with a portable grout plant (grout was pumped through tubing placed at the bottom of the well and pulled up as well was filled). The well was grouted from 477 ft bgs (bottom of the well) to the surface and allowed to set overnight. The next morning, the grout plug had settled to approximately 12 ft bgs. The concrete pad and steel guard posts were removed from the surface of the well head.

The protective casing consisted of approximately 3 feet of steel casing that was welded to a length of conductor casing that extended below ground. The conductor casing was required for the mud-rotary drilling technique used to advance the borehole and was left in place during the installation of the well to serve as the protective casing. As the annulus between the conductor casing and the PVC well casing was firmly cemented, it was not possible to remove the 20-ft length of conductor casing. There was approximately 14 inches of the casing above ground and the PVC well casing extended a foot above that. The PVC casing was cut flush with the steel casing. A concrete plug was placed from the top of the grout plug (approximately 12 ft bgs) to the top of the two casings (approximately 14 inches above ground). The well monument was built over the two casings and a brass marker was placed in the monument. The marker denotes the well name, date of P&A, and well depth.
4.0 WELL DEVELOPMENT

Well development of MWL-BW2 was conducted March 10 through 13, 2008, according to the Well Development Field Operating Procedure (FOP) 94-41 (SNL/NM 1994). The well was developed with the WDC development rig. The initial water level reading taken on March 10, 2008, was 474.55 ft bgs. The calculated saturated wellbore volume (includes pore spaces in the annular sand pack) was approximately 42 gallons. The volume was originally overestimated (in the field notes – Attachment A) at 68 gallons, as it included the saturated casing and bore volume below the screen section.

The development began by evacuating the well with a stainless steel bailer. Approximately 40 gallons of water was bailed before the well went dry. The water was turbid, but did not contain much sediment. The well screen was swabbed and the well was allowed to recover for approximately 30 minutes. Another 25 gallons of water was bailed before the well went dry again. The following day, the well was repeatedly swabbed, bailed dry, and allowed to recover. A total of approximately 340 gallons (approximately 8 bore volumes) was removed from the well with the bailer.

Water quality parameters were measured and recorded during the well development, including:

- Temperature (degrees Celsius [°C])
- Specific Conductivity (micromhos/centimeter [μmho/cm])
- pH (potential of hydrogen), and
- Turbidity (measured in nephelometric turbidity units [NTUs]).

Water quality parameters were not stable during the bailing and swabbing of the well. The well was then purged with a submersible pump (Bennett™) at approximately 1/3 gallon per minute (lowest possible flow rate). The pump was set at the bottom of the screen section (497 ft bgs). Water quality parameters were stable during the pumping of approximately 150 gallons (approximately 3.5 bore volumes). A summary of the water quality parameters measured during pumping are presented in Table 4-1. The Well Development Forms are provided as Attachment F.
Table 4-1. Summary of Water Quality Parameters during Well Development, March 13, 2008

<table>
<thead>
<tr>
<th>Time</th>
<th>Gallons pumped&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Water Level (ft bgsl</th>
<th>Temperature (°C)</th>
<th>Specific Conductivity (μmho/cm)</th>
<th>pH</th>
<th>Turbidity (NTUs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0802</td>
<td>5</td>
<td>480.18</td>
<td>15.47</td>
<td>693</td>
<td>6.80</td>
<td>0.94</td>
</tr>
<tr>
<td>0916</td>
<td>25</td>
<td>482.91</td>
<td>18.37</td>
<td>700</td>
<td>7.22</td>
<td>4.18</td>
</tr>
<tr>
<td>1041</td>
<td>50</td>
<td>483.94</td>
<td>18.60</td>
<td>706</td>
<td>7.22</td>
<td>1.00</td>
</tr>
<tr>
<td>1213</td>
<td>75</td>
<td>484.21</td>
<td>18.37</td>
<td>706</td>
<td>7.20</td>
<td>0.68</td>
</tr>
<tr>
<td>1317&lt;sup&gt;b&lt;/sup&gt;</td>
<td>100</td>
<td>488.10</td>
<td>19.54</td>
<td>703</td>
<td>7.13</td>
<td>2.94</td>
</tr>
<tr>
<td>1436</td>
<td>125</td>
<td>485.92</td>
<td>19.36</td>
<td>705</td>
<td>7.17</td>
<td>2.89</td>
</tr>
<tr>
<td>1558</td>
<td>150</td>
<td>485.42</td>
<td>19.86</td>
<td>708</td>
<td>7.11</td>
<td>3.39</td>
</tr>
</tbody>
</table>

<sup>a</sup> Pumping followed the evacuation of approximately 340 gallons with the bailer on March 10 and 11, 2008. Water quality parameters were not stable during the bailing.

<sup>b</sup>Pump rate was increased to approximately ¾ gallon per minute at 1259 and water level dropped significantly. Rate was returned to approximately 1/3 gallon per minute and water level recovered. Turbidity remained below 5 NTUs (as specified in FOP).

ft = Feet
bgsl = Below ground surface
°C = Degrees Celsius
FOP = Field operating procedure
μmho/cm = Micromhos/centimeter
NTUs = nephelometric turbidity units
pH = Potential of hydrogen
5.0 VARIANCES

All FOPs and Administrative Operating Procedures (AOPs) cited in the Plan (SNL/NM August 2007) were followed. There were no instances of variance from either the Plan or the FOPs/AOPs during these activities.

6.0 REFERENCES


New Mexico Environment Department (NMED), April 2004. “Compliance Order on Consent Pursuant to the New Mexico Hazardous Waste Act,” § 74-4-10, New Mexico Environment Department.


ATTACHMENT A
Well Data for MWL-BW2
<table>
<thead>
<tr>
<th>Items Required by the Order(^a) Section VIII.D</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Well name/number</td>
<td>MWL-BW2</td>
</tr>
<tr>
<td>2. Date of well construction</td>
<td>January 22, 2008 (completion)</td>
</tr>
<tr>
<td>3. Drilling method</td>
<td>Air rotary casing hammer</td>
</tr>
<tr>
<td>4. Drilling contractor and name of driller</td>
<td>Water Development Corporation, Mark Green</td>
</tr>
</tbody>
</table>
| 5. Borehole diameter and well casing diameter | Borehole: 11 3/4 inches 0 to 300 ft bgs, 9 5/8 inches to 300 to 519 ft bgs  
 Well casing: 5.563 inches OD, 4.767 inches ID |
| 6. Well depth | 502 ft bgs (borehole depth 519 ft bgs) |
| 7. Casing length | 504.35 ft total (bgs 2.35 ft above ground) |
| 8. Casing materials | Schedule 80 PVC |
| 9. Casing and screen joint type | Flush thread |
| 10. Screened interval(s) | 467 to 497 ft bgs |
| 11. Screen materials | Schedule 80 PVC |
| 12. Screen slot size and design | 0.010-inch slotted screen |
| 13. Filter pack material and gradation | Primary: #20-40 silica sand  
 Secondary: #60 silica sand |
| 14. Filter pack volume (calculated and actual) | Calculated: 18.2 ft\(^3\), 36.4 50-lb bags  
 Actual: 40 bags |
| 15. Filter pack placement method | Gravity feed through drive casing |
| 16. Filter pack interval(s) | Primary: 461.5 to 510 ft bgs  
 Secondary: 456 to 461.5 ft bgs |
| 17. Annular sealant composition | Volclay chip plug, bentonite grout |
| 18. Annular sealant placement method | Gravity feed through drive casing |
| 19. Annular sealant volume (calculated and actual) | Calculated: Plug 11.4 ft\(^3\), 12.7 50-lb bags  
 Grout 1\(^{st}\) 121-ft lift 46 ft\(^3\), 345 gallons  
 Grout 2\(^{nd}\) through 4\(^{th}\) 100-ft lifts 63 ft\(^3\), 472 gallons each  
 Actual: Plug 14 bags  
 Grout 1\(^{st}\) 121-ft lift 380 gallons  
 Grout 2\(^{nd}\) through 4\(^{th}\) 100-ft lifts 400 gallons each (brought to 12 ft bgs) |
| 20. Annular sealant interval(s) | Plug: 426 to 456 ft bgs  
 Grout: 12 to 426 ft bgs |
| 21. Surface sealant composition | Concrete |
| 22. Surface sealant placement method | Gravity feed through drive casing |
| 23. Surface sealant volume (calculated and actual) | 7.56 ft\(^3\)  
 Not recorded, placed concrete 0 to 12 ft bgs |
| 24. Surface sealant interval | 0 to 12 ft bgs |
| 25. Surface seal and well apron design and construction | 3-ft by 3-ft by approximately 8-inch deep concrete pad |
| 26. Well development procedure and turbidity measurements | Stainless steel bailer and submersible pump (see Table 4-1 for turbidity measurements) |
| 27. Well development purge volume(s) and stabilization parameter measurements | Total of 490 gallons (see Table 4.1 for parameter measurements) |
| 28. Type and design and construction of protective casing | 10-ft length of 12-inch diameter steel casing with hinged cap (7 ft bgs and 3 ft above ground) |
| 29. Well cap and lock | Hinged cap on protective casing with padlock and locking well cap with padlock on well casing |
| 30. Ground surface elevation | 5386 ft amsl |
| 31. Survey reference point elevation on well casing | 5388.35 ft amsl |
| 32. Top of monitoring well casing elevation | 5388.35 ft amsl |

Refer to footnotes at end of table.
Table A-1. Well Data for MWL-BW2 (concluded)

<table>
<thead>
<tr>
<th>Items Required by the Order* Section VIII.D</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>33. Top of protective steel casing elevation</td>
<td>5388.95 ft amsl</td>
</tr>
<tr>
<td>34. Name of geologist</td>
<td>Stacy Griffith</td>
</tr>
<tr>
<td>35. Initial water level</td>
<td>472.5 ft bgs (estimated by diminished cuttings return during drilling)</td>
</tr>
<tr>
<td>36. Final water level</td>
<td>474.46 ft bgs January 22, 2008 (475.27 ft bgs on April 3, 2008)</td>
</tr>
<tr>
<td>37. Date of well development</td>
<td>March 13, 2008 (completed)</td>
</tr>
</tbody>
</table>

* New Mexico Environment Department, April 2004. "Compliance Order on Consent Pursuant to the New Mexico Hazardous Waste Act," § 74-4-10, New Mexico Environment Department.

amsi = above mean seal level  
bgs = below ground surface  
ft = feet  
ft³ = cubic feet  
ID = inside diameter  
OD = outside diameter  
PVC = polyvinyl chloride
ATTACHMENT B
Field Notes for Activities at MWL-BW1 and MWL-BW2
1-7-08
Drilling @ MWL
Kick-off Meeting w/ training

1344: Arrive ERFO for meeting
Mike Skelly (CT-32165)
Stacy Griffith SNL/NM (CT-32215)
Mike Sanders

Clint
Mark Green Water Development Corp.
Dustin
Richard

Watch all training videos @ ERFO, Discuss SaV
HASP, site access, security, etc.
1530: All personnel leave site.
1-8-08
Drilling @ MWL
Task: Set up @ site
Personnel: SRG - SNL/GRAM
Mark Green
& Dustin O’Jole WOC
Richard Bate

0930: Arrive @ site. Mob equipment from decon pad. All equipment second prior to arriving @ drill site.

1000: Franz Leuthner arrives
1045: Craig Hoobler arrives to conduct safety inspection
1115: Safety inspection complete & approval from Hoobler to proceed w/work.
1130: All personnel of-site. WOC needs new filters for rig. Must go off-site.
Return to ERMQ
1-14-08  Monday

Task: MWL Drilling

Weather: Cold, clear. 26°F @ 0700.

Personnel: SRG - SNL/GRAM
Mark Green  WDC
Richard Bale

0645: SRG @ ERMD, mob to site.
0700: On-site, all personnel conduct daily H&S mtg.
       Dustin Crow not on site. New crew member (263-2396)
       waiting @ badge office. (Rig Type: STAR-30K)
0730: Setting up @ location.
0750: Bill Gibson & Alfred S. on-site to deliver eye wash station.
0810: Bill & Alfred off-site.

Drill string - 1’ shoe then 20’ of 11½” drill casing
1st length of casing 20’

0830: 2nd 20’  →  40’ total
0900: 3 X 20’  →  60’
0930: 4 X 20’  →  80’
0930: 5 X 20’  →  100’
0940: 6 X 20’  →  120’
0945: 7 X 20’  →  140’
1000: 8 X 20’  →  160’
1010: 9 X 20’  →  180’
1020: 10 X 20’  →  200’
1030: 11 X 20’  →  220’
1040: 12 X 20’  →  240’
1050: 13 X 20’  →  260’

145’ no grab sample
Sample @ 135’
8:40: 14 x 20' = 280' total drill pipe casing in hole.
1201: 15 x 20' = 300'
1220: Reached 300' bgs w/ 13
e 1/4" casing, pull drill stem x 1
1230: All personnel off-site for lunch, badge office, decor, pad.
1330: All personnel back on-site including Dustin Crow
a d ERFO (Lynch, Gibson, Santillanes) to set up
site perimeter zone.
1435: Set up w/ 9 1/8" drill casing, trip back in all
drill stem, 520' of casing in pipe truck.
1500: Site visitors: Casey Heath (WDC, new crew)
Danielle Nieto (SNC), Daniel Kurtz (SNC)
Lynch, Gibson, Santillanes (ERFO) - set up exclusion
zone perimeter.
Cover HASPs training forms w/ Heath.
1540: Heath, Nieto, Kurtz off-site.
1600: Mike Skelly on-site for SNC; kg off-site @ 1605.
1629: Gebert/Lynch/Santillanes finish setting up perimeter
pipe, caution barrier, tree care for ERFO.
1647: Drill rig off, secure site, drill crew
off-site.
1653: Secure trailer, Skelly off-site.

Michael F. Skelly
1-15-06 Tuesday
Task: MWL Drilling
Weather: Cold, clear
Personnel: SRG - SNL/GRAM
Mark Green    Richard Bare

0645: 0700: Personnel on-site, Conduct H&S mtgs.

0732: Prepare to resume drilling @ 200' - 220' of casing on pipe truck

0740: Casing 1 x 20' -> 320' 200'

0802: 2 x 20' -> 340' 180'

0815: 3 x 20' -> 360' 160'

0840: 4 x 20' -> 380' 140'

0900: 5 x 20' -> 400' 120'

0917: 6 x 20' -> 420' 100'

0930: Casey Heath on-site, Badge # CT42653 Temp

Mark Green    Richard Bare    CT411780

0935: 7 x 20' -> 440' 80'

0950: 8 x 20' -> 460' 60'

1017: 9 x 20' -> 480' 40' expect WT ~ 472'

1050: 10 x 20' -> 500' 20' + 10' on truck

1100: Cyclone of tube blocked after encountering material below WT
1140: Add 10' casing => total 510'.
1210: Total Depth ~ 509'. Added ~ 100-150 gallons water to clean out. Will evacuate all added water.
1245: Start tripping out drill stem.
1315: All drill stem out of hole.
1330: Drill crew prep well materials. SRG onsite to EBMO.
1400: Skelly, SRG & JetWest Geophysical Services onsite.
Neutron probe & resistivity logging of well w/ jet drive casing. JetWest personnel- Al Henderson
1445: Start logging borehole.
1700: JetWest finished. Skelly, offsite.
1720: Secure site. SRG w/ JetWest to Eubank Gate.
1-16-08  Wednesday

Task: MWC Drilling
Weather: Very cold, windy.

Personnel: SRG, SNL/GRAM

Mark Green
Richard Bax
Casey Heath

0645: SRG @ ERMO, mob to site.
0700: All personnel on site. Conduct H45 mfg.
0740: Water level 485' bgs. (measurement 489'-3.8' stick up, WL has not reached anticipated ~472' bgs.
0800: SRG off-site to ERMO to discuss situation.
0930: Call Mark Green to trip drill stem back in hole and drill an additional 10'.
1000: SRG on site, drill crew tripping into borehole
1030: Mike Skelly onsite. Begin drilling @ 509'.
Gravel layer only few inches thick. Back into some gravel but w/ clay.
1120: Not much difference in lithologies - intermittent sands, clay, very few gravel lenses. TD = 519' bgs.
1145: Trip out drill stem.
1220: All drill stem out.
1300: SRG off-site to ERMO.
1-17-08 Thursday

Task: MWL Drilling
Weather: Very very cold -10°F w/ wind chill
Personnel: SEG / SNL/GRAM
Mike Green
Casey Heath
Richard Bace

0630: SEG @ ERMO mob to site.
0655: SEG, Green & Heath on site. Very cold conditions.
0720: Conduct 1st intake.
0730: Tag water level: 502.3' - 3.8' stick up = 498.5'
      Leg bottom of borehole - 523.38' = 519'
      Borehole stayed open, water level has not
      come up to expected level (~472')
      There is ~20.7' of water in borehole.
      Expect ~47' of water in borehole.
0945: Mike Skeddy called Will Moats (NMED) to discuss
      situation. Moats agreed to set the well as
      proposed w/ an anticipated water level of
      472'.
1000: Begin to build well. Brand new tape measure for leg.
1030: Add Volclay core chips to bottom of hole
      50 lb bags -> Ht H 1
      pulled 10' casing left in hole 510'
      added clay to 509.2' bags.
Build well - 5" cap, subm 30' 0.012 slot screen
      centralizer @ base of screen & at top.
1-17-08

1400: Set well to 504.66' of P.U. Set bottom @ 502'. Add 5' of stick up for building well (7.66' of stick up w/ addition).

1420: Start adding 20-40 sand 50 lb bags. 

1500: Pull casing 1' x 10' = 2,500' in hole.

1515: Pull 1' x 20' = 4,160' in hole.

1530: Pull 1' x 20'.

1600: Pull 1' x 10' casing. 4,600'.

1615: Add volclay chips. 50 lb bags. (Calc. 9 use 7)

1715: Add ~ 100 gallons water.

1730: Secure site. SRCs to ERMD.
1-18-08 Friday
Task: MWL Drilling
Weather: Cold & clear
Personnel: SRG, SNL/GRAM
Mark Green
Richard Bare
Casey Heath
0700: SRG @ ERMA mob to site
0730: All personnel @ site, conduct H45 mtgs.
0754: Adding Volclay chips to 426', need 4 or 1111 used
0820: Water level 472.5' -> Yeah.
0830: Hydrate last 10' of chips, w/ 140 gallons
0850: Pull 1x20' casing (410' in hole)

Well Construction Diagram

Top 1st great lift 16'30"
Top Volclay Plug 426'
Top 60 sand 456'
Top primary sand 461.5'
Top Screen 467'
Bottom Screen 497'
Bottom of well 502'
TD 519'

Benhitite Great
1st lift
Volclay Chip Plug 30'
Secondary Sand (60) 55'
Primary Sand Pack
0.010 slot '30' [20-40] 48.5'
Sump 6'
0.4" cap
Volclay Chip Plug
1-18-08 cont'

0900: Mark Green offsite to Home Depot
Richard & Casey to demo pad w/ casing

0930: Richard & Casey break

0945: Mark back onsite. Prepare to mix 1st lift of grout.

1020: Pump in 1st tanking of grout. SmoothGrout® One Step
(Grouting System Powdered) 50 lb. bags Wyoming Portlandite

1030: Pull 4 x 20' casing (330' casing in borehole)

1045: Cut off upper portion of well casing.
Pull 5 x 20' casing (230' casing)

1105: Pull all remaining 9 5/8'' casing. Leave in 11 3/4''
(300' in borehole).

1205: All 9 5/8'' casing pulled. 5' open hole b/w bottom
of 11 3/4'' casing @ 300' d top of grout ~305'
WDC crew to demo pad to clean drill casing.

1300: Secure site. SRC to ERMB.
1-21-08 Monday
Task: MWL Drilling
Weather: Cold clear, high winds expected
Personnel: SRG, SNL, GRAM
Mark Green, Richard Barc, WDC
0645: SRG @ ERMO, mob to site
0700: All personnel on site, Casey Heath not on site today
0720: Water level @ 474.32, No grout on water level probe, Conduct H&S mtgs.
0731: Tagged top of grout @ 308'. ~100'
0900: Mixed batch of grout ~400 gallons, Pumped in Pull 20' casing, 144T = 100'
0950: Mix ~400 gallons grout ~100', pump in
1000: Pull 100' casing, let grout sit 1 hour
1200: Mix last batch of grout to bring up to near surface
1230: Grout up to ~12' bgs. Let set up & top off tomorrow, SRG off-site to ERMO, WDC site clean up & clean
1300-1700 Stand by => 4 hours
1-22-08 Tues
Task: MWL Drilling - Official date of Completion BW2
Weather: Overcast, cold
Personnel: SRG, SNL/ERAM

0800: SRG on-site,
Mark Green & Richard Base (WOC) on-site.
Prepare to complete well pad @ BW2.
Casey Heath on-site (WOC).

0850: Water level 474.46'
1000: WOC crew to finish well pad w/ bollards.
SRG back to ERMO.
Casey Heath picked up new badge CT42467
10:30 - 5:30 Stand by hours - 7 hr.
1-23-08  Wed
Task: P+4 @ MWL-BWZ
Weather: Clear, cold
Personnel: SRG SNL/GRAM
Mark Green  > WDC
Richard Baze  > WDC
Casey Heath

0800: Mob to BW1 to prepare to P+4A the well.
0830: Run tubing to bottom of well for grouting. Conduct HSS.
Grout product: Quick-Grout™ Bafoid

Placement of grout w/ portable grout plant on trailer. Mixes grout & water in small tank.

1030: Start grouting well.
1245: Grout to surface. All personnel off-site. WDC crew to dean grout equipment. Will check grout level in morning. SRG to ERM0.
5 hours standby.
1-24-08 Thur
Task: MWL Drilling - P+ A MWL - BW1
Weather: Overcast, cold
Personnel: SRG, SNL/GRAM
  Mark Green
  Richard Basa
  Casey Heath
  WOC

0645: SRG @ ERMO, mob to site.
0700: SRG on site, trailer, H+5 mfg.
0740: David Miller and Mike Sanders on site, discussion of TA-V next week.
0830: Miller & Sanders off site.
0900: Grout sunk to 12' bgs in well casing @ BW1, use forklift to pull up concrete pad & bollards.

The protective casing (above pad portion) was welded to 8 conductor casing. This was not indicated on the well construction diagram. The lithology log showed 14" butt welded casing to 20' bgs. There is ~10" of the casing above ground & another 1' of the PVC well casing above that. Cannot pull that 14'6" steel casing. In order to abandon the well, cut off the PVC level w/ the steel casing, fill to surface w/ quickcrete at mound around steel casing. Place tagger in concrete monument to be marked as P+ A by ERFO later.
1130: All personnel off site to 0585 to watch TA-V security video.
MUL 8W2 DEVELOPMENT 3/1/08 MON.

PERSONNEL: MIKE SAUNDERS (6765/GRADE INC.),
NICHOLAS (NIK) COOPER (WOC)
WEATHER: CLEAR, CALM, MID-50'S
TASK: START MUL-8W2 WELL DEVELOPMENT

0800 ARRIVE AT BASE OFFICE (EPAC 13D3).
COOPER HAS TEMP. BASE, HEAD TO 9925.
9925 FOR VIDEO TRAINING.
1054 ALLOWED @ TA 12 DEAN PAD AFTER COMPETE
VIDEO TRAINING & FILLING TO 60' WATER
TANK @ 8 99.25.
1340 still @ DEAN PAD, HAD TO RUSH DOWN REPAIR
PART FOR STEAM CLEANER.

Bore Vol Calcs: Please see recalculation p. 188

---

GRAVEL PACK:

10'' DIA: 0.5454 ft³/ft
5'' DIA: 0.1364 ft³/ft
18'' DIA: 0.5454 - 0.1364 = 0.409 ft³/ft

12.3' x 10'' = 1.022 ft³ x 12.3 = 12.74 ft³
10'' x 10'' = 1.022 ft³ x 12.3 = 12.74 ft³
502'' x 10'' = 102.2 ft³ x 12.3 = 1.274 ft³
516'' x 10'' = 103.6 ft³ x 12.3 = 1.274 ft³

Total: 12.74 + 12.74 + 1.274 + 1.274 = 37.03 ft³

1.62 GALS/ft³ x 30' = 48.6 GALS

Total: 37.5 + 30.6 = 68.1 GALS PER BORE VOLUME.

---
M.U.L-BUIZ2 DEVELOPMENT 3/16/08  M.M.M.
1407  HEAT TO BUIZ2, DECON DRAIN, CARRY JEN.
2-3 GALLONS WATER TO DECON PAD.
(TO TOP OF STORE ARE PROTECT CASING I)
1435  477.55' r: 3.0' STICKUP ABOVE GROUND SURFACE.
474.55' TO WATER RFS. ~ 7.5' OF SCREEN IS DRY.
1440  COMPLETED HASP REVIEW, TAILGATE H/BRIEF
DISCUSSO LAYNE LIFTING HOOK ACCIDENT.
2 YRS AGO.
1520  BAILED ~ 40 GALLONS FROM WELL, MUDY WATER,
NOT MUCH SEDIMENT IN SUMP. BAILED DRY.
1542  START SWABBING WELL.
1625  FINISH SWABBING, RUN BAIZ 2 AGAIN.
1700  BAILED ~ 25 GALLONS (~ 75 TOTAL NOW), WATER
LEVEL DROPPING FAIRLY QUICKLY (LOW PRODUCER).
LOCK UP WELL, WILL SWAB AGAIN IN A M.
1718  DEPART SITE, CAME STACY/GRIFFITH STATUS
REPORT.

M. R. Sage 3/16/08
MWL-BWZ Development

Michael Shelly taking over for Michael Sanders.
0648 at ER MOS + pick up gal + truck lead

to MWL

0703 On site at MWL-BWZ

0711 Nick Cooper onsite, set up over well, discuss bail plan, review tailgate HTS plan.

0732 Tag water level 478.1 top of protective casing (stone pipe).

0738 Begin swabbing well screen

0802 Finish swabbing run tail.

0815 Removed n 95 gal (total 45 today) water sample very muddy, silt (see field log for parameter readings).

0832 Bailed dry at 120 gal (total) allow well to recover.

0848 Resume bailing.

0904 Bailed dry at 148 gal (total) allow well to recover.

0921 Resume bailing; transfer water to drum #3 (150 gal).

0947 Bailed dry at 160 gal.

1010 Resume bailing.

1021 Bailed dry at 175 gal.

1044 Resume bailing.

1055 Bailed dry at 185 gal.

1126 Resume bailing.

1138 Bailed dry at 200 gal, allow well to set before swabbing. Leave site for ER MOS.

1156 At ER MOS tag off with Stacy.
3-11-08 cont

1250: S. Griffith on site. WDC swabbing well again.
1300: Bailed ~ 25 gal, well nearly dry, allow recovery.
1340: Resume bailing. Bailed ~ 20 gal -> dry
1430: 
1455: ~250 gallons total purged from well
parameters not stable, see log
1500: Able to purge ~ 20 gal every 20 - 25 minutes
1530: Mike Skelly on-site. Continue purge & recovery
1700: Total purge volume ~ 300 gal, parameters did not stabilize w/ bailing method alone. Well recovery too slow to pump w/ WDC development rig. Will continue to develop w/ ERFO. Skelly offsite.
1715: Secure site, WDC at Griffith offsite

Recalculation of Well Bore Volume:

\[ R_1 = \text{well ID} = 0.40 \text{ ft} \]
\[ R_2 = \text{bore ID} = 0.83 \text{ ft} \]
\[ \text{saturation screen height} = (497 - 474.58) = 22.45 \text{ ft} \]
\[ V_1 = \text{saturation casing volume} = \left(\frac{R_2}{2}\right)^2 \pi (22.45)(7.48 \text{ ft}^3/\text{gal}) = 21 \text{ gal} \]
\[ V_2 = \text{saturation bore volume} = \left(\frac{R_2}{2}\right)^2 \pi (22.45)(7.48) = 91 \text{ gal} \]
\[ V_3 = \text{sand pack} = (V_2 - V_1)(0.30) = 21 \text{ gal} \]
Well Bore Volume = \( V_3 + V_1 = 42 \text{ gal} \)
3-13-08
Task: Continued Development MUL-BWZ
Weather: Clear, expected very high winds
Personnel: S. Griffith / GRAM
          Robert Lynch
          Bill Gibson
          Alfred Santillanes
          > ERFQ

0730: Prepare to pump well w/ Bennett pump
Water level 477.35' BTC
Set pump @ bottom of screen section ~ 497'

0802: Set pump @ bottom of screen.
Start pumping @ ~ 1/3 gal/minute.
Parameters recorded on log.
Water is only slightly cloudy.

0830: After 10 gals => turbidity 1.28 NTU
0900: 20 gals => 6.34 NTU
Water level drops to 483 and
then only drops slightly w/ continued
pumping.

1116: WL 483.73' BTC, turb 1.01 NTU
60 gals purged.
3-13-08 am

1300: Pump rate @ ~ ½ gal/minute.  
        WL in well ~ 4.83.  
        Parameters remain stable.  
        Turbidity below 1 NTV.  
        Increased pump flow rate to approximately  
        ¾1 gal/min.  
        WL drops ~ 4 ft at turb increases. (max 28.2 NTV)  

1330: Reduce flow rate to ~½ gal/min.  
        Parameters stabilize turb return to <1 NTV  

1400: Continue pumping @ lower rate.  
        Total gallons pumped ~115.  

1558: Total gallons @ 150 for day.  Gallons  
        bailed previously this week ~340 gallons.  
        Parameters stabilized. End of development  
        full pump secure well head leave site.  
        See field logs for MWL-3Wd.
ATTACHMENT C

Combination Lithologic and Geophysical Logs with Well Construction Details for MWL-BW2
Water level during geophysical logging (~484 ft GSC) was not static.
ATTACHMENT D
Well Construction Diagram for MWL-BW2
**WELL DATABASE SUMMARY SHEET**

<table>
<thead>
<tr>
<th>Project Name:</th>
<th>ENVIRONMENTAL RESTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>ER ADS #:</td>
<td>1289</td>
</tr>
<tr>
<td>Well Name:</td>
<td>MWL-BW2</td>
</tr>
<tr>
<td>Owner Name:</td>
<td>U.S. DEPT. OF ENERGY</td>
</tr>
<tr>
<td>Date Drilling Started:</td>
<td>14-JAN-2008</td>
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<tr>
<td>Drilling Contractor:</td>
<td>WATER DEVELOPMENT CORP.</td>
</tr>
<tr>
<td>Drilling Method:</td>
<td>AIR ROTARY CASING HAMMER</td>
</tr>
<tr>
<td>Borehole Depth:</td>
<td>519</td>
</tr>
<tr>
<td>Casing Depth:</td>
<td>502</td>
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<tr>
<td>Geo Location:</td>
<td>TA-III</td>
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<tr>
<td>Well Completion Date:</td>
<td>22-JAN-2008</td>
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<tr>
<td>Completion Zone:</td>
<td>ALLUVIAL MATERIAL</td>
</tr>
<tr>
<td>Formation of Completion</td>
<td>SANTA FE GROUP</td>
</tr>
<tr>
<td>Well Comment:</td>
<td>INITIAL WATER LEVEL APPROX. BASED ON CONDITIONS ENCOUNTERED DURING DRILLING. CUTTINGS RETURN DIMINISHED DUE TO SATURATION. BOREHOLE DIAMETER IS 11 3/4 IN. TO 300 FT. AND 9 5/8 IN. TO TD.</td>
</tr>
</tbody>
</table>

**Survey Data**

| Survey Date:          | 23-MAR-2008          |
| Surveyed By:          | SNJ/NM               |

**State Plane Coordinates**

| (X) Easting:          | 411947.89            |
| (Y) Northing:         | 1452389.85           |

**Surveyed Elevations (FAMSL)**

- Protective Casing: 5386.95
- Top of inner Well Casing: 5388.35
- Concrete Pad: 5386.01
- Ground Surface: 5386

**Completion Data Measured Depths (FBGS)**

- Casing Stickup: 2.34

<table>
<thead>
<tr>
<th>Interval</th>
<th>Start</th>
<th>Stop</th>
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<tbody>
<tr>
<td>BOREHOLE</td>
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</tbody>
</table>

**Initial Water Elevation**

- Initial Water Elevation: 4915.85 (FAMSL)
- Initial Depth To Water: 472.5 (FBGS)
- Last measured water level was 4913.5 FASL measured on 22-JAN-2008

**Date Updated:** 03-APR-08  
**Date Printed:** 07-APR-2008
## WELL DATABASE SUMMARY SHEET

<table>
<thead>
<tr>
<th>Project Name:</th>
<th>ENVIRONMENTAL RESTOR</th>
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<td>Well Name:</td>
<td>MWL-BW2</td>
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<td>U.S. DEPT. OF ENERGY</td>
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<td>14-JAN-2008</td>
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<td>WATER DEVELOPMENT CORP.</td>
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<td>Drilling Method:</td>
<td>AIR ROTARY CASING HAMMER</td>
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<td>Borehole Depth:</td>
<td>519</td>
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<td>22-JAN-2008</td>
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<td>Completion Zone:</td>
<td>ALLUVIAL MATERIAL</td>
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<td>Formation of Completion:</td>
<td>SANTA FE GROUP</td>
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<tr>
<td>Well Comment:</td>
<td>INITIAL WATER LEVEL APPROX. BASED ON CONDITIONS ENCOUNTERED DURING DRILLING, CUTTINGS RETURN DIMINISHED DUE TO SATURATION. BOREHOLE DIAMETER IS 11 3/4 IN. TO 300 FT. AND 9 5/8 IN. TO TD.</td>
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### Interval

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<tbody>
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<td>510'</td>
<td>519'</td>
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### VOLCLAY CHIP

**Additional Comments**
ATTACHMENT E

Groundwater Well Abandonment Diagram for MWL-BW1
Well Name: MWL-BW1
Location: Mixed Waste Landfill
State Plane Coordinate X: 411756.001
Y: 1451698.73
Surface Casing Type: steel conductor casing
Surface Casing Length: 20 feet
ID Well Casing: 4.75 inches
Well Casing Depth: 477.17 feet
Screen Interval: 452.17 to 472.17 feet
Plugging Grout Type: Quick-Crete™ (bentonite grout)
Grout Volume Used: approximately 450 gallons
Date of Decommissioning: 24-Jan-08
ATTACHMENT F
Well Development Forms for MWL-BW2
# FIELD MEASUREMENT LOG FOR GROUNDWATER SAMPLE COLLECTION

<table>
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<th>Project Name:</th>
<th>Mixed Waste Landfill</th>
<th>Project No.:</th>
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<td>MWL-BW2</td>
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<td>Weather</td>
<td>CLEAR, CALM, 505-605</td>
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<td>Method:</td>
<td>Boiler, Portable pump</td>
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## PURGE MEASUREMENTS

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<th>Depth to Water (FT)</th>
<th>Time 24 hr</th>
<th>Vol. g</th>
<th>Temp °C</th>
<th>mS/cm</th>
<th>ORP MV</th>
<th>pH</th>
<th>Flow L g/s</th>
<th>Turb NTU</th>
<th>DO %</th>
<th>Color and appearance</th>
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<td>08/04</td>
<td>40</td>
<td>20.27</td>
<td>0.637</td>
<td>180.2</td>
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## Purge Volume Calculations

### Well Diameter
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FIELD MEASUREMENT LOG FOR GROUNDWATER SAMPLE COLLECTION

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Method: √ Portable pump  Dedicated pump  Pump depth: 497'

### PURGE MEASUREMENTS

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<th>Ec µmho</th>
<th>ORP MV</th>
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COC number(s):  Sample number(s):

### Purge Volume Calculations

- **Well Diameter**
  - 2" well: 0.16 gal/ft X (height of water column) = _____ gallons
  - 4" well: 0.65 gal/ft X (height of water column) = _____ gallons
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  - 1/4" OD: 2.4 ml/ft X (length of tubing) = ______ milliliters
  - 3/8" OD: 9.7 ml/ft X (length of tubing) = ______ milliliters
  - 1/2" OD: 21.6 ml/ft X (length of tubing) = ______ milliliters

AL4/69/MSdoc/SNL/FOP9448,RV2
FIELD MEASUREMENT LOG FOR GROUNDWATER SAMPLE COLLECTION

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PURGE MEASUREMENTS

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COC number(s):  
Sample number(s): 

Purge Volume Calculations

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### Weather

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<th>Ec μmho</th>
<th>ORP MV</th>
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### CCC number(s): 

### Sample number(s): 

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