

PERMIT ATTACHMENT 2: GROUNDWATER SAMPLING AND ANALYSIS PLAN

2.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) provides additional requirements that shall be adhered to by the Permittees for the collection and analysis of water samples from groundwater monitoring wells located at the Chemical Waste Landfill (CWL) during the post-closure care and compliance monitoring periods. The post-closure care and compliance groundwater monitoring program is designed to address the requirements of 40 C.F.R. Part 264 Subpart F.

The Permittees must comply with the groundwater protection standard at 40 C.F.R. § 264.92. The hazardous constituents that shall be monitored in accordance with 40 C.F.R. § 264.93 are trichloroethene, chromium, and nickel. Additionally, in accordance with 40 C.F.R. § 264.99(g), the Permittees shall collect and analyze water samples for an enhanced list of constituents (see Section 1.8.1.1 of Permit Attachment 1 for the enhanced list of constituents) at least annually from wells located at the point of compliance and the background well.

The purpose of this SAP is to document procedures for the collection and reporting of consistent, reliable, defensible, and comparable groundwater sampling results. This SAP provides additional instructions for sample collection, data management, and reporting of data that shall be adhered to during the post-closure care and compliance periods. Other instructions are provided in Sandia National Laboratories/NM (SNL/NM) Field Operating Procedures (FOPs), and SNL/NM Administrative Operating Procedures (AOPs); however, the requirements of this SAP and the CWL Post-Closure Care Permit (Permit) shall take precedence over any FOPs and AOPs. Table 2-1 summarizes documents that are referenced in this SAP, which can be obtained from the SNL/NM Environmental Safety and Health (ES&H) and Security Records Center. The most current versions of these documents shall be consulted for the purpose of conducting groundwater sampling.

The Permittees shall provide to the New Mexico Environment Department (the Department) within 60 days of the effective date of this Permit in hard copy and electronic format the current versions of the FOPs and AOPs listed above. The Permittees shall provide the Department with any updated versions of the FOPs/AOPs within 30 days of their acceptance by the Permittees. If any requirement or procedure in the FOPs or AOPs is found by the Department to be unacceptable for reasons including, but not limited to, the requirement or procedure will or could prevent the acquisition of representative and reliable groundwater sampling results, the requirement or procedure shall be replaced by the Permittees with a different requirement or procedure that is acceptable to the Department.

2.1. DATA QUALITY OBJECTIVES AND QUALITY CONTROL

The data quality objective (DQO) for groundwater monitoring is to collect accurate and defensible data of high quality to assess the concentrations of hazardous constituents in the groundwater in the uppermost aquifer underlying the CWL such that they can be compared to the concentration limits in Table 1-2 in Permit Attachment 1, as it may be amended. The Permittees shall evaluate accuracy, precision, representativeness, completeness, and comparability of the groundwater data to verify that data are of high quality and ensure that the DQO is met. Quality control (QC) procedures discussed in Section 2.20 of this Permit Attachment shall also be used to determine whether the DQO has been attained. QC samples generated in both the field and the laboratory shall be analyzed and evaluated. Laboratory measurements shall comply with

SNL/NM Sample Management Office (SMO) procedures and protocols listed in Table 2-1, including qualification or validation of laboratory analytical data, and shall also comply with this Permit. This procedure for determining the quality and usability of analytical data acquired during groundwater sampling shall be summarized in data validation reports regarding the overall quality of the data and the resulting data qualifiers. All associated data validation reports shall be submitted to the Department in the post-closure care annual report along with the results for each monitoring event. Data not meeting DQO requirements are subject to corrective action(s) as discussed in SNL/NM SMO procedures and protocol and as discussed in Section 2.22 of this Permit Attachment.

TABLE 2-1
Reference Documentation
CWL Groundwater Monitoring^a

Document Number	Document Title
AOP 00-03	Data Validation Procedure for Chemical and Radiochemical Data
AOP 95-16	Sample Management and Custody
FOP 05-01	Groundwater Monitoring Well Sampling and Field Analytical Measurements
FOP 05-02	Groundwater Monitoring Equipment Field Check For Water Quality Measurements
FOP 05-03	Groundwater Sampling Equipment Decontamination
FOP 05-04	Groundwater Monitoring Waste Management
LOP 94-03	Sample Handling, Packaging, and Shipping
SMO 05-03	Procedure for Completing the Contract Verification Review

^a Sandia National Lab's Documents (procedures/documents will be used as revised and updated).

2.2. ACCURACY

Accuracy is the agreement between a measured value and an accepted reference value. When applied to a set of observed values, accuracy is influenced by a combination of a random component and a systematic bias. Accuracy shall be maintained and evaluated through referenced calibration standards, laboratory control samples (LCS), matrix spike (MS) samples, and surrogate spike samples. The bias component shall be evaluated and expressed as percent recovery (%R), as indicated in the equation below:

$$\% R = \frac{(\text{measure sample concentration})}{\text{true concentration}} \times 100\%$$

The acceptable range for %R shall be 50-130% for volatile organic compounds (VOCs) and 75-125% for metals.

2.3. PRECISION

Precision is the agreement among a set of replicate measurements. Precision data shall be derived from field and laboratory duplicate samples. Precision shall be reported as relative percent difference (RPD), which is calculated as follows:

$$RPD = \frac{|(\text{measured value sample 1} - \text{measured value sample 2})|}{\text{average of samples 1 and 2}} \times 100\%$$

The acceptable range for RPD is $\pm 20\%$ for VOCs and $\pm 35\%$ for metals.

2.4. COMPLETENESS

Completeness is defined as a measure of the amount of usable data compared to the total amount of data required. Examples of events that reduce the amount of usable data include improperly collected and preserved samples, missed holding times, sample container breakage, and operating outside prescribed QC limits. The completeness objective is 100 % for compliance data. If the completeness objective is not met and sufficient sample material remains for re-analysis, and if still appropriate, the laboratory shall repeat the analysis. Otherwise, the incomplete portion of the sampling shall be made complete by repeating the sampling and analysis as necessary. Percent completeness is expressed in the equation below:

$$\% \text{ Completeness} = \frac{\text{number of useable data points}}{\text{total number of samples required}} \times 100\%$$

2.5. DATA REPRESENTATIVENESS

Data representativeness is the degree to which samples represent the media they are intended to represent. To help ensure that samples are representative of formation water, the Permittees shall implement the procedures in this Permit for groundwater purging and sampling. Monitoring wells shall be adequately purged and stability of field parameters achieved prior to the collection of water samples.

2.6. COMPARABILITY

Comparability is the extent to which one data set or value can be related to another. Comparability between data sets shall be achieved through the collection and analysis of samples using consistent methods and QC criteria.

2.7. SAMPLING LOCATIONS AND FREQUENCY

The compliance and post-closure care groundwater monitoring network at the CWL consists of four monitoring wells. The monitoring well network shall include one upgradient and three downgradient wells located near the CWL. These wells are identified as background well CWL-BW5, and downgradient compliance monitoring wells, CWL-MW9, CWL-MW10, and CWL-MW11. Table 2-2 summarizes the monitoring well network and groundwater sampling frequency. Well completion diagrams for these wells are provided in Appendix 2-1 of this Permit Attachment.

In accordance with 40 C.F.R. § 264.97(g)(2), at least one sample shall be collected from each well (background and compliance wells) during each of two semi-annual sampling events and shall be analyzed for trichloroethene (TCE), chromium (Cr), and nickel (Ni). Additionally, in

accordance with 40 C.F.R. § 264.99(g), the Permittees shall collect and analyze water samples at least annually from wells located at the point of compliance and analyze them for an enhanced list of constituents (see Section 1.8.1.1 of Permit Attachment 1 for the enhanced list of constituents). The Permittees shall conduct semi-annual (twice each year) groundwater sampling for the entire compliance and post-closure care-periods, with one of these events each year including the enhanced sampling list (see Section 1.8.1.1 of Permit Attachment 1 for the enhanced list of constituents). Aqueous samples shall be reported in units of milligrams per liter (mg/L) or micrograms (µg)/L.

**TABLE 2-2
 CWL Groundwater Monitoring Wells and Sampling Frequency**

Well Number	Installation Year	Semi-Annual Sampling		Comments
		TCE	Cr, Ni	
CWL-BW5	2010	X	X	Upgradient well.
CWL-MW9	2010	X	X	Downgradient well
CWL-MW10	2010	X	X	Downgradient well
CWL-MW11	2010	X	X	Downgradient well

Note: Refer to Table 2-3 for specific information regarding analytical methods and constituents.

2.8. FIELD OPERATIONS

Groundwater sampling shall be conducted in accordance with this SAP and this Permit to ensure accurate, precise, representative, complete, and comparable groundwater sampling results. Other groundwater monitoring activities shall include the measurement of water levels and calculating the direction, flow rate, and gradient of groundwater flow, the decontamination of equipment, inspection of monitoring equipment, monitoring field water quality parameters, collecting and handling samples, and managing waste.

2.9. SAFETY

Field operations shall be conducted in a manner that protects the health and safety of field personnel. Every team member has the authority and responsibility to stop operations if an unsafe condition develops or is observed. All groundwater monitoring personnel shall perform field activities safely in accordance with the SNL/NM Groundwater Health and Safety Plan.

2.10. WATER LEVEL MEASUREMENTS

Water level information is used to calculate the volume of water in a well casing and the minimum amount required for purging. It is also used to determine the direction and gradient of groundwater flow, as required by 40 C.F.R. § 264.99(e). Measurements shall be referenced to a surveyed mark of known elevation at the top of each well casing. The static water level shall be measured in each well prior to purging or obtaining a sample, and measurements shall be taken to the nearest 0.01-foot using a water level indicator. Other requirements for water level measurements are provided in SNL/NM FOP 05-01. Water levels in all compliance wells shall be measured during every sampling event.

Field Water Quality Parameters – Field water quality parameters shall be collected during purging in accordance with SNL/NM FOP 05-01 and this Permit Attachment. Measurements taken shall include potential of hydrogen (pH), specific conductance (SC), temperature, and turbidity. Additional field water quality parameters shall include dissolved oxygen (DO) and oxidation-reduction potential (ORP). Field water quality parameters are as follows.

DO – The DO content of the water in percent saturation or in mg/L.

SC – The ability of a cubic centimeter of water to conduct electricity. It varies directly with the amount of ionized minerals in the water and is measured in micro-mhos per centimeter at 25 degrees Celsius (°C).

pH – A measure of the acidity or alkalinity of a solution. Numerically equal to 7 for neutral solutions, increasing with increasing alkalinity and decreasing with increasing acidity.

ORP – Potential for an oxidation (loss of electrons to another atom or molecule) or reduction (gain of electrons from another atom or molecule) reaction in millivolts.

Temperature – The temperature of the water in °C.

Turbidity (nephelometric) – The cloudiness in water due to suspended and colloidal organic and inorganic material. Water turbidity is measured in Nephelometric Turbidity Units (NTUs).

2.11. SAMPLE COLLECTION

Sample collection procedures are provided in SNL/NM FOP 05-01 and this Permit Attachment. Groundwater monitoring shall be performed using conventional sampling methods. The Permittees shall purge monitoring wells with a portable Bennett™ submersible pump system or equivalent. The pump intake shall be set at or near the bottom of the screened interval. In an effort to lower the rate of discharge for wells that purge dry, the existing Bennett pump system used at the CWL shall be equipped with a flow meter valve located along the water discharge line, and with small-diameter tubing (no less than 0.25 inches inside diameter) for both the water discharge and air (or other drive gas) intake lines. These actions represent best faith efforts that shall be employed by the Permittees to attain a pumping rate of 0.3 liters per minute or less. If the desired pumping rate of 0.3 liters per minute is not achieved during a particular sampling event for a particular well that purges dry, the Permittees will document in the annual reports submitted pursuant to Section 1.12 of Permit Attachment 1 their attempts to achieve the desired pumping rate that failed.

Regardless of the desired pumping rate mentioned above, the maximum pumping rate in any case shall not exceed 12 liters per minute, and groundwater samples collected for VOC analyses shall be collected by filling the sample containers at a flow rate not to exceed 0.1 liter per minute. The Permittees may modify the sampling system in order to split the flow of water, such that the flow of water through one side can be reduced to a rate of 0.1 liter per minute or less to facilitate the filling of sample containers. The flow rate through the other side shall be the minimum rate that is reasonably achievable. Each monitoring well shall be purged a minimum of one saturated casing volume (a saturated casing volume is the volume of all static water in the well screen interval plus the volume of water in the primary and secondary filter packs adjacent to the well screen interval). Prior to the collection of groundwater samples, purging shall continue beyond one saturated casing volume until four stable measurements are obtained for turbidity, pH, temperature, and SC. Groundwater stability shall be considered acceptable when measurements are less than 5 NTU for turbidity, ± 0.1 pH units for pH, ± 1.0 °C for temperature,

and $\pm 5\%$ for SC. If the turbidity measurements are greater than 5 NTU after completing the purging of a saturated casing volume, stability shall be considered acceptable when the lowest and highest of four consecutive measurements are within plus or minus 10%. If a monitoring well is purged dry prior to meeting the above purging and stability requirements, then sampling shall be conducted once the well has recovered such that the volume of water available in the well is the minimum necessary to collect the required water samples.

Samples shall be placed into clean laboratory-supplied containers. Groundwater samples shall be collected for VOC and metals analyses, in that order, from each well. Samples shall not be filtered. Sample documentation and custody shall be performed in accordance with SNL/NM SMO procedures and protocols (AOP 95-16 and LOP [Laboratory Operating Procedure] 94-03) and this Permit. Samples shall be delivered to the shipping facility for repackaging in shipping coolers in accordance with appropriate U.S. Department of Transportation shipping regulations (49 C.F.R. Parts 170–179).

2.12. MONITORING EQUIPMENT FIELD CHECKS

Monitoring instruments used to measure field water quality parameters shall be calibrated where appropriate or function-checked prior to sampling activities. Calibration and field-check instructions are presented in FOP 05-02.

2.13. EQUIPMENT DECONTAMINATION

All equipment that would come into contact with a sample, the interior of a well, or groundwater shall be decontaminated prior to entering any well or contacting any sample to prevent cross-contamination. Equipment and materials (including chemicals and protective clothing), decontamination procedures, and waste management procedures are presented in the FOPs 05-01, 05-02, 05-3, and 05-04.

2.14. WASTE MANAGEMENT

All waste generated during groundwater sampling activities shall be managed in accordance with federal, state, and local regulations. All purge and decontamination water shall be managed as listed hazardous waste. Analytical data from sampling events shall be compared to discharge and disposal criteria. The anticipated disposal path for purge water and decontamination water is discharge to the sanitary sewer. If the City of Albuquerque discharge standards are not met, purge and decontamination water shall be managed appropriately through the Facility's Hazardous Waste Management Unit. Personal protective equipment that comes into contact with groundwater shall be managed as listed hazardous waste and disposed of through the Hazardous Waste Management Unit. Waste management activities associated with groundwater monitoring are discussed in FOP 05-04.

2.15. SAMPLE DOCUMENTATION AND CUSTODY

To ensure the integrity of samples from the time of collection through the reporting of analytical results, sample collection, handling, and custody shall be documented in writing. Primary elements in the documentation of samples are: sample identification numbers, sample labels, custody tape, and Analysis Request/Chain of Custody (AR/COC) forms. Standardized forms shall be used to document sample information. Sample custody and documentation procedures for sampling activities are outlined in SNL/NM AOP 95-16 and LOP 94-03. These procedures, and the procedures in this Permit Attachment, shall be followed throughout each groundwater-sampling event.

2.16. SAMPLE SHIPMENT

Samples shall be shipped to the analytical laboratory in accordance with SMO procedures detailed in LOP 94-03. Prior to shipment, sample collection documentation shall be verified. Any error shall be noted in writing and corrected. Samples shall be packaged and shipped in accordance with LOP 94-03.

2.17. LABORATORY ANALYTICAL PROCEDURES

The Permittees shall ensure that the analytical laboratory analyzes samples using EPA-approved analytical methods. The analytical laboratory shall provide appropriate sample containers prepared with the required preservative. The analytical laboratory shall prepare and submit to the Permittees an analysis data report as described in Section 4.0 of the SOW for Analytical Laboratories and as required by the conditions of this Permit. Table 2-3 summarizes EPA Methods (EPA November 1986), container types and preservation methods applicable to groundwater sampling at the CWL; however, the Permittees may use other appropriate test methods, container types, and preservation methods that meet the data quality requirements of this Permit subject to the procedures in 40 C.F.R. § 270.42(a)(2).

2.18. ANALYTICAL LABORATORY

The Permittees shall ensure that the analytical laboratory performs the analyses in accordance with this SAP, this Permit, and regulatory requirements. The laboratory shall maintain written documentation of sample handling and custody, analytical results, and internal QC data. The laboratory shall analyze QC samples in accordance with this SAP and its own internal QC program. The Permittees shall direct the laboratory to investigate and if necessary conduct corrective action where data are found to be outside quality acceptance limits.

Two types of additional analytical laboratory audits shall be performed as part of the sampling program: system audits and performance audits. A system audit determines whether appropriate project systems (i.e., equipment, procedures) are in place. Performance audits indicate whether the projects systems are functioning properly and are capable of meeting project DQOs. These audits shall be completed as required by SMO procedures and protocols.

**TABLE 2-3
 LABORATORY ANALYTICAL METHODS, CONTAINER TYPES AND
 PRESERVATIVES
 CWL GROUNDWATER SAMPLING**

Analysis	SW-846 EPA Method ^a	Volume and Container Type/Preservation
VOCs, including TCE	8260	3 x 40 mL glass/HCL, 4°C
Metals ^b , including Cr, and Ni	6020/7191/7421/7470	1 x 500 mL polyethylene/HNO ₃ , 4°C

^aU.S. Environmental Protection Agency, 1986 (and updates), *“Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,”* SW-846, 3rd Edition, U.S. Environmental Protection Agency, Washington, D.C. The Permittees may use other appropriate test methods, container types, and preservation methods that meet the data quality requirements of this Permit subject to the procedures in 40 C.F.R. § 270.42(a)(2).

^bmetals = including chromium and nickel
 HCL = Hydrochloric acid
 HNO₃ = Nitric acid
 mL = Milliliter(s)
 SW = Solid waste

2.19. QUALITY CONTROL

Quality Control (QC) samples shall be collected in the field and prepared in the laboratory to ensure that the data generated meet the DQO. QC shall be achieved through adherence to requirements and procedures listed and described in Section 2.1 of this Permit Attachment. Mandatory QC samples are identified in the following sections.

2.19.1. Field Quality Control

Field QC samples are used to document data quality and identify errors that may be introduced by field conditions, in sample collection, storage, transportation, and equipment decontamination. Field QC samples submitted to the analytical laboratory shall be handled and analyzed in an identical manner as environmental samples. The Permittees shall collect and analyze the following Field QC sample types: equipment blanks, duplicates, field blanks, and trip blanks.

Equipment blanks demonstrate the effectiveness of equipment decontamination and monitor the cleanliness of the sampling system. After sampling equipment decontamination has been completed, an equipment blank is produced by pouring de-ionized water over the sampling equipment and collecting a sample of this water. Equipment blanks shall be collected at a frequency of 10 percent (minimum of one per CWL sampling event) and shall be analyzed for all of the constituents required by this Permit.

Duplicate environmental samples are collected in the field and analyzed to document the precision of the sampling and analysis process. The duplicate samples shall be collected immediately after the original environmental sample in order to reduce variability caused by time and/or the sampling process. Duplicates shall be collected and analyzed at a frequency of at least 10 percent. At least one duplicate groundwater sample shall be collected and analyzed per sampling event for each of the constituents required by this Permit.

Field blanks are collected for VOCs (including TCE) to assess whether any contamination of the samples was caused by ambient field conditions. The field blanks shall be prepared by pouring deionized water into sample containers at wellheads to simulate the transfer of environmental

samples from the sampling system to the sample container. Field blank samples shall be collected and analyzed at a frequency of 10 percent (minimum of one per sampling event).

Trip blanks (TBs) are used to assess the potential for cross-contamination between environmental samples during sample handling and shipping activities. The TBs are to be analyzed for VOCs (including TCE) only. Each batch of groundwater samples to be analyzed for VOCs shall be accompanied by at least one TB during shipping. The Analytical Laboratory shall prepare the TB by filling a VOC-sample vial with deionized water and using the same sample preservation method designated for VOC environmental samples. Each vial shall be sealed with custody tape and dated when it is prepared. The TBs shall accompany the empty sample containers when they are shipped to the field supervisor prior to the start of sample collection. The TBs shall be taken into the field during sample collection and shall be included in the shipment of environmental samples to the laboratory. The TBs must remain sealed during this entire cycle and may be opened only for analysis on return to the analytical laboratory.

2.19.2. Laboratory Quality Control

The analytical laboratory must have established procedures that demonstrate the analytical process is always in control during each sample analysis step. The procedures include Laboratory Control Samples (LCSs), method blank samples, and Matrix Spike (MS) samples.

A LCS consists of a control matrix (e.g., deionized water) spiked with known concentrations of analytes representative of the target analytes. LCSs shall be prepared and analyzed for each analytical procedure performed. LCSs shall be analyzed with each analytical batch containing environmental samples to determine accuracy of the data. The laboratory shall also evaluate the precision of the data by analyzing twice either the environmental samples, LCSs, or MS samples and calculating the RPD between corresponding results.

Method blank samples shall be used to check for contamination in the laboratory during sample preparation and analysis. Method blank samples shall be concurrently prepared and analyzed with each analytical batch. Method blanks shall be reported in the same units as corresponding environmental samples, and the results shall be included with each analytical report.

Surrogate spike analysis shall be performed for all samples analyzed by Gas Chromatography/Mass Spectroscopy. The surrogate compounds added to the sample shall be those specified in the applicable EPA analytical method procedure (EPA November 1986). Recovery values for surrogate compounds that are outside specified control limits require corrective action.

The analytical process shall be systematically evaluated for the effects of indigenous constituents present in the environmental sample matrix. MS/matrix spike duplicate (MSD) analyses shall be performed in accordance with the specified analytical procedures.

2.20. DATA VALIDATION, REVIEW, AND REPORTING

Data validation and review of analytical and field documentation shall be performed. Field and analytical QC data shall be reviewed for conformance to QC acceptance criteria. The entire data package shall be reviewed for completeness, comparability, representativeness, precision, and accuracy to determine whether the DQO has been met. All groundwater monitoring data shall be reported in the CWL post-closure care annual reports for the year for which the data were obtained.

2.20.1. Field Water Quality Data and Documentation Review

Completed field documentation shall be reviewed and checked for errors, completeness, and conformance with the procedures required by this Permit. The review shall occur at the end of each day in the field to allow verification, correction, and retrieval of missing information as appropriate. Field documentation found to be incomplete or to contain questionable data shall be corrected prior to finalizing the field reports. If necessary, measurements of field water quality parameters shall be repeated.

2.20.2. Laboratory Data Verification and Validation

The Permittees shall review laboratory reports for completeness and conformance to the requirements of this Permit and to the performance criteria of the laboratory contract according to the "Procedure for Completing the Contract Verification Review," SMO 05-03.

Upon receipt of the analytical results from the Analytical Laboratory, the Permittees shall arrange for the validation of the data. The purpose of the validation is to determine the usability and establish the defensibility of the results in support of environmental and waste management activities. Data qualification shall be based upon review of field and laboratory-supplied QC data, the specific QC criteria identified in the procedures for the EPA-approved analytical methods, and the QC criteria for meeting the DQO identified in this Permit Attachment. Data validation shall be conducted according to the requirements of this Permit and AOP 00-03, "Data Validation Procedure for Chemical and Radiochemical Data." All associated data validation reports shall be submitted in the CWL post-closure care annual report.

2.20.3. Data Reporting

All groundwater monitoring data shall be reported in the CWL post-closure care annual reports for the year for which the data were obtained. This report shall include a description of sampling activities, field water quality data, laboratory analytical data, a discussion of QC evaluations and data reviews, a description of any project variance or nonconformance, and data validation summaries. The reports shall also include control charts for each hazardous constituent for every well in the monitoring well network. The control charts shall show laboratory analytical results for each hazardous constituent (TCE, chromium, and nickel) plotted against the times the samples were collected. Additionally, after the first six sampling events have been completed for a well, the concentration limit, and the upper and lower confidence limits about the mean (at a 95% confidence level) shall also be shown on the control chart for each hazardous constituent.

Additional reporting requirements are found in Section 1.12 of Permit Attachment 1.

Copies of the annual reports and post-closure care groundwater monitoring records shall be maintained in the Facility's ES&H and Security Records Center.

2.20.4. Records Management

Records associated with groundwater monitoring, including field documentation, chains of custody, laboratory analytical results, data validation reports, post-closure care reports and technical data evaluations shall be maintained at the Facility's ES&H and Security Records Center. The Permittees shall comply with the record-keeping provisions of 40 C.F.R. § 264.74, concerning the availability, retention, and disposition of records.

2.21. NON-CONFORMANCES AND VARIANCES

Corrective actions must be taken to rectify or prevent a nonconformance or variance that could adversely affect the quality of data generated. Corrective actions must be documented in writing by the persons identifying the need for action.

Any purposeful change to or deviation from the requirements of this SAP and Permit shall take effect only after approval by the Department of a permit modification request.

A nonconformance is any action or condition that does not meet the requirements of this Permit. The analytical laboratory, SMO, groundwater monitoring team members, or the Project Leader may identify a nonconformance. The person noting a nonconformance shall document the nonconformance in writing and suggest an appropriate corrective action. Resolution of the nonconformance shall be documented in writing and acknowledged by the Permittees.

The Permittees and the analytical laboratories shall have systems in place to identify QC issues and initiate corrective actions. In accordance with SMO procedures, the laboratories are required to notify the SMO of QC problems that may affect data quality. The Permittees shall evaluate and determine whether data are comparable to historical values and whether or not corrective action is required based upon the specific issue. Corrective action may include documentation of QC issues in an analytical laboratory report, data qualifiers, and/or sample re-analysis. In all cases, the DQO in Section 2.1 of this Permit Attachment shall be met.

2.22. REFERENCES

EPA, see U.S. Environmental Protection Agency.

Sandia National Laboratories/New Mexico (SNL/NM), August 2005. "LTES Groundwater Monitoring Well Sampling and Field Analytical Measurements," FOP 05-01, Sandia National Laboratories, Albuquerque, New Mexico.

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- Sandia National Laboratories/New Mexico (SNL/NM), April 1997. "Appendix G, Sampling and Analysis Plan for Groundwater Assessment at the Chemical Waste Landfill," Sandia National Laboratories, Albuquerque, New Mexico.
- Sandia National Laboratories/New Mexico (SNL/NM), October 1995. "Discharges to the Sanitary Sewer System", NM431001, Issue C, Sandia National Laboratories, Albuquerque, New Mexico.
- Sandia National Laboratories/New Mexico (SNL/NM), May 1993. "Chemical Waste Landfill Final Closure Plan and Postclosure Permit Application," Sandia National Laboratories, Albuquerque, New Mexico.
- Sandia National Laboratories/New Mexico (SNL/NM), December 1992. "Chemical Waste Landfill Final Closure Plan and Postclosure Permit Application," Sandia National Laboratories, Albuquerque, New Mexico, amended January 2003.
- SNL/NM, see Sandia National Laboratories/New Mexico.
- U.S. Environmental Protection Agency (EPA), July 2002. "National Primary Drinking Water Standards," Office of Water, U.S. Environmental Protection Agency, Washington, D.C.
- U.S. Environmental Protection Agency (EPA), November 1986. "Test Methods for Evaluating Solid Waste," 3rd ed., and all updates, SW-846, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, D.C.

APPENDIX 2-1 of PERMIT ATTACHMENT 2

**CWL GROUNDWATER MONITORING WELL NETWORK
WELL CONSTRUCTION DIAGRAMS**

Well Name: CWL-MW9
Project Name: CHEM WASTE LANDFILL
NMOSE Well File Code: RG-90065, POINT OF DIVERSION: 105
Owner Name: SNL/NM
Date Drilling Started: 04/16/2010
Date Well Dev. Completed: 05/13/2010

Drilling Contractor: WDC EXPLORATION & WELLS
Drilling Method: AIR ROTARY CASING HAMMER
Borehole Depth (FBGS): 523
Casing Depth (FBGS): 520
Geo Location: SNL/NM T-411
Completion Zone: ALLUVIAL FAN FACIES
Completion Formation: SANTA FE GROUP

Survey Data

Survey Date: 08/16/2010
Surveyed By: RANDOLPH C. HEWITT
State Plane Coordinates: NAD 83
(X) Easting: 1554551.25
(Y) Northing: 1445108.08

Surveyed Elevations (FAMSL) NAVD 88

Protective Casing: 5426.64
Top of Inner Well Casing: 5426.12
Concrete Pad: 5423.88
Ground Surface: 5423.5

Calculated Depths and Elevations

Initial Water Elevation (FAMSL): 4925.34
Initial Depth to Water (FBGS): 498.19
Last Measured Water Elevation (FAMSL): 4924.81
Date Last Measured: 1/28/2011

Miscellaneous Information

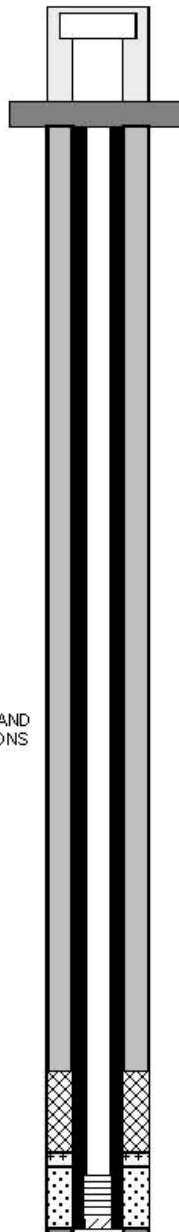
Date of Last Maintenance:
Date Updated: 27-AUG-2010
Date Printed from EDMS: 4/6/2011 2:18:34 PM

Comments:
 BOREHOLE DIAMETER IS 11 3/4 IN. TO 200 FBGS AND 9 5/8 IN. FROM 200 FBGS TO 523 FBGS. ELEVATIONS ARE NAVD 88.

Completion Data Measured Depths (FBGS)

Casing Stickup: 2.6

Interval	Material	Start	Stop	Length	ID/OD(In.)
CASING	SCHEDULE 80 PVC	0	520	520	4.77 / 5.56
GROUT/BACKFILL	CONCRETE, BENT. GR	446.2	446.2		
SEAL	3/8 IN. BENT. CHIPS	446.2	484.6	38.4	
SECONDARY PACK	#60 SAND	484.6	490.6	6	
PRIMARY PACK	#20/40 SAND	490.6	520	29.4	
SCREEN	SCHEDULE 80 PVC	496	515	20	
SUMP		515	520	5	
PLUG BACK	#20/40 SAND	520	523	3	



Well Name: CWL-MW10
Project Name: CHEM WASTE LANDFILL
HMOSE Well File Code: RG-90065, POINT OF DIVERSION: 106
Owner Name: SNL/NM
Date Drilling Started: 05/03/2010
Date Well Dev. Completed: 05/27/2010

Drilling Contractor: WDC EXPLORATION & WELLS
Drilling Method: AIR ROTARY CASING HAMMER
Borehole Depth (FBGS): 520
Casing Depth (FBGS): 518
Geo Location: SNL/NM T-411
Completion Zone: ALLUVIAL FAN FACIES
Completion Formation: SANTA FE GROUP

Survey Data

Survey Date: 08/16/2010
Surveyed By: RANDOLPH C. HEWITT
 State Plane Coordinates: NAD 83
(X) Easting: 1554455.79
(Y) Northing: 1444960.65

Surveyed Elevations (FAMSL) NAVD 88

Protective Casing: 5425.05
Top of Inner Well Casing: 5424.58
Concrete Pad: 5422.45
Ground Surface: 5422.2

Calculated Depths and Elevations

Initial Water Elevation (FAMSL): 4926.91
Initial Depth to Water (FBGS): 495.24
Last Measured Water Elevation (FAMSL): 4926.48
Date Last Measured: 1/26/2011

Miscellaneous Information

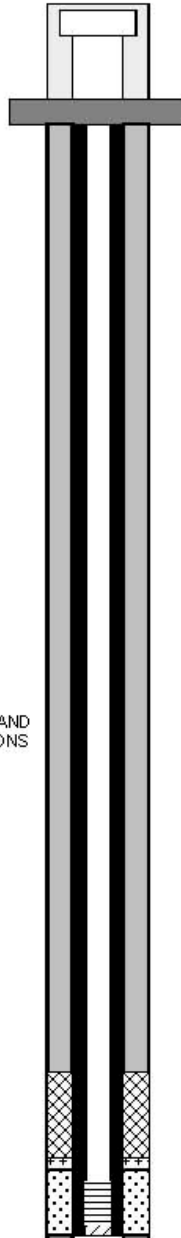
Date of Last Maintenance:
Date Updated: 27-AUG-2010
Date Printed from EDMS: 4/6/2011 2:11:32 PM

Comments:
 BOREHOLE DIAMETER IS 11 3/4 IN. TO 200 FBGS AND 9 5/8 IN. FROM 200 FBGS TO 520 FBGS. ELEVATIONS ARE NAVD 88.

Completion Data Measured Depths (FBGS)

Casing Stickup: 2.4

Interval	Material	Start	Stop	Length	ID/OD (In.)
CASING	SCHEDULE 80 PVC	0	518	518	4.77 / 5.56
GROUT/BACKFILL	CONCRETE, BENT. GR	0	442	442	
SEAL	3/8 IN. BENT. CHIPS	442	482	40	
SECONDARY PACK	#60 SAND	482	487	5	
PRIMARY PACK	#20/40 SAND	487	518	31	
SCREEN	SCHEDULE 80 PVC	493	513	20	
SUMP		513	518	5	
PLUG BACK	#20/40 SAND	518	520	2	



Well Name: CWL-MW11
Project Name: CHEM WASTE LANDFILL
NMOSE Well File Code: RG-90065, POINT OF DIVERSION: 107
Owner Name: SNL/NM
Date Drilling Started: 04/23/2010
Date Well Dev. Completed: 05/27/2010

Drilling Contractor: WDC EXPLORATION & WELLS
Drilling Method: AIR ROTARY CASING HAMMER
Borehole Depth (FBGS): 520
Casing Depth (FBGS): 516
Geo Location: SNL/NM TAJII
Completion Zone: ALLUVIAL FAN FACIES
Completion Formation: SANTA FE GROUP

Survey Data

Survey Date: 08/16/2010
Surveyed By: RANDOLPH C. HEWITT
State Plane Coordinates: NAD 83
(X) Easting: 1554457.19
(Y) Northing: 1444825.61

Surveyed Elevations (FAMSL) NAVD 88

Protective Casing: 5423.79
Top of Inner Well Casing: 5423.24
Concrete Pad: 5421.02
Ground Surface: 5420.8

Calculated Depths and Elevations

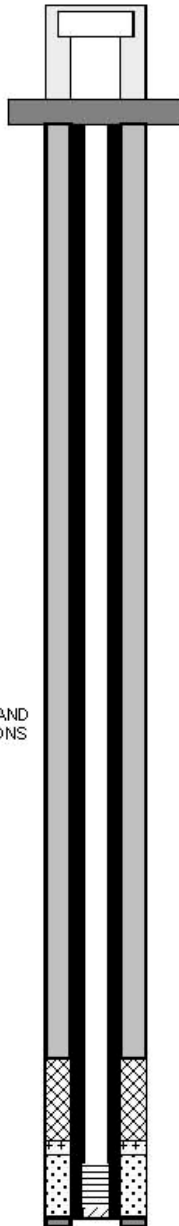
Initial Water Elevation (FAMSL): 4926.33
Initial Depth to Water (FBGS): 494.51
Last Measured Water Elevation (FAMSL): 4925.6
Date Last Measured: 1/28/2011

Miscellaneous Information

Date of Last Maintenance:
Date Updated: 27-AUG-2010
Date Printed from EDMS: 4/6/2011 2:11:57 PM

Comments:

BOREHOLE DIAMETER IS 11 3/4 IN. TO 200 FBGS AND 9 5/8 IN. FROM 200 FBGS TO 520 FBGS. ELEVATIONS ARE NAVD 88.



Completion Data Measured Depths (FBGS)

Casing Stickup: 2.4

Interval	Material	Start	Stop	Length	ID/OD(In.)
<input type="checkbox"/> CASING	SCHEDULE 80 PVC	0	516	516	4.77 / 5.56
<input type="checkbox"/> GROUT/BACKFILL	CONCRETE, BENT. GR	441	441		
<input checked="" type="checkbox"/> SEAL	3/8 IN. BENT. CHIPS	441	480	39	
<input checked="" type="checkbox"/> SECONDARY PACK	#60 SAND	480	486	6	
<input checked="" type="checkbox"/> PRIMARY PACK	#20/40 SAND	486	516	30	
<input type="checkbox"/> SCREEN	SCHEDULE 80 PVC	491	511	20	
<input checked="" type="checkbox"/> SUMP		511	516	5	
<input type="checkbox"/> PLUG BACK	#20/40 SAND	516	520	4	

Well Name: CWL-BW5
Project Name: CHEM WASTE LANDFILL
NMOSE Well File Code: RG-90065, POINT OF DIVERSION: 108
Owner Name: SNL/NM
Date Drilling Started: 04/07/2010
Date Well Dev. Completed: 05/11/2010

Drilling Contractor: WDC EXPLORATION & WELLS
Drilling Method: AIR ROTARY CASING HAMMER
Borehole Depth (FBGS): 536
Casing Depth (FBGS): 525
Geo Location: SNL/NM T4HII
Completion Zone: ALLUVIAL FAN FACIES
Completion Formation: SANTA FE GROUP

Survey Data

Survey Date: 08/16/2010
Surveyed By: RANDOLPH C. HEWITT
 State Plane Coordinates: NAD 83
(X) Easting: 1554966.98
(Y) Northing: 1444740.87

Surveyed Evaluations (FAMSL) NAVD 88

Protective Casing: 5435.29
Top of Inner Well Casing: 5434.79
Concrete Pad: 5432.45
Ground Surface: 5432.2

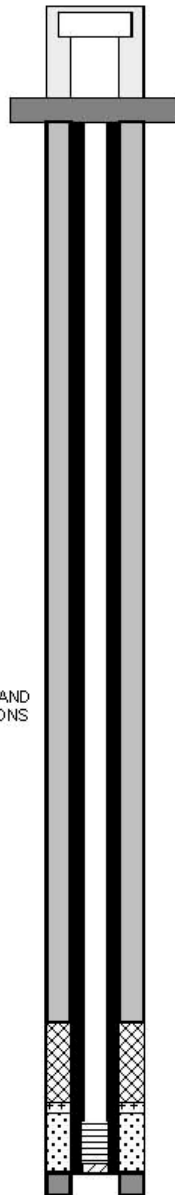
Calculated Depths and Elevations

Initial Water Elevation (FAMSL): 4926.68
Initial Depth to Water (FBGS): 505.53
Last Measured Water Elevation (FAMSL): 4926.02
Date Last Measured: 1/28/2011

Miscellaneous Information

Date of Last Maintenance:
Date Updated: 27-AUG-2010
Date Printed from EDMS: 4/6/2011 2:10:41 PM

Comments:
 BOREHOLE DIAMETER IS 11 3/4 IN. TO 200 FBGS AND 9 5/8 IN. FROM 200 FBGS TO 536 FBGS. ELEVATIONS ARE NAVD 88.



Completion Data Measured Depths (FBGS)

Casing Stickup: 2.6

Interval	Material	Start	Stop	Length	ID/OD(In.)
■ CASING	SCHEDULE 80 PVC	0	525	525	4.77 / 5.56
■ GROUT/BACKFILL	CONCRETE, BENT. GR	0	490	490	
⊗ SEAL	3/8 IN. BENT. CHIPS	490	490	40	
⊕ SECONDARY PACK	#60 SAND	490	496	6	
⊕ PRIMARY PACK	#20/40 SAND	495	525	30	
≡ SCREEN	SCHEDULE 80 PVC	500	520	20	
⊕ SUMP		520	525	5	
■ PLUG BACK	#20/40 SAND	525	536	11	