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Mr. Richard F. Sena
Acting Manager
U. S. Department of Energy
National Nuclear Security Administration
Sandia Site Office, MS-0184
P. O. Box 5400
Albuquerque, NM 87185-0184

Dear Mr. Sena:

Subject: ***Submittal of Chemical Waste Landfill (CWL) Annual Post-Closure Care Report, Chemical Waste Landfill Post-Closure Care Permit (PCCP) for Sandia National Laboratories/New Mexico (SNL/NM), Environmental Protection Agency Identification Number NM5890110518***

The CWL Annual Post-Closure Care Report is being provided to the Department of Energy (DOE) for submittal to the New Mexico Environment Department (NMED). This submittal is required by Part 2, Section 2.6.3, of the CWL PCCP and includes information for activities conducted at the CWL during Calendar Year 2011. Because the Permit became effective on June 2, 2011, this first Annual Report addresses six months of monitoring and inspection activities for the period June 2, 2011 through December 31, 2011. The report and supporting documentation satisfy requirements listed in Permit Attachment 1, Sections 1.9 and 1.12.

I have signed the attached certification statement as the Operator at SNL/NM, and it is also to be signed by you as the Owner at the DOE. Please transmit this report to the NMED by March 31, 2012. Should you have any questions regarding this submittal, please contact Pamela Puissant at (505) 844-3185/pmpuiss@sandia.gov or Terry Cooper at (505) 284-1831/twcoope@sandia.gov.

Sincerely,

Enclosures:
1. Enclosure A –Chemical Waste Landfill Annual Post-Closure Care Report for Sandia National Laboratories/New Mexico (SNL/NM) Environmental Protection Agency Identification Number NM5890110518. (electronic copy included).
2. Certification Statement.

Copy to (w/enclosures):
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Submittal of Chemical Waste Landfill Annual Post-Closure Care Report, Chemical Waste Landfill Post-Closure Care Permit for Sandia National Laboratories/New Mexico, Environmental Protection Agency Identification Number NM5890110518

CERTIFICATION STATEMENT

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.

_____ _____

Michael W. Hazen, Vice-President
Sandia Corporation
Albuquerque, New Mexico
Operator

Date signed

_____ _____

Richard F. Sena, Acting Manager
U. S. Department of Energy
National Nuclear Security Administration
Sandia Site Office
Owner

Date signed

Sandia National Laboratories

CHEMICAL WASTE LANDFILL
ANNUAL POST-CLOSURE CARE REPORT
CALENDAR YEAR 2011

SANDIA NATIONAL LABORATORIES, NEW MEXICO
LONG-TERM STEWARDSHIP
CHEMICAL WASTE LANDFILL POST-CLOSURE CARE PERMIT

MARCH 2012

United States Department of Energy
Sandia Site Office

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CHEMICAL WASTE LANDFILL
ANNUAL POST-CLOSURE CARE REPORT
CALENDAR YEAR 2011

Facility: Chemical Waste Landfill

Location: Sandia National Laboratories
Albuquerque, New Mexico

EPA ID No.: NM5890110518

Permit Basis: Chemical Waste Landfill Post-Closure Care Permit, effective June 2, 2011

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ACRONYMS AND ABBREVIATIONS

AOP	administrative operating procedure
AR/COC	analysis request and chain of custody
bgs	below ground surface
CAMU	Corrective Action Management Unit
CFR	Code of Federal Regulations
Closure Plan	CWL Final Closure Plan
CMS	corrective measures study
CWL	Chemical Waste Landfill
CY	calendar year
DO	dissolved oxygen
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
ET	evapotranspirative
FOP	field operating procedure
KAFB	Kirtland Air Force Base
LCL	lower confidence limit
LE	landfill excavation
MDL	method detection limit
µg/L	micrograms per liter
mg/L	milligrams per liter
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
OLS	ordinary least squares
ORP	oxidation-reduction potential
P&A	plugging and abandonment
PCCP	Post-Closure Care Permit
pH	potential of hydrogen (negative logarithm of the hydrogen ion concentration)
PQL	practical quantitation limit
QC	quality control
RPD	relative percent difference
SAP	sampling and analysis plan
SC	specific conductance
SNL/NM	Sandia National Laboratories, New Mexico
TCE	trichloroethene (also trichloroethylene)
UCL	upper confidence limit
VCM	voluntary corrective measure
VE	vapor extraction
VOC	volatile organic compound

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1.0 INTRODUCTION

The Chemical Waste Landfill (CWL) at Sandia National Laboratories/New Mexico (SNL/NM) is a remediated interim status landfill that has undergone closure in accordance with Title 20, Chapter 4, Part 1 of the New Mexico Administrative Code (NMAC) (20.4.1.600 NMAC), incorporating Title 40, Code of Federal Regulations (CFR), Part 265, (40 CFR 265) Subpart G and the CWL Final Closure Plan (Closure Plan) (SNL/NM December 1992 and subsequent revisions). The CWL Post-Closure Care Permit (PCCP) (NMED October 2009) became effective June 2, 2011 (Kieling June 2011) and addresses applicable 40 CFR Part 264 groundwater monitoring, corrective action, and post-closure requirements.

1.1 Purpose and Scope

The purpose of this first Annual CWL Post-Closure Care Report is to document monitoring, inspection, maintenance, and repair activities conducted during Calendar Year (CY) 2011 as defined in Attachment 1 of the CWL PCCP (NMED, October 2009). Because the CWL PCCP became effective in June 2011, this first annual report documents Permit activities conducted from June through December 2011 and fulfills the CWL PCCP requirement for annual reporting to the New Mexico Environment Department (NMED).

The CWL PCCP requires monitoring and inspection activities that must be documented and reported for each CY. Monitoring activities include semi-annual groundwater monitoring for specific volatile organic compounds (VOCs) and metals, and annual vadose zone soil-gas monitoring for specific VOCs. Inspection activities are required for the following components: final cover (vegetation and surface); storm-water diversion structures; monitoring networks and sampling equipment (groundwater and soil-gas); and security fence, locks, gates, signage, and survey monuments. The CWL final cover is a vegetative at-grade soil cover, or evapotranspirative (ET) cover.

The scope of this report includes summarized documentation of all monitoring and inspection activities for CY 2011. This report documents implementation of the CWL PCCP and the first, partial CY activities (June through December, 2011) as described in a communication from SNL/NM to the NMED (J. Cochran to W. Moats, June 8, 2011). Monitoring and inspections performed during this initial six-month time period were:

- One semi-annual groundwater monitoring event (July- August 2011).
- One semi-annual inspection of the groundwater monitoring network and sampling equipment.
- One quarterly inspection of final cover vegetation (i.e., biology inspection of the final cover) [note: two biology inspections were planned, but the final cover met “successful revegetation criteria” so only one inspection was required].
- Two quarterly inspections of the final cover surface (i.e., physical features excluding vegetation covered in the biology inspection), storm-water diversion structures, fence, locks, gates, signs, and survey monuments.

No soil-gas monitoring was performed, but the soil-gas monitoring network was inspected in preparation for CY 2012 monitoring activities.

This CY 2011 report is organized as follows:

- Chapter 2.0 provides a description of the final cover system, compliance monitoring system (groundwater and soil-gas), storm-water diversion structures, and security fence (fence, locks, gate, signage, and survey monuments).
- Chapter 3.0 presents monitoring and inspection, maintenance, and repair requirements.
- Chapter 4.0 presents groundwater monitoring activities and results.
- Chapter 5.0 presents soil-gas monitoring activities and results (there were no 2011 activities).
- Chapter 6.0 presents inspection, maintenance, and repair activities and results.
- Chapter 7.0 summarizes regulatory activities.
- Chapter 8.0 presents a general summary and conclusions for the 2011 reporting period.
- Chapter 9.0 lists the references cited in this report.

Annexes are provided that include CY 2011 supporting information as follows:

- Annex A –Groundwater Monitoring Field Forms
- Annex B – Data Validation Reports and Contract Verification Review Forms
- Annex C –Post-Closure Inspection Forms/Checklists
- Annex D –Chemical Waste Landfill Final Cover Biology Report

2.0 CHEMICAL WASTE LANDFILL POST-CLOSURE CARE CONDITIONS

The CWL is a 1.9-acre remediated interim status landfill located in the southeastern corner of SNL/NM Technical Area III (Figures 2-1 and 2-2) undergoing post-closure care in accordance with the CWL PCCP (NMED October 2009). From 1962 until 1981, the CWL was used for the disposal of chemical and solid waste generated by SNL/NM research activities. Additionally, a small amount of radioactive waste was disposed of during the operational years. Disposal of liquid waste in unlined pits and trenches ended in 1981, and after 1982 all liquid waste disposal was terminated. From 1982 through 1985, only solid waste was disposed of at the CWL, and after 1985 all waste disposal ended. The CWL was also used as a hazardous waste drum-storage facility from 1981 to 1989. A summary of the CWL disposal history is presented in the Closure Plan (SNL/NM December 1992) along with a waste inventory based upon available disposal records and information.

The CWL was excavated from September 1998 through February 2002 as part of the Landfill Excavation (LE) Voluntary Corrective Measure (VCM). Soil-vapor extraction was also conducted as a VCM from 1997 through 1998 prior to landfill excavation to reduce the concentrations of VOC soil vapor in the vadose zone, control the VOC soil-gas plume, and to reduce groundwater trichloroethene (TCE) concentrations below the regulatory standard of 5 micrograms per liter (µg/L). All former disposal areas were excavated during the LE VCM and groundwater TCE concentrations have been below the regulatory standard since completion of the Vapor Extraction (VE) VCM in 1998. Approximately 52,000 cubic yards of contaminated soil and debris were removed during the LE VCM.

Additional information on CWL current conditions can be found in the CWL Final RCRA (Resource Conservation and Recovery Act) Closure Report for the CWL (SNL/NM, September 2010), the CWL PCCP (NMED, October 2009), and the CWL Corrective Measures Study (CMS) Report (SNL/NM, December 2004). Detailed information on residual soil contamination at the CWL can be found in Part 3, Section 3.1 and Table 3-1 of the CWL PCCP (NMED October 2009).

The following sections summarize information on the physical characteristics of the CWL, including the final cover system, compliance monitoring system, storm-water diversion structures, and security fence. More detailed information is provided in Attachment 1, Section 1.3 through 1.6, of the CWL PCCP.

2.1 Final Cover System

The CWL final cover is a centrally crowned “at-grade” ET cover designed to minimize infiltration of moisture into the former disposal area and to minimize long-term maintenance consistent with 40 CFR 264.111(a). The crown of the cover slopes to the north and south at a 1-percent grade, and east to west at a 3-percent grade to minimize erosion losses and control run-on/run-off. The ET cover consists of two discrete layers; a 3-foot-thick native soil layer installed from 4 feet below ground surface (bgs) to 1 foot bgs, and a topsoil layer (approximately 1.5-feet thick) installed from 1 foot bgs to the local grade. The topsoil layer was revegetated with native plants

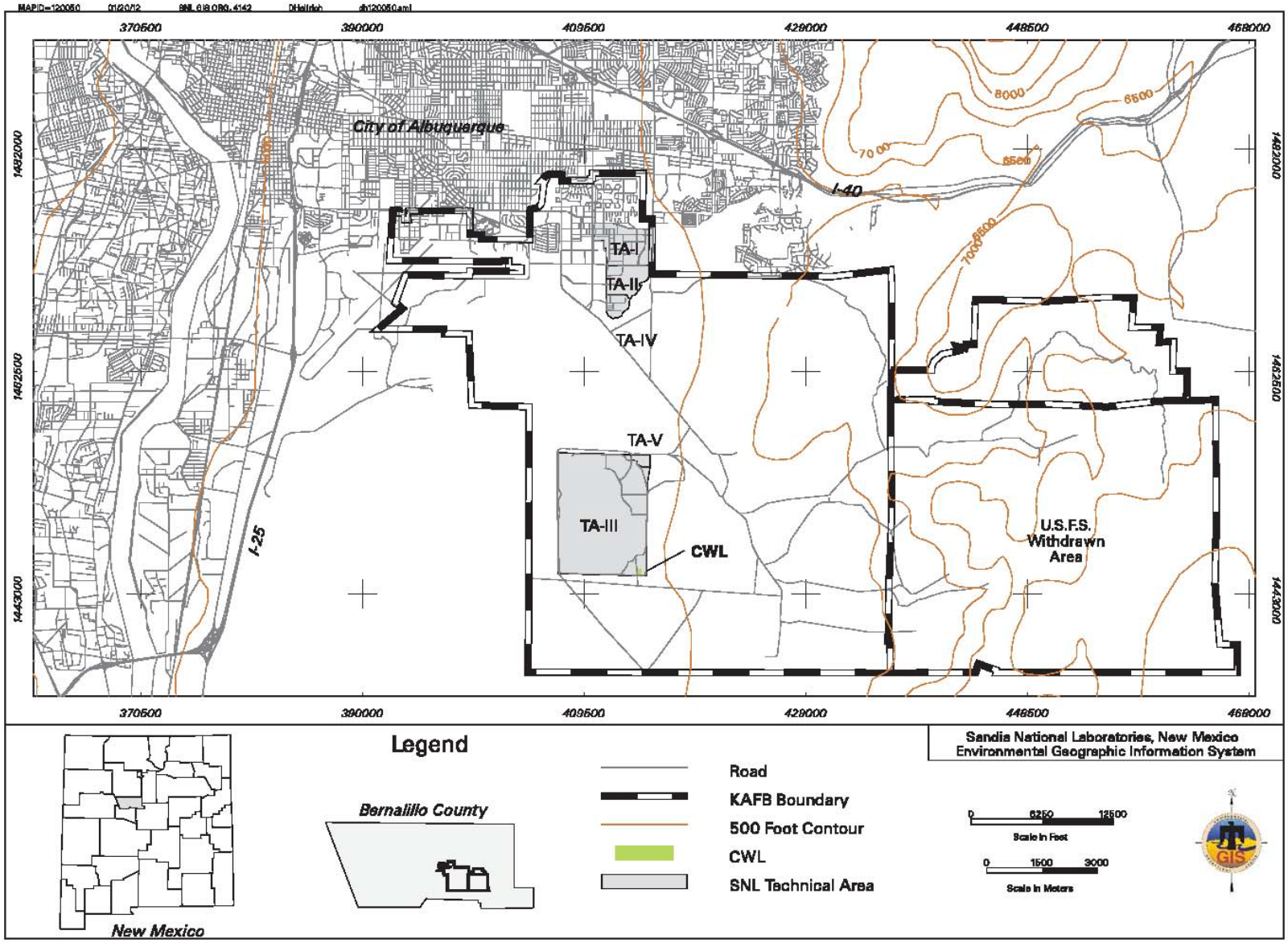

Figure 2-1
Location of the Chemical Waste Landfill with respect to Kirtland Air Force Base and the City of Albuquerque

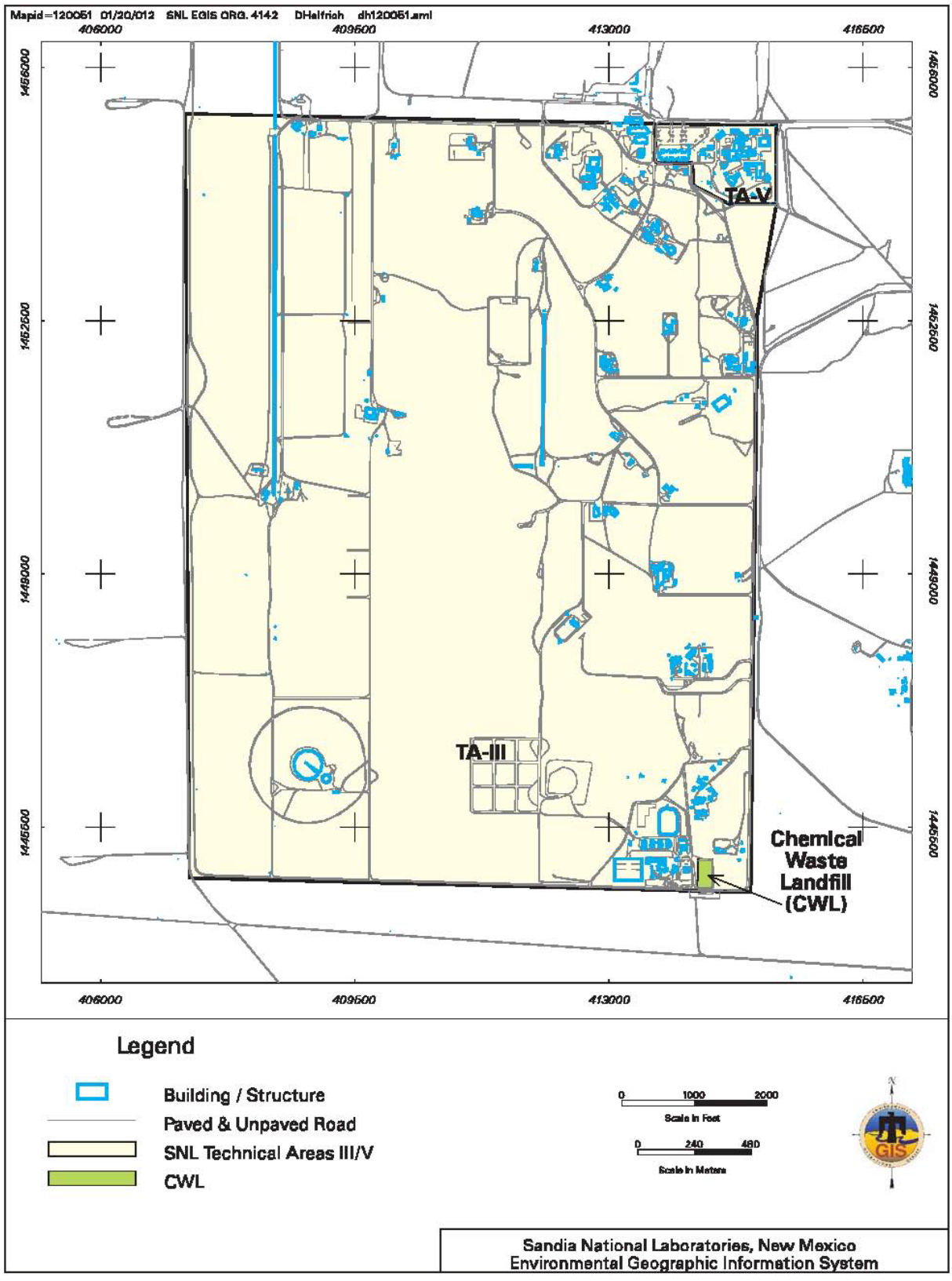

Figure 2-2
Location of the Chemical Waste Landfill within Technical Area III

according to the specifications contained in the Remedial Action Proposal, Annex I, CMS Report (SNL/NM December 2004). Figure 2-3 shows a conceptual schematic profile of the ET cover and Figure 2-4 shows the central crown and surface drainage patterns.

2.2 Compliance Monitoring System

The compliance monitoring system includes a groundwater monitoring network and a soil-gas-monitoring well network, which are described in the following sections.

2.2.1 Groundwater Monitoring Network

Groundwater monitoring is performed to ensure the protection of groundwater during the compliance and post-closure care periods. The CWL groundwater monitoring network consists of four NMED-approved monitoring wells that monitor the uppermost part of the regional aquifer in accordance with the requirements of 40 CFR 264.99. The four wells are described below and their locations are shown in Figure 2-4.

- One hydraulically upgradient background well – CWL-BW5, and
- Three hydraulically downgradient compliance wells – CWL-MW9, CWL-MW10, and CWL-MWL11.

Well-completion diagrams for all of the groundwater monitoring wells are provided in Attachment 2 of the CWL PCCP (NMED October 2009).

2.2.2 Soil-Gas Monitoring Network

The post-closure care soil-gas monitoring network is an early detection system designed for the protection of groundwater. The five multiport wells, shown in Figure 2-4, are designed to monitor the vadose zone at various depths beneath the CWL in the area most contaminated by past disposal of organic liquid waste. The wells and their depth-specific sampling ports are as follows:

- D1 – Sampling Ports at 100, 160, 240, 350, and 470 feet bgs (5 ports)
- D2 – Sampling Ports at 120, 240, 350, 440, and 470 feet bgs (5 ports)
- D3 – Sampling Ports at 120, 170, 350, 440, and 480 feet bgs (5 ports)
- U11 – Sampling Ports at 40, 80, and 120 feet bgs (3 ports)
- U12 – Sampling Ports at 36, 76, and 136 feet bgs (3 ports)

Well-completion diagrams for all of the soil-gas monitoring wells are provided in Attachment 3 of the CWL PCCP (NMED October 2009).

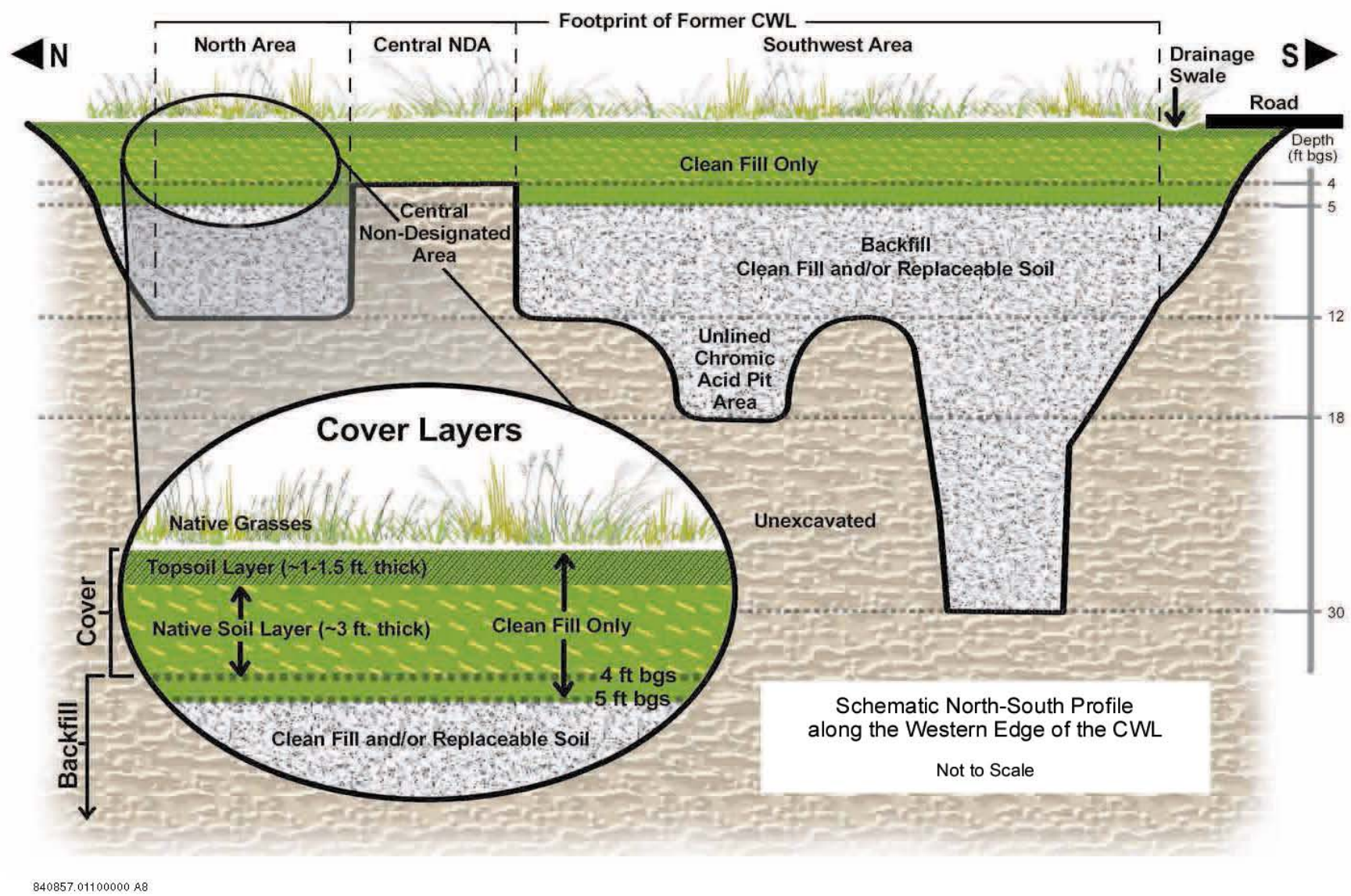

Figure 2-3
Schematic Profile of the Chemical Waste Landfill Evapotranspirative Cover

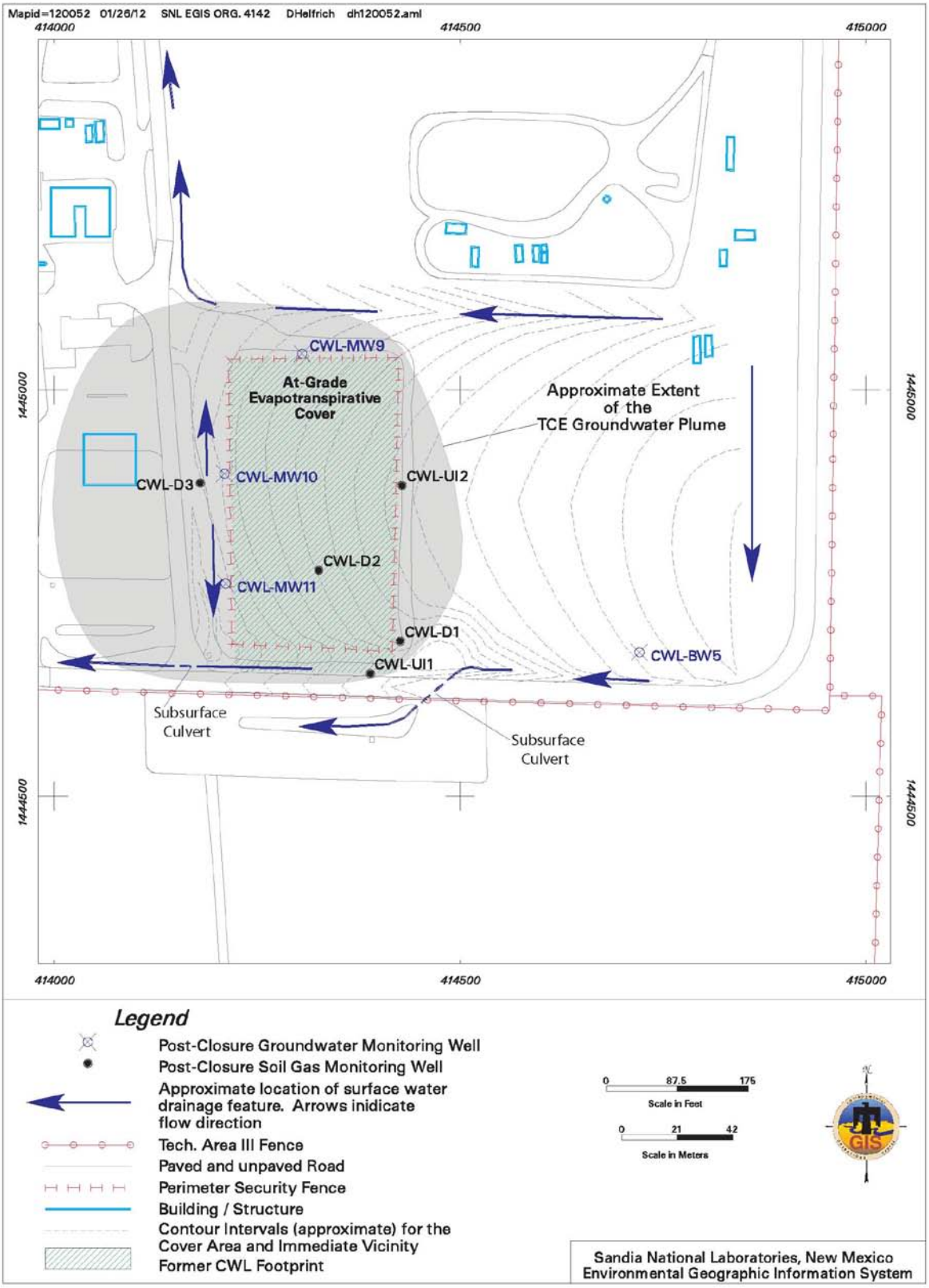

Figure 2-4
Chemical Waste Landfill Surface Drainage Patterns and Monitoring Networks

2.3 Storm-Water Diversion Structures

The function of the storm-water diversion features associated with the CWL is to minimize soil erosion caused by storm-water run-on and run-off and to reduce the amount of water that could potentially percolate into the former disposal area. Drainage features designed to control surface-water run-on and run-off are shown in Figure 2-4 and include: ET cover surface topography/slopes that direct water away from and off the ET cover surface; roadside ditches; boundary swales; and two ditch drainage culverts at the southeastern and southwestern corners of the CWL that divert surface-water from the road ditch away from the CWL. The slight northeast and southeast inflection of the surface topography to the east of the ET cover prevents significant run-on by directing the upgradient surface water toward the northern and southern boundary swales. Precipitation that falls directly on the ET cover is diverted toward the boundary swales that intersect at the northwestern and southwestern corners of the site; its impact is minimized by the native vegetation, the central crown, and gently sloping topography (approximately 3-percent grade from east to west) of the ET cover surface.

2.4 Security Fence

The perimeter security fence location is shown in Figure 2-4. It is a four-strand, barbed-wire fence with two main gates. The gates remain locked except when inspections, maintenance, and monitoring activities are occurring, and only authorized personnel control the keys to the locks. Warning signs are posted on all sides of the CWL fence at 100-foot intervals, at the main gate, and at the emergency exit.

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3.0 MONITORING AND INSPECTION REQUIREMENTS

Monitoring and inspection, maintenance, and repair requirements are defined in Attachment 1 of the CWL PCCP (NMED October 2009) and briefly summarized in this Chapter. Monitoring requirements include groundwater and soil-gas monitoring, which generate empirical data that are evaluated to assess site conditions over the compliance and post-closure care periods. Inspection requirements apply to the final cover, storm-water diversion structures, compliance monitoring system, and security fence. Emergency equipment required by the CWL Contingency Plan (CWL PCCP Attachment 6) is also subject to routine inspections. Maintenance and/or repairs are performed based upon the inspections. Inspection, maintenance, and repair are performed to ensure the adequate performance of the ET cover, monitoring networks, and surface features throughout the post-closure care period.

Monitoring and inspection activities began in late July after completion of CWL PCCP implementation activities, including personnel training and qualification checks/verification in accordance with CWL PCCP Attachment 5. Results of CY 2011 monitoring and inspection activities are presented in Chapters 4.0 and 6.0, respectively. The following sections provide information specific to the requirements for each type of monitoring under the PCCP.

3.1 Monitoring Requirements

The frequency, parameters/constituents of concern, and methods for groundwater and soil-gas monitoring are summarized in Table 3-1. The groundwater and soil-gas monitoring networks are described in Section 2.2.1 and 2.2.2 respectively. The groundwater and soil-gas monitoring requirements are detailed in Attachment 1, Section 1.8, of the CWL PCCP. Sampling and analysis plans (SAPs) in CWL PCCP Attachments 2 and 3, respectively, describe the procedures, methods, and analytical protocols for collecting and analyzing groundwater and soil-gas samples.

Table 3-1
Chemical Waste Landfill Groundwater and
Soil-Gas Monitoring Frequency, Parameters, and Methods

Monitoring System	Monitoring Frequency	Monitoring Parameters/ Constituents of Concern	Monitoring Method
Groundwater	Semi-Annually[a]	TCE by EPA Method 8260[b] and Cr and Ni by EPA Methods 6020[b]	Sampling and Analysis per CWL PCCP Attachment 2
Soil Gas	Annually	Compendium Method TO-14 VOCs[c]	Sampling and Analysis per CWL PCCP Attachment 3

[a]Semi-Annually: An enhanced list of constituents must be analyzed on an annual basis (see Attachment 1, Section 1.8.1.1, of the CWL PCCP).
[b]EPA November 1986.
[c]EPA January 1999.
EPA = U.S. Environmental Protection Agency.
TO-14 = EPA Method TO-14.

For groundwater monitoring, one semi-annual sampling event must include analysis of all environmental samples for TCE, chromium, and nickel. For the other semi-annual event, analysis of all environmental samples for an enhanced list of constituents comprised of 1,1,2-trichloroehane (Freon 113), tetrachlorethene (PCE), 1,1-dichloroethene (1,1-DCE), chloroform, and trichlorofluoromethane (Freon 11), in addition to TCE, chromium, and nickel, is required. Groundwater surface elevation must be measured each time groundwater is sampled and the groundwater flow rate, hydraulic gradient, and flow direction must be determined at least annually.

Soil-gas monitoring must be performed annually in accordance with the Soil-Gas SAP (CWL PCCP Attachment 3) using U.S. Environmental Protection Agency (EPA) Compendium Method TO-14 (EPA January 1999) to ensure the collection of data in a manner consistent with historic soil-gas monitoring. Consistency in sampling and analysis is necessary so that results can be evaluated over time to determine changes/trends in soil-gas concentrations.

3.2 Inspection, Maintenance, and Repair Requirements

Inspection, requirements for the final cover system, storm-water diversion structures, compliance monitoring system, security fence, and emergency equipment are briefly summarized in this section and detailed in Attachment 1, Section 1.9, of the CWL PCCP. All inspections were performed by personnel who meet the qualification and training requirements of CWL PCCP Attachment 5. The schedule for implementing inspections and prescribed maintenance and/or repairs is provided in CWL PCCP Attachment 1, Section 1.10, Table 1-6. Maintenance and/or repairs are performed as needed based upon the inspections.

3.2.1 Final Cover System Inspection/Maintenance/Repair Requirements

Inspection of the final cover includes vegetation inspection and monitoring by the staff biologist and cover inspection by a field technician.

3.2.1.1 Vegetation Inspection and Monitoring

Achieving a sustainable native plant community on the final cover is an important component of overall ET cover performance. Vegetation minimizes erosion by stabilizing the ET cover surface and by moving soil moisture from the ET cover to the atmosphere through transpiration.

Cover vegetation monitoring will be accomplished in a two-phase approach. The first phase concentrates on establishing the vegetation on the ET cover from seed to a mature plant community such that successful revegetation criteria (defined in Attachment 1, Section 1.9, of the CWL PCCP) are met. These criteria are provided below.

- Total percent foliar coverage equals 20 percent (i.e., 20 percent of the land surface is covered with living plants versus 80 percent bare surface area;
- Of the 20 percent total foliar coverage, 50 percent or greater comprises native perennial species, and 50 percent or less comprises annual species; and

- No contiguous bare spots greater than 200 square feet (approximately 14 by 14 feet) are present.

During this first phase of vegetation inspection and monitoring a staff biologist must inspect and document the inventory of the main flora populating the cover on a quarterly basis. These inspections will be documented on the Biology Inspection Form/Checklist (CWL PCCP Attachment 4) and include inspecting the cover for contiguous areas lacking vegetation in excess of 200 square feet, signs of animal intrusion, and deep-rooted plants. Any repairs required by the inspection to address vegetation parameters not meeting CWL PCCP specifications will be performed as described in Section 3.2.1.3. At the end of each CY, the staff biologist must compile the results of the quarterly inspections, summarize local climate trends, and present recommendations in a summary report that will be included in the annual CWL post-closure care report submitted to the NMED.

Once successful revegetation criteria are met, the second phase of cover vegetation inspection and monitoring begins. During this phase the staff biologist inspection frequency changes to annual. The biology inspection will occur near the end of the growing season (August-September) to most accurately determine the coverage of living plants. As with the first phase, the inspection will be documented on the Biology Inspection Form/Checklist (CWL PCCP Attachment 4), include inspection results for the same parameters as the first phase of inspection, and be documented in a summary report along with a summary of local climate trends and recommendations.

3.2.1.2 Cover Inspection Requirements

Cover inspections are required to be performed by a field technician on a quarterly basis to assess the physical integrity of the ET cover. Settlement of the cover surface in excess of 6 inches, erosion of the cover soil in excess of 6 inches deep, areas of ponding water, animal intrusion burrows in excess of 4 inches in diameter, contiguous areas lacking vegetation in excess of 200 square feet, and any other conditions that may impact the cover integrity must be documented on the Post-Closure Inspection Form/Inspection Checklist (CWL PCCP Attachment 4). During the first phase of quarterly cover vegetation monitoring described in Section 3.2.1.1, documentation of animal intrusion burrows in excess of 4 inches in diameter and contiguous areas lacking vegetation in excess of 200 square feet are recorded on the Biology Inspection Form/Checklist. During the second phase of annual cover vegetation monitoring, these inspection parameters must be noted by the field technician on the Post-Closure Inspection Form/Checklist.

3.2.1.3 Cover Repairs

Cover damage exceeding CWL PCCP specifications is required to be repaired within 60 days to a condition that meets or exceeds the original design. However, repairs to fix inadequate cover vegetation may be delayed until the appropriate growing season if approved by NMED in advance, and if measures are taken as needed to prevent excessive erosion of the ET cover during the delay period. Repairs to the cover shall be done using materials consistent with the cover installation specifications, according to soil classification and gradation specifications in the Remedial Action Proposal (SNL/NM December 2004).

3.2.2 Storm-Water Diversion Structure Inspection Requirements

Inspection of the storm-water diversion structures is required on a quarterly basis to verify structural integrity and to ensure adequate performance. This inspection will be performed at the same time as the cover inspection. Erosion of the channels or sidewalls in excess of 6 inches deep, accumulations of silt greater than 6 inches deep, or debris that block more than one-third of the channel width must be documented on the Post-Closure Inspection Form/Inspection Checklist. Repairs, if needed, will be completed within 60 days.

3.2.3 Monitoring Well Network Inspection Requirements

Inspection of monitoring wells and sampling equipment is required at the same frequency as the associated monitoring, and will be performed concurrently with all groundwater and soil-gas monitoring events. Inspections will address the condition of the components including protective casings and bollards, wellhead covers/caps/locks, soil-gas sampling ports, well identification markings, and passive venting BaroBalls™ or equivalent devices. Sampling pumps and sample tubing are inspected during each sampling event (pumps are not dedicated to the wells). Pump replacement and maintenance/repair, and tubing replacement are performed on an as-needed basis based upon pump and tubing performance, inspections, and review of analytical sampling results. Excessive accumulations of wind-blown plants and debris that would interfere with any of the groundwater or soil-gas monitoring network components will also be addressed and removed during these inspections, as necessary.

3.2.4 Security Fence Inspection Requirements

Inspection of the fence, gates, locks, and warning signs at the CWL is required on a quarterly basis and will be performed at the same time as the cover inspection. The condition of the fence, including fence wires, posts, gates, gate locks, and warning signs, will be inspected and documented on the Post-Closure Inspection Form/Inspection Checklist. Excessive accumulations of wind-blown plants and debris on the fence that would obscure warning signs or block access to the CWL will be addressed during the inspection and removed within 60 days. Local survey monuments must also to be inspected and excess soil and/or vegetation covering these features will be removed within 60 days.

3.2.5 Emergency Equipment Inspection Requirements

Inspection of emergency equipment is required to be performed on a quarterly basis. Emergency equipment is maintained at the nearby Corrective Action Management Unit (CAMU) for use at the CWL, if necessary. A list of emergency equipment and its location is provided in CWL PCCP Attachment 6, Table 6-4.

4.0 GROUNDWATER MONITORING RESULTS

This chapter presents groundwater monitoring activities (i.e., sampling and analysis), analytical results, and data evaluation for CY 2011 in accordance with CWL PCCP Attachment 1, Sections 1.8 and 1.12, and Attachment 2. Groundwater sampling field activities are described in Section 4.1, analytical laboratory results and a discussion of data quality are presented in Section 4.2, data evaluation requirements and results are presented in Section 4.3, and hydrogeologic information on the regional aquifer is presented in Section 4.4. A summary of groundwater monitoring activities and results is provided in Section 8.1.

4.1 Groundwater Sampling Field Activities

This section describes groundwater monitoring activities conducted at the CWL in conformance with the CWL Groundwater SAP, Permit Attachment 2 of the CWL PCCP (NMED October 2009) that describes the procedures, methods, and analytical protocols for collecting and analyzing groundwater samples. 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. Field forms and documentation that address safety, sampling equipment check/calibration, decontamination, and field measurements are provided in Annex A of this report and filed in the SNL/NM Records Center.

One semi-annual groundwater monitoring event was conducted from July 27 to August 2, 2011. Groundwater samples were collected from monitoring wells CWL-BW5, CWL-MW9, CWL-MW10, and CWL-MW11 and analyzed for TCE, chromium, and nickel. A duplicate sample was collected from CWL-MW10 and analyzed for the three parameters. The NMED U.S. Department of Energy Oversight Bureau was on-site and received split samples for all analyses at each monitoring well. The Oversight Bureau split sampling results are presented in a separate report and are not included in this report.

Because the CWL PCCP became effective in June 2011, only one semi-annual groundwater monitoring event was conducted in CY 2011. CY 2012 will be the first full year of monitoring under the CWL PCCP and will include two semi-annual groundwater monitoring events. The first groundwater monitoring event for CY 2012 will include analyses for the enhanced list of constituents comprised of 1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113), tetrachloroethene (PCE), 1,1-dichloroethene (1,1-DCE), chloroform, and trichlorofluoromethane (Freon 11), in addition to TCE, chromium, and nickel.

4.1.1 Well Purging

Purging removes stagnant water from the well so that a representative groundwater sample can be obtained. In accordance with the CWL Groundwater SAP, the minimum purge requirement for a portable piston pump is one borehole volume (a borehole volume is the volume of all static water in the well plus the volume of water in the adjacent filter packs). Purging continued until four stable field measurements for temperature, specific conductance (SC), potential of hydrogen (pH), and turbidity were obtained in monitoring wells that did not purge dry. As specified in PCCP Attachment 2, Section 2.12, groundwater stability is considered acceptable

when measurements are less than five nephelometric turbidity units (NTU) for turbidity, pH is within 0.1 units, temperature is within 1.0 degree Celsius, and SC is within five percent as micromhos per centimeter. Field measurements for water quality parameters were collected using a YSI™ Model 620 Water Quality Meter, and a HACH™ Model 2100P portable turbidity meter. Additional water quality measurements included oxidation-reduction potential (ORP) and dissolved oxygen (DO).

A portable Bennett Company groundwater sampling system was used to collect groundwater samples from all wells. Minimum purge requirements were satisfied at all monitoring wells, except at CWL-MW10. This monitoring well was purged to dryness, allowed to recover, and then sampled to collect the most representative groundwater sample possible given the low yield of this well. In an effort to decrease flow rate for wells that purge dry, the existing sampling system is equipped with a flow meter valve located along the discharge line, and with small diameter tubing. Monitoring well CWL-MW10 was purged for 261 minutes (4.35 hours) and slightly more than 23 gallons were purged prior to the well going dry. The average flow rate during this purge is estimated at 0.088 gallons per minute (equivalent of 0.33 liters per minute).

4.1.2 Field Quality Control

Field quality control (QC) samples were collected as part of the July-August 2011 sampling event and included an environmental duplicate sample, an equipment blank sample, trip blank samples, and a field blank sample. The field QC samples were submitted for analysis along with the groundwater samples. A brief explanation of the field QC samples is provided below. Analytical results are presented in Section 4.2.2 of this report.

A duplicate environmental sample was collected from CWL-MW10, and analyzed in order to estimate the overall reproducibility of the sampling and analytical process. The duplicate sample was collected immediately after the original environmental sample, in order to reduce variability caused by time and/or sampling mechanics.

One equipment blank (also referred to as a rinsate blank) sample was collected prior to sampling CWL-MW10 to verify the equipment decontamination process. This sample was submitted for all analyses. The sampling pump and tubing bundle used to collect groundwater samples were decontaminated prior to sampling each monitoring well according to procedures described in “General Sampling Equipment Decontamination,” SNL/NM field operating procedure (FOP) FOP 05-03.

Trip blank samples were submitted along with the groundwater samples analyzed for TCE to assess whether contamination of the samples had occurred during shipment and storage. Trip blanks are contained in 40-milliliter vials prepared by the analytical laboratory, which accompany the empty sample containers supplied by the laboratory. TCE trip blanks consist of laboratory reagent grade water with hydrochloric acid preservative. Trip blanks were brought to the field and accompanied each sample shipment. A total of five TCE trip blanks were submitted with the July-August 2011 samples.

4.1.3 Waste Management

Purge and decontamination water generated from sampling activities were placed into 55-gallon containers and stored at the Environmental Field Office less than 90-day waste accumulation

area. Approximately 300-gallons of purge water were generated during the July-August 2011 groundwater sampling event. All purge water was managed and disposed of in accordance with federal, state, and local regulations.

Personal protective equipment and other solid waste generated during July and August 2011 activities were packaged into a 5-gallon plastic bucket and managed as hazardous waste. This waste was submitted to the SNL/NM Hazardous Waste Management Facility for ultimate disposal at a permitted off-site facility.

4.2 Laboratory Results

Groundwater samples and field QC samples were submitted to GEL Laboratories for analyses. Samples were analyzed in accordance with applicable EPA analytical methods. For comparison, hazardous constituent concentration limits from the CWL PCCP are included in the analytical results tables. Analytical results that are above the analytical laboratory method detection limit (MDL) but below the practical quantitation limit (PQL) are qualified as estimated values and designated with a "J" qualifier. Analytical laboratory reports, including certificates of analyses, analytical methods, MDLs, PQLs, dates of analyses, results of QC analyses, and data validation findings are filed in the SNL/NM Records Center.

4.2.1 Environmental Sample Results

Table 4-1 summarizes TCE results for the July-August 2011 groundwater samples. TCE was not detected in any CWL groundwater samples above the laboratory MDL, except at CWL-MW10. TCE was detected in the CWL-MW10 environmental and duplicate environmental samples at concentrations of 1.47 µg/L and 1.61 µg/L, respectively, which are below the concentration limit of 5.0 µg/L.

Table 4-2 summarizes chromium and nickel results. Chromium was not detected above the laboratory MDL in any sample. Nickel was detected in all samples at concentrations ranging from 0.00347 milligrams per liter (mg/L) in CWL-MW11 to 0.00431 mg/L in the CWL-MW10 environmental sample. Chromium and nickel were not detected above their respective concentration limits.

Table 4-3 summarizes field water quality measurements collected prior to sampling. Field water quality measurements include turbidity, pH, temperature, SC, ORP, and DO.

Table 4-1
Summary of Trichloroethene Results
Chemical Waste Landfill Groundwater Monitoring
Analytical Method SW846-8260B[a]
July-August 2011

Well ID	Result (µg/L)	MDL (µg/L)	PQL (µg/L)	Concentration Limit[b] (µg/L)	Laboratory Qualifier[c]	Validation Qualifier[c]	Sample No.
CWL-BW5 27-Jul-11	ND	0.250	1.00	5.00	U	--	090964-001
CWL-MW9 28-Jul-11	ND	0.250	1.00	5.00	U	--	090968-001
CWL-MW10 01-Augl-11	1.47	0.250	1.00	5.00	--	--	090974-001
CWL-MW10 (Duplicate) 01-Aug-11	1.61	0.250	1.00	5.00	--	--	090975-001
CWL-MW11 02-Aug-11	ND	0.250	1.00	5.00	U	--	090979-001

[a]Analytical Method EPA 9310: U.S. Environmental Protection Agency, 1990 (and updates), "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd edition.
[b]Concentration limit from CWL PCCP, Attachment 1, Table 1-2 (NMED October 2009).
[c]Laboratory/Validation Qualifier - If cell is blank (--), then all quality control samples met acceptance criteria with respect to submitted samples. See explanation for "U" laboratory qualifier below.
EPA = U.S. Environmental Protection Agency.
MCL = Maximum contaminant level. Established by the U.S. Environmental Protection Agency Primary Water Regulations (40 CFR 141.11(b)), National Primary Drinking Water Standards, EPA, July 2002.
MDL = Method detection limit. The minimum concentration or activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix-specific.
µg/L = Micrograms per liter.
ND = Not detected (at method detection limit).
PQL = Practical quantitation limit. The lowest concentration of analytes in a sample that can be reliably determined within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions.
U = Analyte not present or concentration is below the method detection limit.

Table 4-2
Summary of Chromium and Nickel Results
Chemical Waste Landfill Groundwater Monitoring
Analytical Method SW846-6020[a]
July-August 2011

Well ID/ Sample Date	Analyte	Result (mg/L)	MDL (mg/L)	PQL (mg/L)	Conc. Limit[b] (mg/L)	Laboratory Qualifier[c]	Validation Qualifier[c]	Sample No.
CWL-BW5	Chromium	ND	0.002	0.010	0.050	U	--	090964-013
27-Jul-11	Nickel	0.0039	0.0005	0.002	0.028	--	J+	090964-013
CWL-MW9	Chromium	ND	0.002	0.010	0.050	U	--	090968-013
28-Jul-11	Nickel	0.00408	0.0005	0.002	0.028	--	J+	090968-013
CWL-MW10	Chromium	ND	0.002	0.010	0.050	U	--	090974-013
01-Aug-11	Nickel	0.00431	0.0005	0.002	0.028	--	--	090974-013
CWL-MW10	Chromium	ND	0.002	0.010	0.050	U	--	090975-013
(Duplicate) 01-Aug-11	Nickel	0.00402	0.0005	0.002	0.028	--	--	090975-013
CWL-MW11	Chromium	ND	0.002	0.010	0.050	U	--	090979-013
02-Aug-11	Nickel	0.00347	0.0005	0.002	0.028	--	--	090979-013

[a]Analytical Method EPA 9310: U.S. Environmental Protection Agency, 1990 (and updates), "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd ed.
[b]Concentration limit from CWL PCCP, Attachment 1, Table 1-2 (NMED October 2009).
[c]Laboratory/Validation Qualifier - If cell is blank (--), then all quality control samples met acceptance criteria with respect to submitted sample. See explanation for "U" laboratory qualifier below.

EPA = U.S. Environmental Protection Agency.
J+ = The associated numerical value is an estimated quantity with a suspected positive bias.
MCL = Maximum contaminant level. Established by the U.S. Environmental Protection Agency Primary Water Regulations (40 CFR 141.11(b)), National Primary Drinking Water Standards, EPA, July 2002.
MDL = Method detection limit. The minimum concentration or activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix-specific.
mg/L = Milligrams per liter.
ND = Not detected (at method detection limit).
PQL = Practical quantitation limit. The lowest concentration of analytes in a sample that can be reliably determined within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions.
U = Analyte not present or below the method detection limit.

Table 4-3
Summary of Field Water Quality Measurements[a]
Chemical Waste Landfill Groundwater Monitoring
July-August 2011

Well ID/ Sample Date	Temperature (°C)	SC (µmho/cm)	ORP (mV)	pH	Turbidity (NTU)	DO (% Sat)	DO (mg/L)
CWL-BW5 27-Jul-11	25.72	1221	397.0	6.58	0.35	88.6	7.20
CWL-MW9 28-Jul-11	23.23	1072	-26.3	6.67	0.59	16.1	1.37
CWL-MW10 01-Aug-11	22.90	990	386.2	670	4.18	46.6	3.99
CWL-MW11 02-Aug-11	28.52	1121	392.9	6.71	0.76	64.7	4.99

[a]Field measurements collected prior to sampling.
°C = Degrees Celsius.
% Sat = Present saturation.
DO = Dissolved oxygen.
mg/L = Milligrams per liter.
µmho/cm = Micromhos per centimeter.
mV = Millivolts.
ORP = Oxidation-reduction potential
NTU = Nephelometric turbidity units.
pH = Potential of hydrogen (negative logarithm of the hydrogen ion concentration).
SC = Specific Conductance

4.2.2 Field Quality Control Sample Results

Tables 4-1 through 4-3 present field duplicate results for samples collected from well CWL-MW10. Table 4-4 summarizes results of duplicate sample analyses and the calculated relative percent difference (RPD) values between the environmental and duplicate sample results. RPD values were only calculated for detected constituents and show good agreement (i.e., RPD values < 20 for organics and < 35 for metals).

The equipment blank sample was analyzed for all constituents. The five trip blank samples and one field blank sample were analyzed for TCE only. TCE, chromium, and nickel were not detected in the equipment blank sample, and TCE was not detected in any of the trip blank or field blank samples.

Table 4-4
Summary of Duplicate Samples
Chemical Waste Landfill Groundwater Monitoring
July-August 2011

Well ID/Parameter	Environmental Sample (R1)	Duplicate Sample (R2)	RPD[a]
CWL-MW10			
Trichloroethene (µg/L)	1.47	1.61	9
Nickel (mg/L)	0.00431	0.00402	7

[a]RPD = Relative percent difference is calculated with the following equation and rounded to nearest whole number.

$$RPD = \frac{|R_1 - R_2|}{[(R_1 + R_2)/2]} \times 100$$

where: R_1 = Analysis result.
R_2 = Duplicate analysis result.

µg/L = micrograms per liter.
mg/L = milligrams per liter.

4.2.3 Data Quality

Field QC sample results indicate the field sampling procedures and protocol are adequate to support the sampling DQOs. Internal laboratory QC samples, including method blanks and duplicate laboratory control sample were analyzed concurrently with environmental groundwater samples. All chemical data was reviewed and qualified in accordance with SNL/NM Administrative Operating Procedure (AOP) AOP 00-03, "Data Validation Procedure for Chemical and Radiochemical Data."

Nickel results in the CWL-BW5 and CWL-MW9 samples were qualified as estimated values during data validation since nickel was detected in the associated interference check sample. All data were determined to be acceptable (i.e., technically defensible) and the reported laboratory QC measures were determined to be adequate. Data Validation Reports and Contract Verification Review forms are provided in Annex B of this report.

4.2.4 Variances and Non-Conformances

No variances, non-conformances, or project-specific issues from requirements in the CWL SAP were identified during the July-August 2011 semi-annual groundwater sampling event.

4.3 Data Evaluation

Groundwater monitoring is required to determine whether the groundwater beneath the CWL is in compliance with the groundwater protection standard under 40 CFR § 264.92 and for the determination of statistical significance under 40 CFR § 264.97(h). In accordance with CWL

PCCP Attachment 1, Section 1.8.1.2, statistical evaluation of groundwater monitoring results from new wells is not required until after three years of groundwater sampling results have been obtained to allow for the collection of sufficient data (i.e., minimum data set for statistical analysis is six sampling results). For replacement wells, historical groundwater sampling results are used to augment the data sets and increase the amount of data for statistical analysis. Historical groundwater data is limited to data obtained after completion of the VE VCM (July 1998).

Statistical evaluation is limited to results from CWL-BW5/4A for this CY 2011 reporting period. CWL-MW9, CWL-MW10, and CWL-MW11 are new wells installed in 2010 and have been sampled twice (November-December 2010 and July-August 2011). Statistical evaluation of the results from these wells is not required until the completion of CY 2013 groundwater monitoring (NMED October 2009).

CWL-BW5 is a replacement well for CWL-BW4A. All results for CWL-BW5 (November-December 2010 and July-August 2011) and historic results for CWL-BW4A (since completion of the VE VCM) are used for statistical evaluation presented in the following sections. All references to sample results are to CWL-BW5/4A sample results.

4.3.1 Statistical Assessment Requirements

Groundwater monitoring data are statistically evaluated on a well-by-well basis for each of the three hazardous constituents in accordance with Attachment 1, Section 1.8.1.2, of the CWL PCCP. The hazardous constituents and their respective concentration limits are listed in Table 4-5. Prediction and confidence intervals are calculated and used to evaluate semi-annual groundwater monitoring results. In addition, the cumulative percentage of sample results that are greater than the median (i.e., Median Test) is calculated to determine if there is statistically significant evidence of increased contamination. If a result is below the analytical laboratory detection limits, the MDL for the constituent is used for statistical analysis. More detailed information regarding statistical assessment requirements is provided below and statistical assessment results for CY 2011 groundwater monitoring data are presented in Section 4.5.2 of this report.

Table 4-5
Concentration Limits for the Hazardous Constituents of Concern at the Chemical Waste Landfill

Hazardous Constituent	Concentration Limit	Basis of Concentration Limit
Trichloroethene	5 µg/L	EPA MCL, 40 CFR § 264.94(b)
Chromium	0.050 mg/L	Table 1, 40 CFR § 264.94(a)(2)
Nickel	0.028 mg/L	Background level, 40 CFR § 264.94(a)(1)

EPA = U.S. Environmental Protection Agency
MCL = Maximum concentration limit.
µg/L = Micrograms per liter.
mg/L = Milligrams per liter.

Prediction and Confidence Intervals

The probability that each semi-annual sample result for a given hazardous constituent falls within the range of previous sample results is determined using prediction intervals. The

prediction interval for a given hazardous constituent is the range between the 95% upper confidence limit (UCL) of the mean and the 95% lower confidence limit (LCL) of the mean. Therefore, the probability of a sample result for a given hazardous constituent falling within the range of previous sample results (i.e., between the LCL and the UCL) is 90%. Sample results are also compared to the historical range (minimum and maximum result) to determine whether semi-annual results for the reporting period fall within, below, or above the range of previous sample results.

The 95% LCL is also used to determine statistically significant evidence that the concentration limit for the particular hazardous constituent has been exceeded (NMED October 2009). The calculated 95% LCL is compared to the concentration limit in Table 4-5 and if it exceeds the concentration limit, this is statistically significant evidence that the concentration limit has been exceeded, which triggers corrective action in accordance with Attachment 1, Section 1.8.3, of the CWL PCCP. Individual sample results that exceed the concentration limit do not constitute an exceedance requiring corrective action.

Median Test

The median value is calculated using all historic data prior to the sampling event(s) being evaluated. For example, the median values against which the July-August 2011 sample results are compared was calculated using all historic results obtained since July 1998 (i.e., completion of the VE VCM) not including the July-August 2011 sample results. For the next groundwater monitoring event, the median will be recalculated and include the July-August 2011 sample results. If the cumulative percentage of results that are greater than the median for a given hazardous constituent is 80% or greater, that is considered statistically significant evidence of increased contamination. No action is required due to statistically significant evidence of increasing contamination unless a concentration limit is exceeded (NMED October 2009).

4.3.2 Statistical Assessment Results

CY 2011 groundwater sampling data and statistical analysis for CWL-BW5/4A are discussed in this section. CWL-BW5/4A sample and statistical assessment results are presented in Table 4-6 and shown graphically in Figures 4-1 through 4-3.

Prediction Intervals

July-August 2011 sample results for chromium and TCE were lower than their respective 95% LCLs, and thus are below the prediction interval (range of 95% LCL to 95% UCL). This is due to the decrease in the laboratory detection limit over time, and the fact that chromium and TCE are often not detected and were not detected in the July-August 2011 samples. The result for nickel fell within the range of the 95% LCL and 95% UCL. Results for all three hazardous constituents fell within the historical range.

Confidence Intervals

The three hazardous constituent 95% LCLs and 95% UCLs of the mean for the CWL-BW5/4A sample results are presented in Table 4-6 and shown on the associated control charts (Figures 4-1 through 4-3) as solid horizontal red lines. All 95% LCLs are below the respective

Table 4-6
CWL-BW5/4A Statistical Assessment Results Summary
July-August 2011 Semi-Annual Sampling Results

Hazardous Constituent[a]	Result[b]	Minimum[c]	Maximum[c]	Mean[d]	Standard Deviation	LCL[e]	UCL[e]	Distribution Type[e]	Median Test[f]	Concentration Limit Exceeded[g]
Chromium (mg/L)	ND (0.002)	0.00038	0.0125	0.0036	0.0034	0.0021	0.005	Gamma	30%	No
Nickel (mg/L)	0.0039	0.00109	0.049	0.0060	0.0093	0.0029	0.014	Chebyshev	48%	No
TCE (µg/L)	ND (0.25)	0.1	0.6	0.32	0.13	0.37	0.07	Student's-t	13%	No

[a]Hazardous Constituent and Concentration Limit from CWL Permit Attachment 1, Section 1.4.1, Table 1-2 and Table 4.5.1-1.
[b]July-August semi-annual sampling result.
[c]Minimum and maximum result determined from historical data.
[d]Mean is the sum of the sample results divided by the number of sample results, which is the mathematical average.
[e]LCL, UCL, and Distribution Type determined using PRO-UCL statistical program.
[f] Median Test is the cumulative percentage of sample results that are greater than the median.
[g] Exceedance determined by comparing the sample result (2nd column of this table) against the concentration limit in CWL Permit Attachment 1, Table 4.5.1-1.
LCL = Lower confidence limit.
µg/L = Micrograms/liter.
mg/L = Milligrams/liter.
ND = Not detected (value shown is method detection limit).
TCE = Trichloroethene.
UCL = Upper confidence limit.

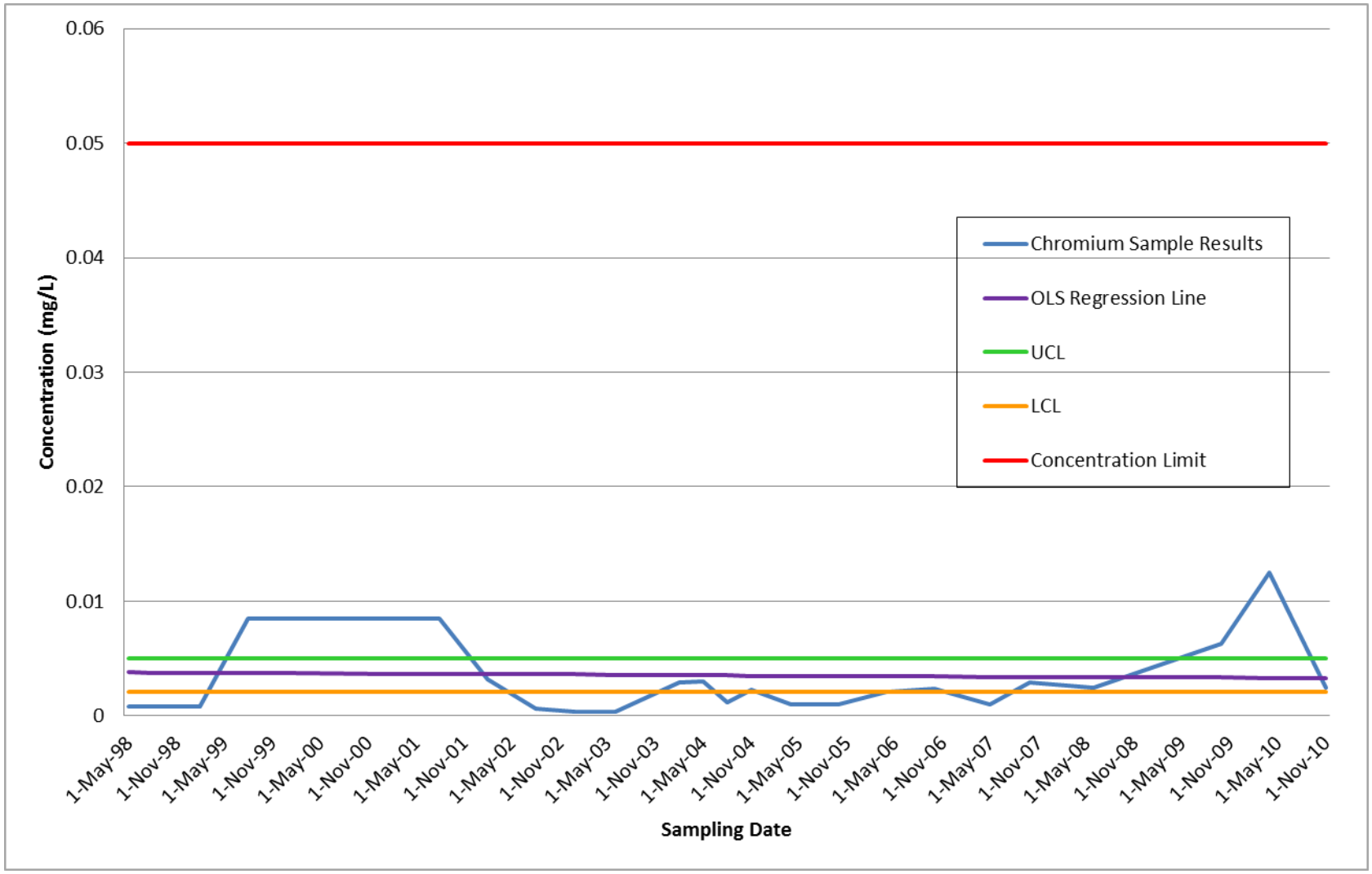

Figure 4-1
Chromium Control Chart for CWL-BW5/4A

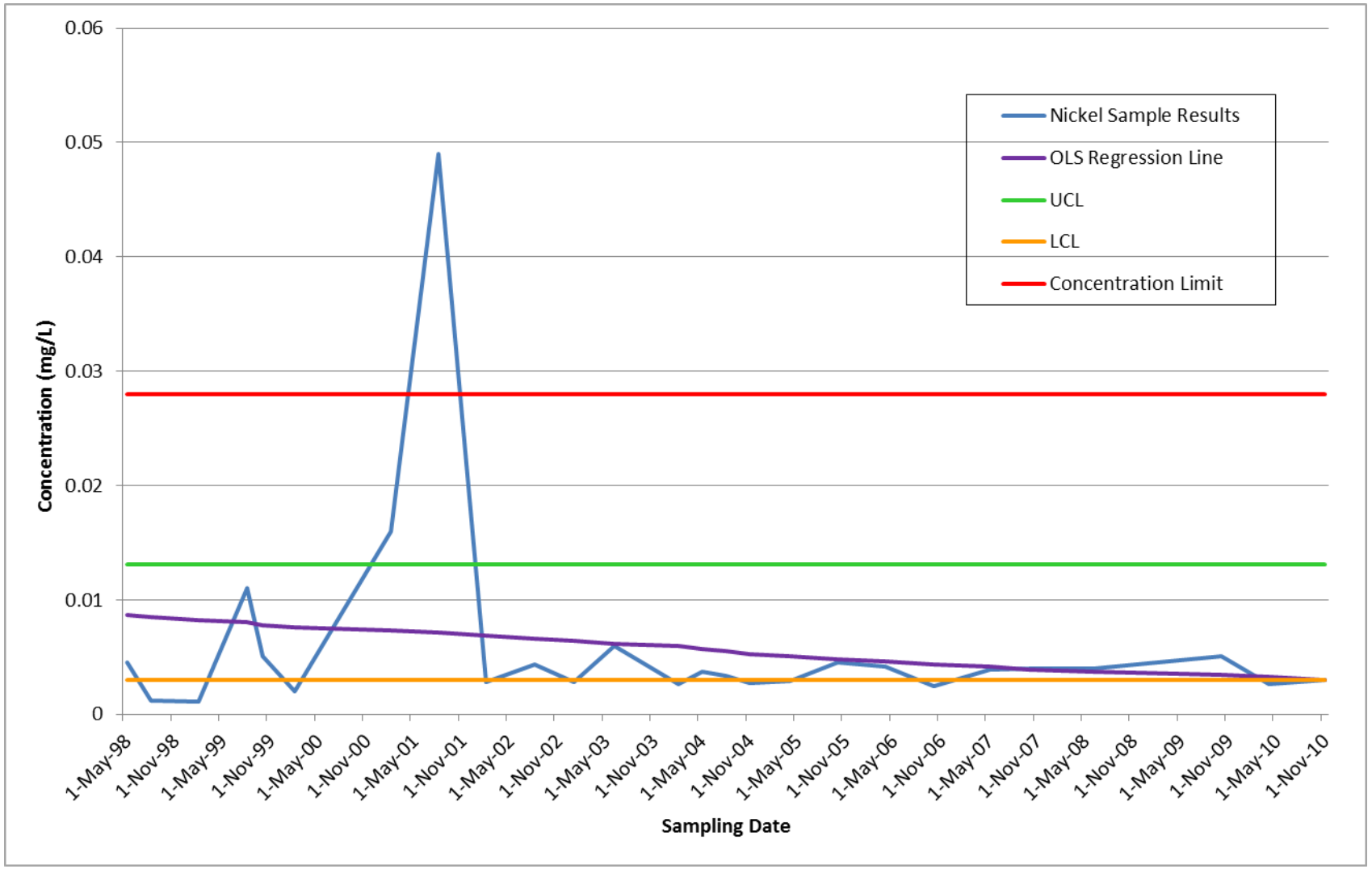

Figure 4-2
Nickel Control Chart for CWL-BW5/4A

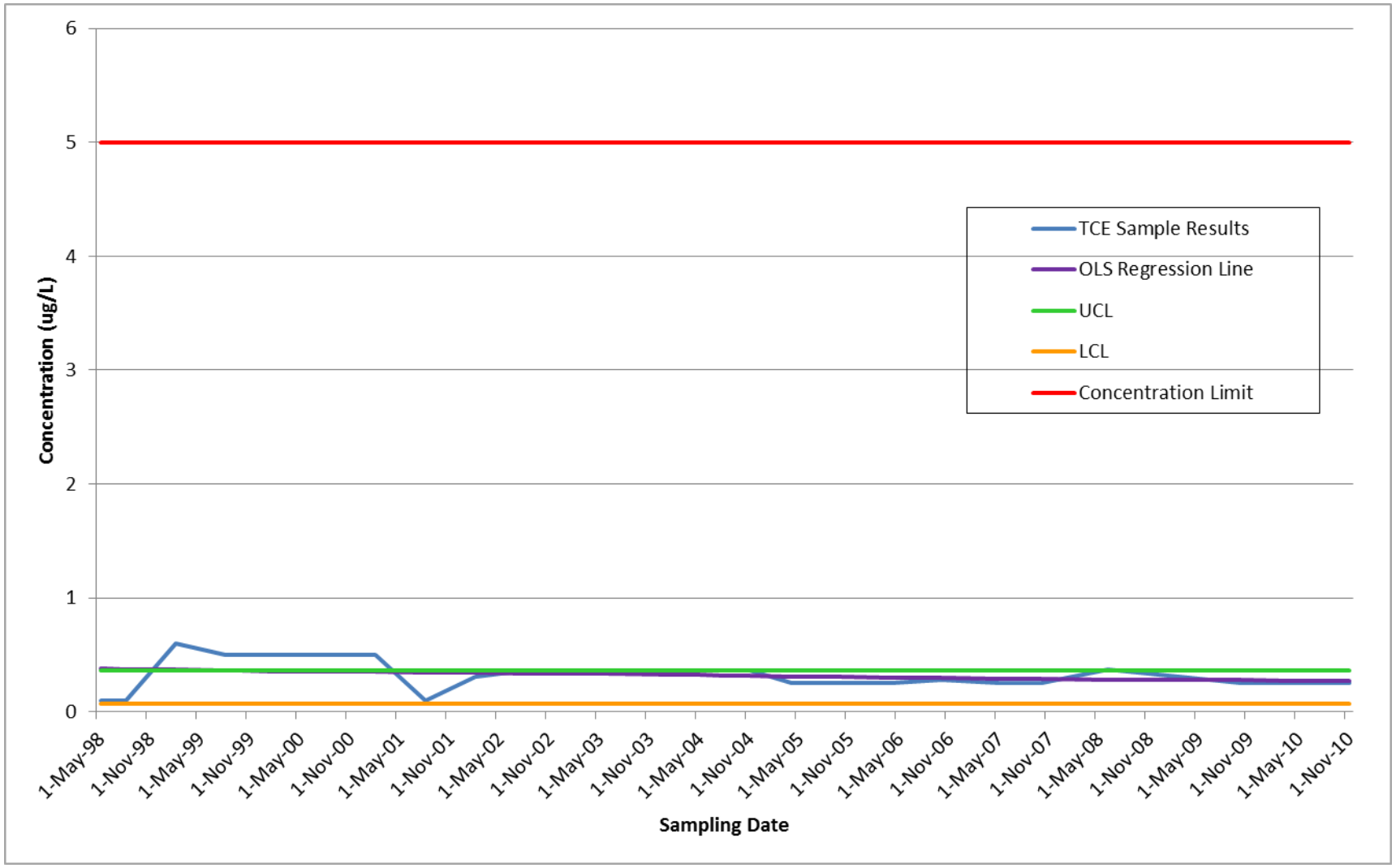

Figure 4-3
TCE Control Chart for CWL-BW5/4A

concentration limits and therefore there are no exceedances of any concentration limits. There is a single historical nickel result that is greater than the concentration limit (0.49 mg/L) that occurred in a sample from CWL-BW4A collected in August 2001 (Figure 4-2). However, the calculated 95% LCL for nickel is 0.0029 mg/L, significantly below the concentration limit of 0.028 mg/L.

Median Test

The cumulative percentage of sample results greater than the median (i.e., Median Test) for the three hazardous constituents is below 80%. Therefore, there is no statistically significant evidence of increasing contamination for any of the hazardous constituents. The Median Test result for nickel, 48%, is typical for a consistent data set characterized by detections that reflect limited natural variation. The low median test results for both chromium and TCE (30% and 13%, respectively) reflect a data set influenced by non-detection results and an analytical laboratory detection limit that has decreased over time.

In addition, the ordinary least squares (OLS) regression line is shown on Figures 4-1 through 4-3. This line provides a visual representation of the overall trend of the sample results. As shown in Figures 4-1 through 4-3, all three hazardous constituents show a decreasing trend, consistent with the Median Test results.

4.4 Hydrogeologic Assessment

The regional aquifer in the area of the CWL is located within the Santa Fe Group alluvial sediments at a depth of approximately 485 to 500 feet bgs. Regional groundwater beneath Kirtland Air Force Base (KAFB) flows generally westward toward the Rio Grande and away from the mountains to the east. Pumping by the City of Albuquerque and KAFB have modified the natural groundwater flow regime and resulted in a steady decline of the upper surface of the regional aquifer. Water levels at the CWL have been declining since monitoring began at the CWL in 1985. The average rate of decline has been somewhat variable over time, but typically in the range of 0.4 to 0.8 feet per year.

In CY 2011, water levels were measured in all wells on a quarterly basis, and during the July-August semi-annual sampling event. Figure 4-4 is the potentiometric surface map of the regional aquifer beneath the CWL, based upon October 2011 water level measurements. Based on this map the local groundwater flow direction is generally to the west-northwest, which is consistent with the hydrogeologic conceptual model for the KAFB area. Changes in the water table surface reflect site-specific geologic controls (i.e., vertical and lateral changes in the saturated Santa Fe Group alluvial sediments). The horizontal gradient ranges from approximately 0.006 to 0.013. Groundwater velocities were calculated using the current potentiometric surface gradient, representative hydraulic conductivity data, and an effective porosity of 29 percent (SNL/NM October 1995). The calculated velocity ranges from approximately 5.8×10^{-4} to 1.3×10^{-3} feet per day (2.0×10^{-7} to 4.4×10^{-7} centimeters per second). This very low velocity range is consistent with previous CWL estimates for horizontal groundwater flow.

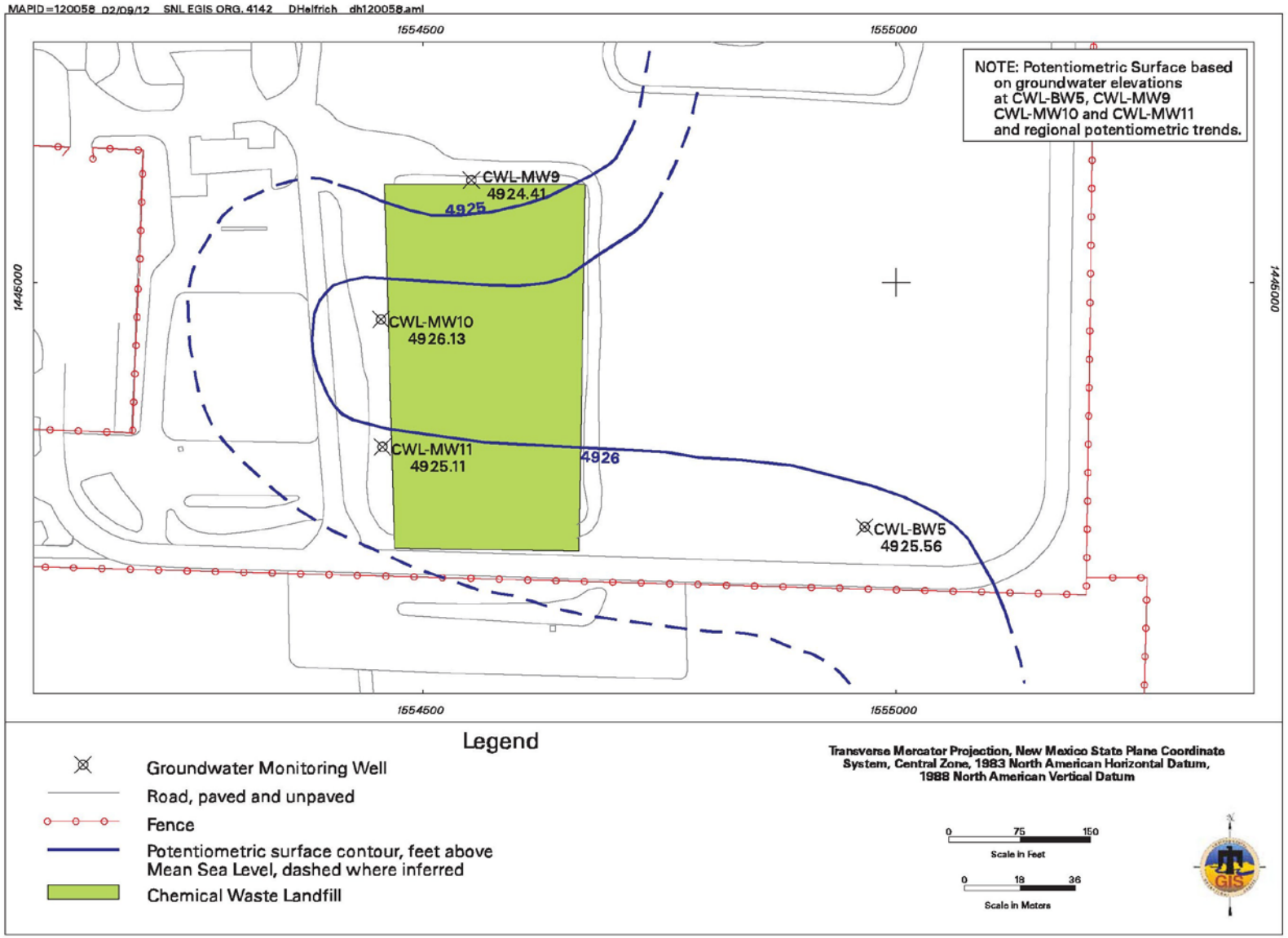

Figure 4-4
Potentiometric Surface of the Regional Aquifer at the Chemical Waste Landfill

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5.0 SOIL-GAS MONITORING RESULTS

No soil-gas monitoring was performed during this reporting period (June through December 2011). The first soil-gas monitoring event under the CWL PCCP will be performed in the first quarter of CY 2012.

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6.0 INSPECTION, MAINTENANCE, AND REPAIR RESULTS

This chapter presents as summary of CY 2011 inspection, maintenance, and repair activities. Inspection, maintenance, and repair requirements are presented in Section 3.2. The CWL post-closure care systems and features that require periodic inspection, maintenance, and/or repair include:

- Final Cover System (vegetation and cover)
- Surface-water diversion structures
- Compliance monitoring system (groundwater and soil-gas monitoring networks and sampling equipment)
- Perimeter security fence (including signs, gates, locks, and survey monuments)

Inspections began in late July after CWL PCCP implementation activities (personnel training and qualification checks/verification in accordance with CWL PCCP Attachment 5) were completed. Results are documented on the CWL Post-Closure Inspection Forms/Checklists provided in Annex C in conformance with the requirements in Attachment 1, Section 1.9 and 1.10, of the CWL PCCP (NMED October 2009). A schedule for implementing inspections and prescribed maintenance is provided in Attachment 1, Section 1.10, Table 1-6, of the CWL PCCP.

6.1 Final Cover System

The final cover system includes the ET cover vegetation and the cover surface. ET cover vegetation is inspected by the staff biologist and documented on the Biology Inspection Form/Checklist. The ET cover surface is inspected by a field technician along with the storm-water diversion structures and security fence, and documented on the Post-Closure Inspection Form/Inspection Checklist.

6.1.1 Vegetation Monitoring and Inspection

The first inspection of the ET cover vegetation (i.e., biology inspection) was conducted on September 22, 2011. This first biology inspection coincided with the end of the New Mexico growing season, so an accurate determination of living plants at the site could be performed. The inspection was made by the SNL/NM staff biologist and documented on the Biology Inspection Form/Checklist provided in Annex C. Although another quarterly biology inspection was scheduled for the end of the CY, it was not required because the ET cover met successful revegetation criteria based upon the September survey. As a result, the ET cover vegetation inspection and monitoring frequency changes to annual, and no further inspections were made by the staff biologist in CY 2011.

The three criteria for successful re-vegetation are restated below with a summary of corresponding inspection results.

- Total percent foliar coverage equals 20 percent (i.e., 20 percent of the land surface is covered with living plants versus 80 percent bare surface area).

  Inspection Results: The approximate vegetative coverage (the actively photosynthesizing foliar coverage) was determined to be 28 percent.

- Of the 20 percent total foliar coverage, 50 percent or greater comprises native perennial species, and 50 percent or less comprises annual species.

  Inspection Results: The vegetative coverage was composed of approximately 90 percent native perennial species and 10 percent annual species.

- No contiguous bare spots greater than 200 square feet (approximately 14 by 14 feet) are present.

  Inspection Results: No contiguous bare vegetation areas greater than 200 square feet were present.

No animal burrows were noted during the September biology inspection, but ant hills/burrows were observed. Four-wing saltbush (*Atriplex canescens*; undesirable because it is potentially deep rooted) seedlings were observed during the September inspection, along with other undesirable annual "weedy" species, but their combined percentage of the total foliar coverage was very small (less than 5 percent).

The *2011 Chemical Waste Landfill Biology Report* (Biology Report) is presented in Annex D and provides background information on ET cover revegetation efforts, a summary of cover maintenance activities performed in 2011 and local climate trends, additional details on the September biology inspection and how foliar coverage was determined, ET cover photographs, and recommendations. Removal of four-wing saltbush and undesirable annual weedy plant species (i.e., Russian thistle and kochia, both considered invasive species) was performed from August 18 through 23, 2011 to promote the overall health of the desired native grasses.

Based on the ET cover meeting successful revegetation criteria, the following recommendations are included in the Biology Report:

- ET cover vegetation monitoring and inspections should be performed on an annual schedule. This is in accordance with requirements for the second vegetation monitoring phase, defined in Permit Attachment 1, Section 1.9, of the CWL PCCP and presented in Section 3.2.1.1 of this report. The next biology inspection will occur near the end of the CY 2012 growing season (August-September) to most accurately determine the coverage of living plants and will be documented in the CY 2012 annual CWL post-closure care report.

- Removal of four-wing saltbush and undesirable annual weedy species will continue to occur as a voluntary, best management practice. Removal will be performed at the time of year that allows the most effective results, as directed by the staff biologist.

Both the annual biology inspections and the quarterly final cover surface inspections will address documentation requirements for contiguous barren areas and animal burrows according to Attachment 1, Section 1.9.1.2, of the CWL PCCP. The annual biology inspections and associated summary reports will also address and document any maintenance or repair work identified and completed according to CWL PCCP requirements and/or as best management practices.

6.1.2 Cover Inspection

Quarterly cover surface inspections were performed by a field technician in September and November and documented on the Post-Closure Inspection Form/Checklist provided in Annex C. No inspection parameters required repairs. During September the field technician also inspected the groundwater and soil-gas monitoring wells. Preventive maintenance on the monitoring well networks was performed as recommended, which included lubricating locks, replacing soil-gas monitoring well sampling port labels/tags, and repainting of specific well bollards. In the future, the monitoring well networks will typically only be inspected during the semi-annual (groundwater monitoring network and sampling equipment) and annual (soil-gas monitoring network and sampling equipment) sampling events.

6.2 Storm-Water Diversion Structure Inspection

Quarterly inspections of storm-water diversion structures by a field technician were performed in September and November at the same time as the cover surface inspection and documented on the same Post-Closure Inspection Form/Checklist provided in Annex C. No inspection parameters required repairs.

6.3 Monitoring Well Network Inspection

An inspection of the groundwater monitoring network and sampling equipment was performed by a field technician on July 27 as part of the July-August semi-annual groundwater sampling event. Because the sampling team was performing an inspection specifically of the monitoring well networks and sampling equipment, only Section IV (Soil-Gas and Groundwater Monitoring Wells) of the July 27, 2011 Post-Closure Inspection Form/Checklist contains inspection information (Annex C). No inspection parameters required repairs. Although not required, an additional inspection was performed by a field technician in September 2011 as described in Section 6.1.2 of this report.

6.4 Security Fence Inspection

Quarterly inspections of the security fence, access controls (gates, locks, signs), and survey monuments were performed by a field technician in September and November. Inspection of these features was performed at the same time as the cover surface inspection and is documented on the same Post-Closure Inspection Forms/Checklists provided in Annex C. No inspection parameters required repairs except for clearing debris and vegetation from the survey monuments, which was performed within 60 days of the September 22 inspection

(completed on October 6). Preventive maintenance was performed on the gate and lock (lubrication).

6.5 Emergency Equipment Inspection

For the CWL, inspection of emergency equipment listed in Attachment 6, Table 6-4, of the CWL PCCP is required on a quarterly basis. This equipment is inspected weekly and documented on the CAMU 90-Day Area inspection forms. Any repairs or replacement of equipment are performed, as necessary, to maintain compliance with requirements for emergency equipment.

7.0 REGULATORY ACTIVITIES

On June 2, 2011, the NMED approved closure of the CWL and the PCCP became the governing regulatory document for the CWL. Regulatory interaction in CY 2011 consisted of two submittals, two permit modifications, and an NMED audit as summarized below in Sections 7.1 through 7.3, respectively.

7.1 Permit Modifications

Modifications that affect Permit Attachment 6 (Contingency Plan) of the CWL PCCP were included as part of a notification of Class 1 Modification to the Hazardous Waste Operating Permits for SNL/NM, submitted to NMED on September 29, 2011. The notification was comprised of the following updates and revisions:

- Updating the list of agreements and memoranda of understanding for emergency response,
- Updating the list of emergency equipment to reflect current locations and capabilities,
- Updating the roster of personnel who can serve as emergency coordinators,
- Noting an additional evacuation route and an assembly point: with revisions to an existing figure and an additional figure, and
- Updating the list of figures in the permit.

All changes took effect on September 26, 2011. The final change (correcting the emergency coordinator contact information) took effect November 16, 2011.

A Class 1 modification request for several operational changes at the CWL was submitted to the NMED on November 17, 2011. The requested modifications, summarized below, affect Permit Attachments 1 through 6 of the CWL PCCP (NMED October 2009).

- Attachment 1 Post-Closure Care Plan for the CWL: Allowing use of equivalent soil-gas passive venting devices; allowing use of an alternate method for analysis of soil-gas samples; clarifying the cover inspection and repair specifications; and updating three figures.
- Attachment 2 Groundwater Sampling and Analysis Plan: revising groundwater purging and stability requirements; and adding well completions diagrams for the four groundwater monitoring wells installed after the Permit was issued.
- Attachment 3 Soil-Gas Sampling and Analysis Plan: updating the list of operating procedures; clarifying soil-gas purging requirements; and allowing use of an alternate method for analysis of soil-gas samples.

- Attachment 4 Inspection Forms: reformatting the forms; clarifying items to be inspected; and revising the inspection criteria for consistency with other parts of the Permit.

- Attachment 5 Personnel Training Program: correcting a typographical error.

- Attachment 6 Contingency Plan: correcting a typographical error in the telephone number for an emergency coordinator.

The change to Attachment 6 (correcting the emergency coordinator contact information) took effect November 16, 2011. The other requested modifications were still under NMED review at eh end of CY 2011.

7.2 Submittals

In July 2011, procedures, plans, and the SNL/NM Sample Management Office statement of work for analytical laboratories that are cited in CWL PCCP Attachments 2 and 3 were submitted as required (within 60 days of the Permit taking effect). Two outdated procedures cited in CWL PCCP Attachment 3 were identified and subsequently addressed in the Class 1 Modification Request submitted to the NMED on November 17, 2011.

A monitoring well plugging and abandonment (P&A) plan for seven groundwater monitoring wells and one soil-gas monitoring well located at the CWL was submitted to the NMED on October 18 (wells no longer needed; obsolete, dry or otherwise not suited for compliance monitoirng). The P&A plan included the rationale, methods, and procedures for decommissioning the wells, which are not part of the post-closure care compliance monitoring network and were approved for plugging and abandonment in the CWL PCCP (NMED October 2009). The NMED approved the plan on December 12, 2011 (Kieling December 2011).

7.3 Audits

An NMED audit of the CWL was conducted the week of November 14, 2011 by NMED inspectors. No findings were identified.

8.0 SUMMARY AND CONCLUSIONS

A summary of CY 2011 activities and results is provided in this Chapter, along with conclusions.

8.1 Groundwater and Soil-Gas Monitoring

One semi-annual groundwater monitoring event was conducted in July-August 2011. Groundwater samples were collected and analyzed in accordance with CWL PCCP Attachment 1, Section 1.8 and Attachment 2 requirements. There were no variances, non-conformances, or project-specific issues related to the sampling activities. TCE was detected in CWL-MW10 at very low, estimated concentrations of 1.47 µg/L and 1.61 µg/L, which is between the analytical laboratory MDL and PQL. Nickel was detected in all samples at concentrations ranging from 0.00347 mg/L to 0.00431 mg/L. No results were above respective concentration limits.

Statistical assessment was conducted on the results from replacement well CWL-BW5 and former well CWL-BW4A. There was no statistically significant evidence of increasing contamination and no hazardous constituent 95% LCLs exceeded their respective concentration limits. Groundwater surface elevation, hydraulic gradient, flow direction, and groundwater flow rate have been determined and are consistent with historical results.

No soil-gas monitoring was performed during this reporting period (June through December 2011). The first soil-gas monitoring event under the CWL PCCP will be performed in the first quarter of CY 2012.

8.2 Inspections

Inspections of the CWL final cover system, storm-water diversion structures, compliance monitoring system, and security fence were performed in accordance with CWL PCCP requirements presented in Chapter 3 of this report. Repairs and preventive maintenance were performed as needed. One repair associated with clearing soil and debris from survey monuments was subject to the 60-day requirement and was completed within this time frame.

Based upon the September biology inspection, the ET cover meets successful revegetation criteria, and inspection and monitoring by the staff biologist has transitioned to an annual frequency. Inspection of animal burrows and documentation of contiguous areas of no vegetative growth greater than 200 square feet will continue to be documented in quarterly cover inspections performed by a field technician, as well as the annual biology inspection performed by the staff biologist. Removal of four-wing saltbush and undesirable annual weedy species will continue to occur as a voluntary, best management practice as directed by the staff biologist.

8.3 Regulatory Activities

Regulatory activities in CY 2011 consisted of two submittals (cited procedures/documents and a well P&A plan) and two Class 1 permit modification requests, one of which was pending NMED

review and response at the end of the year. An NMED audit of the CWL was conducted the week of November 14, 2011 and no findings were identified.

8.4 Conclusions

SNL/NM has performed and documented all required CWL PCCP monitoring and inspection requirements for the first partial CY under the Permit, which became effective on June 2, 2011. This first Annual CWL Post-Closure Care Report presents these monitoring and inspection activities and results as required by Attachment 1, Section 1.12, of the CWL PCCP.

9.0 REFERENCES

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ANNEX A
CY 2011 Groundwater Monitoring Field Forms

Note: Completed AR/COC forms are provided in the Data Validation Section of Annex B.

FIELD SAMPLING FORMS

Form Title	Corresponding Procedure
Tailgate Safety Meeting Form	PLA 05-09
Groundwater Sample Collection Field Equipment Check Log	FOP 05-02
Portable Pump and Tubing/Water Level Indicator Decontamination Log Form	FOP 05-03
Field Measurement Log For Groundwater Sample Collection	FOP 05-01
Analysis Request and Chain of Custody*	LOP 94-03

*Completed AR/COC forms are provided in the Data Validation Section of Annex B.

TAILGATE SAFETY MEETING FORM

Dept: 4142 Well Location: CWL-BW5 Date: 07/27/11 Time: 0750

Activities: Ground Water monitoring/ sampling
(Anyone has the right to cease field activities for safety concerns. The buddy system will be used when needed.)

Weather Conditions:
Temp: _____ °F Wind Speed: _____ MPH Humidity: _____ % Wind Chill ____ °F

Chemicals Used: Acids in sample containers, standard solutions, ~~Hach ACCU-VAC ampoules~~ 71
Other: _____

Safety Topics Presented

☐ Be aware of slips, trips, and falls. Keep work area clean and use a stepping stool when necessary.	☐ Be aware of environmental conditions (heat / cold stress). Dress accordingly. Wear sunscreen if necessary. Stay hydrated.
☐ Wear safety boots.	☐ Be aware of electrical hazards
☐ Use safe lifting practices. Wear leather gloves if necessary.	☐ Be aware of pressure hazards.
☐ Be aware of pinch points on pump cable reel and hydraulic tailgate lift.	☐ No eating or drinking at sampling counter.
☐ Be aware of chemical hazards.	☐ Be aware of biohazards (snakes, spiders, etc.)
☐ Wear nitrile or latex gloves when sampling.	☐ Wear communication device (cell phone, EOC pager).
☐ Wear chemical safety goggles.	☐ Avoid spilling purge / decon water.

Hospital/Clinic: Sandia Medical Clinic Phone: 844-0911/911

Attendees

Printed Name	Signature
Robert Lynch	Robert Lynch
ALFRED SANTILLANES	Alfred Santillanes
William Gibson	William Gibson

Printed Name / Signature

TAILGATE SAFETY MEETING FORM

Dept: 4142 Well Location: CWL-MW9 Date: 07/28/10 Time: 0729

Activities: Ground Water monitoring/ sampling
(Anyone has the right to cease field activities for safety concerns. The buddy system will be used when needed.)

Weather Conditions:
Temp: _____ °F Wind Speed: _____ MPH Humidity: _____ % Wind Chill ____ °F

Chemicals Used: Acids in sample containers, standard solutions, ~~Hach ACCU-VAC ampoules~~ TI
Other: _____

Safety Topics Presented

☐ Be aware of slips, trips, and falls. Keep work area clean and use a stepping stool when necessary.	☐ Be aware of environmental conditions (heat / cold stress). Dress accordingly. Wear sunscreen if necessary. Stay hydrated.
☐ Wear safety boots.	☐ Be aware of electrical hazards
☐ Use safe lifting practices. Wear leather gloves if necessary.	☐ Be aware of pressure hazards.
☐ Be aware of pinch points on pump cable reel and hydraulic tailgate lift.	☐ No eating or drinking at sampling counter.
☐ Be aware of chemical hazards.	☐ Be aware of biohazards (snakes, spiders, etc.)
☐ Wear nitrile or latex gloves when sampling.	☐ Wear communication device (cell phone, EOC pager).
☐ Wear chemical safety goggles.	☐ Avoid spilling purge / decon water.

Hospital/Clinic: Sandia Medical Clinic Phone: 844-0911/911

Attendees

Printed Name	Signature
Robert Lynch	
William Gibson	
ALFRED SANTILLANES	

TAILGATE SAFETY MEETING FORM

Dept: 4142 Well Location: **CWL-MW10** Date: 07/29/10 8/1/11 Time: 0725 0815

Activities: Ground Water monitoring/ sampling
(Anyone has the right to cease field activities for safety concerns. The buddy system will be used when needed.)

Weather Conditions:
Temp: _____ °F Wind Speed: _____ MPH Humidity: _____ % Wind Chill ____ °F

Chemicals Used: Acids in sample containers, standard solutions, ~~Hach ACCU-VAC ampoules~~ N/A
Other: _____

Safety Topics Presented

☐ Be aware of slips, trips, and falls. Keep work area clean and use a stepping stool when necessary.	☐ Be aware of environmental conditions (heat / cold stress). Dress accordingly. Wear sunscreen if necessary. Stay hydrated.
☐ Wear safety boots.	☐ Be aware of electrical hazards
☐ Use safe lifting practices. Wear leather gloves if necessary.	☐ Be aware of pressure hazards.
☐ Be aware of pinch points on pump cable reel and hydraulic tailgate lift.	☐ No eating or drinking at sampling counter.
☐ Be aware of chemical hazards.	☐ Be aware of biohazards (snakes, spiders, etc.)
☐ Wear nitrile or latex gloves when sampling.	☐ Wear communication device (cell phone, EOC pager).
☐ Wear chemical safety goggles.	☐ Avoid spilling purge / decon water.

Hospital/Clinic: Sandia Medical Clinic Phone: 844-0911/911

Attendees

Printed Name	Signature
Robert Lynch	
ALFRED SANTILLANES	
William Gibson	
Robert Lynch	
William Gibson	
ALFRED SANTILLANES	

TAILGATE SAFETY MEETING FORM

Dept: 4142 Well Location: **CWL-MW11** Date: 08/02/11 Time: 0720

Activities: Ground Water monitoring/ sampling
(Anyone has the right to cease field activities for safety concerns. The buddy system will be used when needed.)

Weather Conditions:
Temp: _____ °F Wind Speed: _____ MPH Humidity: _____ % Wind Chill ____ °F

Chemicals Used: Acids in sample containers, standard solutions, ~~Hach ACCU-VAC ampoules~~ N/A
Other: _____

Safety Topics Presented

☐ Be aware of slips, trips, and falls. Keep work area clean and use a stepping stool when necessary.		☐ Be aware of environmental conditions (heat / cold stress). Dress accordingly. Wear sunscreen if necessary. Stay hydrated.
☐ Wear safety boots.		☐ Be aware of electrical hazards
☐ Use safe lifting practices. Wear leather gloves if necessary.		☐ Be aware of pressure hazards.
☐ Be aware of pinch points on pump cable reel and hydraulic tailgate lift.		☐ No eating or drinking at sampling counter.
☐ Be aware of chemical hazards.		☐ Be aware of biohazards (snakes, spiders, etc.)
☐ Wear nitrile or latex gloves when sampling.		☐ Wear communication device (cell phone, EOC pager).
☐ Wear chemical safety goggles.		☐ Avoid spilling purge / decon water.

Hospital/Clinic: Sandia Medical Clinic Phone: 844-0911/911

Attendees

Printed Name	Signature
Robert Lynch	
William Gibson	
ALFRED SANTILLANES	

Printed Name

Signature

GROUNDWATER SAMPLE COLLECTION FIELD EQUIPMENT CHECK LOG

SNL/NM Project Name: CWL	SNL/NM Project No.: 146422.10.11.01
Calibrations done by: RL	Date: 07/27/11

Make & Model:

YSI 6920-V Sonde (S/N: 99J0064) with DO, Ec, pH, ORP, and temperature probes: _____

YSI 650 MDS (S/N): 08H100440 RL

pH Calibration

pH Calibrated to (std): 7.00 | pH sloped to (std): 10.00

Reference value:	4.00		7.00		10.00	
	Value	Temp	Value	Temp	Value	Temp
1. Time: 0628	4.01	17.3	6.99	17.3	10.00	19.3
2. Time: 1332	4.02	18.2	7.01	18.2	10.01	18.2
3. Time:						
4. Time:						

Standard lot no.:054115

Expiration date: 12/~~10~~12 RL

SC Calibration

Reference Value: 1278 | Standard Lot No.: 1710737

Expiration Date: 12/~~10~~12 RL

	Value	Temp
1. Time: 0630	1276	17.3
2. Time: 1334	1279	18.2
3. Time:		
4. Time:		

ORP Calibration

Reference Value: 200.0 | Standard Lot No. 03K0868

Expiration Date: 12/~~10~~12 RL

	Value	Temp
1. Time: 0629	200.2	17.3
2. Time: 1333	201.1	18.2
3. Time:		
4. Time:		

DO Calibration

Calibration Value:	81% air saturation @ 5200 ft.	Atmospheric Pressure in Hg
1. Time: 0627	81.5	24.33
2. Time: 1331	81.4	24.35
3. Time:		
4. Time:		

GROUNDWATER SAMPLE COLLECTION FIELD EQUIPMENT CHECK LOG (continued)

SNL/NM Project Name: **CWL**	Project No.: 146422.10.11.01
Calibration done by: RL	Date: 07/27/11
TURBIDIMETER	
Make & Model: HACH 2100Q	Serial No. 10050C002897

Reference Value	10	20	100	800
Standard Lot No.	0161	0168	0162	0161 RL
1. Time 0750	9.70	20.2	101	802
2. Time 1156	9.59	20.1	102	803
3. Time				
4. Time				

Comments:

GROUNDWATER SAMPLE COLLECTION FIELD EQUIPMENT CHECK LOG

SNL/NM Project Name: CWL	SNL/NM Project No.: 146422.10.11.01
Calibrations done by: RL	Date: 07/28/11

Make & Model:

YSI 6920-V Sonde (S/N: 99J0064) with DO, Ec, pH, ORP, and temperature probes: _____

YSI 650 MDS (S/N): 09H100440 RL

pH Calibration

pH Calibrated to (std): 7.00 | pH sloped to (std): 10.00

Reference value:	4.00		7.00		10.00	
	Value	Temp	Value	Temp	Value	Temp
1. Time: 0630	4.01	18.8	7.00	18.8	10.01	18.8
2. Time: 1303	4.02	19.2	7.01	19.2	10.01	19.2
3. Time:						
4. Time:						
Standard lot no.:054115						
Expiration date: 12/~~10~~12 RL						

SC Calibration

Reference Value: 1278 | Standard Lot No.: 1710737

Expiration Date: 12/~~10~~12 RL

	Value	Temp
1. Time: 0632	1276	18.8
2. Time: 1305	1279	19.2
3. Time:		
4. Time:		

ORP Calibration

Reference Value: 200.0 | Standard Lot No. 03K0868

Expiration Date: 12/~~10~~12 RL

	Value	Temp
1. Time: 0631	200.4	18.8
2. Time: 1304	200.3	19.2
3. Time:		
4. Time:		

DO Calibration

Calibration Value:	81% air saturation @ 5200 ft.	Atmospheric Pressure in Hg
1. Time: 0629	81.2	24.34
2. Time: 1302	81.5	24.35
3. Time:		
4. Time:		

GROUNDWATER SAMPLE COLLECTION FIELD EQUIPMENT CHECK LOG (continued) Page 2 of 2

SNL/NM Project Name: **CWL**	Project No.: 146422.10.11.01
Calibration done by: RL	Date: 07/28/11

TURBIDIMETER

Make & Model: HACH 2100Q	Serial No. 10050C002897

Reference Value	10	20	100	800
Standard Lot No. RL	0161	0168	0162	0161
1. Time 0730	9.63	20.1	103	804
2. Time 1053	9.60	20.2	101	803
3. Time				
4. Time				

Comments:

GROUNDWATER SAMPLE COLLECTION FIELD EQUIPMENT CHECK LOG

SNL/NM Project Name: **CWL**	SNL/NM Project No.: 146422.10.11.01
Calibrations done by: RL RL	Date: 07/29/11 8/1/11 (for Time 3 and 4)

Make & Model:

YSI 6920-V Sonde (S/N: 99J0064) with DO, Ec, pH, ORP, and temperature probes: _____

YSI 650 MDS (S/N): 08H100440 RL

pH Calibration

pH Calibrated to (std): 7.00 | pH sloped to (std): 10.00

Reference value:	4.00		7.00		10.00	
	Value	Temp	Value	Temp	Value	Temp
1. Time: 0630	4.01	18.6	7.01	18.6	9.98	18.6
2. Time: 1322	4.03	19.4	7.01	19.4	10.00	19.4
3. Time: 0632	4.01	18.1	7.00	18.1	9.99	18.1
4. Time: 1011	4.00	18.3	7.00	18.3	10.01	18.3
Standard lot no.:054115						
Expiration date: 12/1~~0~~12 RL						

SC Calibration

Reference Value: 1278 | Standard Lot No.: 1710737

Expiration Date: 12/1~~0~~12 RL

	Value	Temp
1. Time: 0632	1277	18.6
2. Time: 1324	1280	19.4
3. Time: 0634	1275	18.1
4. Time: 1013	1277	18.3

ORP Calibration

Reference Value: 200.0 | Standard Lot No. 03K0868

Expiration Date: 12/1~~0~~12 RL

	Value	Temp
1. Time: 0631	199.8	18.6
2. Time: 1323	200.6	19.4
3. Time: 0633	200.7	18.1
4. Time: 1012	200.5	18.3

DO Calibration

Calibration Value:	81% air saturation @ 5200 ft.	Atmospheric Pressure in Hg
1. Time: 0629	81.6	24.46
2. Time: 1321	81.4	24.49
3. Time: 0631	81.5	24.38
4. Time: 1010	81.6	24.39

GROUNDWATER SAMPLE COLLECTION FIELD EQUIPMENT CHECK LOG (continued) Page 2 of 2

SNL/NM Project Name: **CWL**	Project No.: 146422.10.11.01
Calibration done by: RL RL	Date: 07/29/11 8/1/11

TURBIDIMETER

Make & Model: HACH 2100Q	Serial No. 10050C002897

Reference Value	10	20	100	800
Standard Lot No. RL	0161	0168	0162	0161
1. Time 0732	9.57	20.2	101	803
2. Time 1201	9.61	20.1	101	805
3. Time 0804	9.53	20.1	103	801
4. Time 0911	9.62	20.3	101	802

Comments:

GROUNDWATER SAMPLE COLLECTION FIELD EQUIPMENT CHECK LOG

SNL/NM Project Name: CWL	SNL/NM Project No.: 146422.10.11.01
Calibrations done by: RL	Date: 08/02/11

Make & Model:

YSI 6920-V Sonde (S/N: 99J0064) with DO, Ec, pH, ORP, and temperature probes: _____

YSI 650 MDS (S/N): 08H100440 RL

pH Calibration

pH Calibrated to (std): 7.00			pH sloped to (std): 10.00			
Reference value:	4.00		7.00		10.00	
	Value	Temp	Value	Temp	Value	Temp
1. Time: 0632	4.00	17.7	6.99	17.7	9.99	17.7
2. Time: 1421	4.02	18.2	7.01	18.2	10.06	18.2
3. Time:						
4. Time:						
Standard lot no.:054115						
Expiration date: 12/12 RL						

SC Calibration

Reference Value: 1278			Standard Lot No.: 1710737
	Value	Temp	Expiration Date: 12/12 RL
1. Time: 0634	1274	17.7	
2. Time: 1423	1277	18.2	
3. Time:			
4. Time:			

ORP Calibration

Reference Value: 200.0			Standard Lot No. 03K0868
	Value	Temp	Expiration Date: 12/12 RL
1. Time: 0633	199.7	17.7	
2. Time: 1422	200.2	18.6	
3. Time:			
4. Time:			

DO Calibration

Calibration Value:	81% air saturation @ 5200 ft.	Atmospheric Pressure in Hg
1. Time: 0631	81.6	24.41
2. Time: 1420	81.6	24.44
3. Time:		
4. Time:		

GROUNDWATER SAMPLE COLLECTION FIELD EQUIPMENT CHECK LOG (continued)

SNL/NM Project Name: **CWL**	Project No.: 146422.10.11.01
Calibration done by: RL	Date: 08/02/11
TURBIDIMETER	
Make & Model: HACH 2100Q	Serial No. 10050C002897

Reference Value	10	20	100	800
Standard Lot No.	0161	0168	0162	0161 RL
1. Time 0723	9.61	20.1	103	800
2. Time 1350	9.67	20.2	102	801
3. Time				
4. Time				

Comments:

Portable Pump and Tubing / Water Level Indicator
Decontamination Log Form

Project Name: CWL	Monitoring Well ID # CWL-BW5	Date: 07/27/11

The following equipment was decontaminated at completion of sampling activities in accordance with FOP-05-03

Pump and Tubing Bundle ID #: CWL Low Flow	Water Level Indicator ID#: 56161
Personnel Performing Decontamination: Print Name: Alfred Santillanes Initial: Print Name: William Gibson Initial:	Personnel Performing Decontamination: Print Name : Alfred Santillanes Initial: Print Name William Gibson Initial:

Condition of Equipment

Pump: Good Tubing Bundle: Good Water Level Indicator: Good

List of Decontamination Materials

Distilled or **Deionized** (circle one) **Source: Culligan** **Lot Number: 07- 11 -11**	**HNO_3** **Grade: Reagent** **UN #: 2031** **Manufacture: Fisher** **Lot Number: 002735**

Portable Pump and Tubing / Water Level Indicator
Decontamination Log Form

Project Name: CWL	Monitoring Well ID # CWL-MW9	Date: 07/28/11

The following equipment was decontaminated at completion of sampling activities in accordance with FOP-05-03

Pump and Tubing Bundle ID #: CWL Low Flow	Water Level Indicator ID#: 56161
Personnel Performing Decontamination: Print Name: Robert Lynch Initial: RL Print Name: William Gibson Initial: WJG	Personnel Performing Decontamination: Print Name : Robert Lynch Initial: RL Print Name William Gibson Initial: WJG

Condition of Equipment

Pump: Good Tubing Bundle: Good Water Level Indicator: Good

List of Decontamination Materials

Distilled or **Deionized** (circle one) **Source: Culligan** **Lot Number: 07- 11 -11** **EB-1;CoC 613697 taken prior CWL-MW10 purge.**	**HNO_3** **Grade: Reagent** **UN #: 2031** **Manufacture: Fisher** **Lot Number: 002735**

Portable Pump and Tubing / Water Level Indicator
Decontamination Log Form

Project Name: CWL	Monitoring Well ID # CWL-MW10	Date: 08/01/11

The following equipment was decontaminated at completion of sampling activities in accordance with FOP-05-03

Pump and Tubing Bundle ID #: CWL Low Flow	Water Level Indicator ID#: 56161
Personnel Performing Decontamination: Print Name: Robert Lynch Initial: RL Print Name: Alfred Santillanes Initial: AS	Personnel Performing Decontamination: Print Name : Alfred Santillanes Initial: AS Print Name William Gibson Initial: WG

Condition of Equipment

Pump: Good Tubing Bundle: Good Water Level Indicator: Good

List of Decontamination Materials

Distilled or **Deionized** (circle one) **Source: Culligan** **Lot Number: 07- 11 -11**	**HNO_3** **Grade: Reagent** **UN #: 2031** **Manufacture: Fisher** **Lot Number: 002735**

Portable Pump and Tubing / Water Level Indicator
Decontamination Log Form

Project Name: CWL	Monitoring Well ID # CWL-MW11	Date: 08/02/11

The following equipment was decontaminated at completion of sampling activities in accordance with FOP-05-03

Pump and Tubing Bundle ID #: CWL Low Flow	Water Level Indicator ID#: 56161
Personnel Performing Decontamination: Print Name: William Gibson WJG Initial: Print Name: Robert Lynch RL Initial:	Personnel Performing Decontamination: Print Name : Robert Lynch RL Initial: Print Name William Gibson WJG Initial:

Condition of Equipment

Pump: Good Tubing Bundle: Good Water Level Indicator: Good

List of Decontamination Materials

Distilled or **Deionized** (circle one) **Source: Culligan** **Lot Number: 07- 11 -11**	**HNO_3** **Grade: Reagent** **UN #: 2031** **Manufacture: Fisher** **Lot Number: 002735**

FIELD MEASUREMENT LOG FOR GROUNDWATER SAMPLE COLLECTION

Project Name: CWL	Project No.:
Well I.D.: CWL-BW5	Date: 07/27/11
Well Condition: good	Weather Condition: 24.65" Hg
Method: Portable pump X	Dedicated pump ____ Pump depth: 521'

PURGE MEASUREMENTS

Depth to Water (ft)	Time 24 hr	Vol. (L gal)	Temp (°C)	SC (µS/cm)	ORP (mV)	pH	Turbidity (NTU)	DO (%)	Comments DO mg/L
509.12	0806	/	START						
510.85	0852	5	22.06	1212	395.6	6.56	0.98	86.9	7.56
511.17	0922	10	22.76	1214	396.9	6.59	0.64	82.3	7.07
511.24	0953	15	23.56	1217	399.7	6.59	0.65	87.4	7.39
511.22	1024	20	24.42	1221	396.2	6.59	0.66	87.2	7.27
511.24	1056	25	24.93	1220	395.4	6.59	0.48	87.3	7.20
511.24	1108	27	25.31	1220	395.6	6.59	0.38	87.6	7.17
511.22	1121	29	25.83	1222	396.5	6.59	0.45	87.4	7.09
511.22	1134	31	25.79	1222	397.6	6.58	0.47	87.2	7.08
511.28	1147	33	25.72	1221	397.0	6.58	0.35	88.6	7.20
	1148	/	SAMPLING						
									~1.65 gals purged from tubing 0822

FIELD MEASUREMENT LOG FOR GROUNDWATER SAMPLE COLLECTION

Project Name: CWL	Project No.:
Well I.D.: CWL-MW9	Date: 07/28/11
Well Condition: good	Weather Condition: 24.61" Hg
Method: Portable pump X	Dedicated pump ____ Pump depth: 516'

PURGE MEASUREMENTS

Depth to Water (ft)	Time 24 hr	Vol. (L gal)	Temp (°C)	SC (µS/cm)	ORP (mV)	pH	Turbidity (NTU)	DO (%)	Comments DO mg/L
501.65	0735		START						
504.11	0808	5	20.62	945	391.7	6.83	6.70	30.6	2.74
504.87	0831	10	21.11	1001	148.5	6.75	0.90	17.3	1.53
505.29	0854	15	21.76	1038	-12.6	6.69	0.74	11.6	1.01
505.50	0917	20	22.01	1050	-27.4	6.68	0.66	11.0	0.96
505.57	0940	25	22.29	1060	-30.8	6.67	0.42	12.1	1.05
505.58	1003	30	22.88	1067	-29.6	6.67	0.60	14.3	1.23
505.59	1013	32	23.19	1071	-29.6	6.67	0.56	15.1	1.29
505.60	1022	34	23.20	1072	-27.3	6.67	0.62	15.4	1.30
505.61	1033	36	23.43	1072	-26.3	6.67	0.65	16.0	1.35
505.60	1039	~~37~~ 37	23.23	1072	-26.3	6.67	0.59	16.1	1.37
	1040		SAMPLING						
									≈ 1.65 gal purged prior to measurement.
									0744

FIELD MEASUREMENT LOG FOR GROUNDWATER SAMPLE COLLECTION

Project Name: CWL	Project No.:
Well I.D.: CWL-MW10	Date: 07/29/11 8/1/11
Well Condition: good	Weather Condition: 24.81" Hg
Method: Portable pump X	Dedicated pump ____ Pump depth: 515'

PURGE MEASUREMENTS

Depth to Water (ft)	Time 24 hr	Vol. (L gal)	Temp (°C)	SC (µS/cm)	ORP (mV)	pH	Turbidity (NTU)	DO (%)	Comments DO mg/L
498.44	0740	/	START						
502.70	0831	5	21.90	973	396.8	6.76	2.54	27.8	2.43
506.36	0916	10	22.43	974	364.9	6.78	2.15	25.1	2.17
509.70	1004	15	24.12	982	242.9	6.78	2.30	23.1	1.93
512.93	1059	20	25.46	986	24.1	6.78	2.14	19.8	1.61
514.35	1140	22	25.75	999	-12.9	6.81	3.26	23.9	1.78
514.85	1149	23	25.87	1001	-5.3	6.82	2.81	24.2	1.86
515.32	1152	well	DRY						
498.57	0827	/	START						
500.76	0858	1	22.90	990	386.2	6.70	4.18	46.6	3.99
	0859	/	sampling						
									~1.65 gals purged from tubing
									0754
									0847

FIELD MEASUREMENT LOG FOR GROUNDWATER SAMPLE COLLECTION

Project Name: CWL	Project No.:
Well I.D.: CWL-MW11	Date: 08/02/11
Well Condition: good	Weather Condition: 29.67" Hg
Method: Portable pump X	Dedicated pump ____ Pump depth: 513'

PURGE MEASUREMENTS

Depth to Water (ft)	Time 24 hr	Vol. (L/gal)	Temp (°C)	SC (µS/cm)	ORP (mV)	pH	Turbidity (NTU)	DO (%)	Comments DO mg/L
498.10	0736	/	START						
501.21	0820	5	22.75	1127	406.3	6.67	2.11	60.2	5.17
503.62	0853	10	23.28	1126	407.5	6.66	1.72	59.3	5.05
505.58	0925	15	23.87	1126	404.6	6.65	1.22	58.0	4.88
507.21	0958	20	24.23	1095	367.9	6.66	1.06	44.9	3.76
506.86	1104	25	28.42	1114	372.5	6.66	0.99	45.8	3.54
506.80	1208	30	27.58	1116	388.2	6.70	0.96	50.6	3.97
506.40	1241	32	29.04	1111	390.2	6.74	0.85	62.2	4.77
506.05	1259	33	28.48	1119	390.3	6.73	0.80	63.7	4.84
505.98	1314	34	28.73	1121	392.4	6.71	0.85	63.6	4.89
505.98	1327	35	28.42	1123	393.1	6.70	0.72	63.6	4.93
505.95	1340	36	28.52	1121	392.9	6.71	0.76	64.7	4.99
	1341	/	Sampling						
									~1.65 gals purged from tubing
									0748

ANNEX B
CY 2011 Data Validation Reports and Contract Verification Review Forms

DATA VALIDATION REPORTS FOR ENVIRONMENTAL SAMPLES

AR/COC NUMBERS 613693 and 613695

ANALYTICAL QUALITY ASSOCIATES, INC.

616 Maxine NE
Albuquerque, NM 87123
505-299-5201
www.aqainc.net

Memorandum

Date: September 1, 2011

To: File

From: Kevin Lambert

Subject: GC/MS Organic Data Review and Validation – SNL
Site: CWL GWM
AR/COC: 613693 and 613695
SDG: 282894
Laboratory: GEL
Project/Task: 146422.10.11.01
Analysis: VOCs

See the attached Data Validation Worksheets for supporting documentation on the data review and validation. Data are evaluated using SNL/NM SMO AOP 00-03 Rev 2.

Summary

Four samples were prepared and analyzed with accepted procedures using method EPA 8260B (VOCs). All compounds were successfully analyzed. No problems were identified with the data package that result in the qualification of data.

Data are acceptable and reported QC measures appear to be adequate. The following sections discuss the data review and validation.

Holding Times

The samples were analyzed within the prescribed holding times and properly preserved.

Instrument Tune

All instrument tune requirements were met.

Calibration

The initial calibration and continuing calibration data met QC acceptance criteria.

Blanks

No target analytes were detected in the blanks.

Surrogates

All surrogate recoveries met QC acceptance criteria.

Internal Standards

All internal standards met QC acceptance criteria.

Matrix Spike/Matrix Spike Duplicate (MS/MSD)

The MS/MSD analyses met QC acceptance criteria.

Laboratory Control Sample (LCS)

All LCS recoveries met QC acceptance criteria.

Detection Limits/Dilutions

All detection limits were properly reported. The samples were not diluted.

Tentatively Identified Compounds (TICs)

TIC reports were not required.

Other QC

TBs were submitted on the AR/COC(s).

No other specific issues that affect data quality were identified.

Reviewed by: David Schwent **Date**: 09/05/11

ANALYTICAL QUALITY ASSOCIATES, INC.

616 Maxine NE
Albuquerque, NM 87123
505-299-5201
www.aqainc.net

Memorandum

Date: September 1, 2011

To: File

From: Kevin Lambert

Subject: Inorganic Data Review and Validation – SNL
Site: CWL GWM
AR/COC: 613693 and 613695
SDG: 282894
Laboratory: GEL
Project/Task: 146422.10.11.01
Analysis: Metals

See the attached Data Validation Worksheets for supporting documentation on the data review and validation. This validation was performed according to SNL/NM ER Project AOP 00-03 Rev 3.

Summary

Two samples were prepared and analyzed with approved procedures using methods EPA 6020 (ICP-MS metals). Data were reported for all required analytes. Problems were identified with the data package that result in the qualification of data.

1. ICP-MS metals:
   For samples 282894-002 and -005, the Ca concentrations were > the ICS A Ca concentration and the ICS A result for Ni was > the MDL. The associated sample results were detects <50X the ICS A results and will be **qualified "J+,CK2."**

Data are acceptable and reported QC measures appear to be adequate. The following sections discuss the data review and validation.

Holding Times and Preservation

The samples were analyzed within the prescribed holding times and properly preserved.

ICP-MS Instrument Tune

All instrument tune requirements were met.

Calibration

All initial and continuing calibration met QC acceptance criteria.

Reporting Limit Verification

All CRI recoveries met QC acceptance criteria.

Blanks

No target analytes were detected in the blanks.

ICP-MS Internal Standards

All internal standards met QC acceptance criteria.

Matrix Spike (MS)

All MS recoveries met QC acceptance criteria.

ICP-MS metals:
It should be noted that the MS analyses were performed on a SNL sample from another SDG. No sample data will be qualified as a result.

Laboratory Replicate

The replicate analyses met all QC acceptance criteria.

ICP-MS metals:
It should be noted that the replicate analyses were performed on a SNL sample from another SDG. No sample data will be qualified as a result.

Laboratory Control Sample (LCS)

All LCS recoveries met QC acceptance criteria.

Detection Limits/Dilutions

All detection limits were properly reported. No samples were diluted.

All associated batch QC samples were analyzed at dilution factors that resulted in relative dilution factors to the samples that were ≤5X. No sample data will be qualified as a result.

ICP Interference Check Sample (ICS A and AB)

All ICS A and AB met QC acceptance criteria except as noted above in the summary section and as follows.

ICP-MS metals:
For samples -002 and -005, the Ca concentrations were > the ICS A Ca concentration and the ICS A result for Cr was > the MDL. However, the associated sample results were NDs and will not be qualified.

ICP Serial Dilution

The serial dilution analyses met all QC acceptance criteria.

Other QC

No other specific issues that affect data quality were identified.

Reviewed by: David Schwent **Date**: 09/05/11

Sample Findings Summary

AR/COC: 613693, 613695

Analytical Method	Sample ID	Analyte Name (CAS#)	Qualifier, RC
SW846 3005/6020 DOE-AL			
	090964-013/CWL-BW5	Nickel (7440-02-0)	J+, CK2
	090968-013/CWL-MW9	Nickel (7440-02-0)	J+, CK2

All other analyses met QC acceptance criteria; no further data should be qualified.

Data Validation Summary Worksheet

AR/COC #: 613693, 613695 Site/Project: SNL CWL GWM Validation Date: 09.01.11

SDG #: 282894 Laboratory: GEL Validator: Kevin A Lambert

Matrix: aqueous # of Samples: 6 CVR present: yes Analysis Type: ☒ Organic ☒ Metals

AR/COC(s) present: yes Sample Container Integrity: OK ☐ Rad ☐ Gen Chem

Requested Analyses Not Reported

Sample Number	Laboratory ID	organic	genchem	metals	rad	Comments
All						
Reported						

Hold Time/Preservation Outliers

Sample Number	Laboratory ID	Analysis	Pres.	Coll. Date	Prep. Date	Anal. Date	Anal. within 2X HT	Anal. beyond 2X HT
Met								
Criteria								

Comments: SNL COCs 613694 & 613696 were included in this data package but per client instruction were not validated

Revised 7/2007

Validated By: Kevin A Lambert

Organic Worksheet (GC/MS)

AR/COC #: 613693, 613695 SDG #: 282894 Matrix: aqueous

Laboratory Sample IDs: 282894-001, -003, -004, -006

Method/Batch #s: EPA 8260B(VOC)/1128628 Tuning (pass/fail): Pass TICs Required? (yes/no) No

Analyte (outliers)	Calibration (ICV)				Method Blank	5X (10X) Blank	LCS %R	MS %R	MSD %R	MS/MSD RPD	TBs -003 -006			
	Int.	RF	RSD/ R^2	CCV %D										
Trichloroethylene	NA	✓	✓	✓	✓	NA	✓	✓	✓	✓	✓			

Surrogate Recovery Outliers

Sample ID						
Met Criteria						

IS Outliers

Sample ID	Area	RT	Area	RT	Area	RT	Area	RT	Area	RT	Area	RT
Met Criteria												

Comments: QC: 282893-001 (SNL 613694)
DL: 1X

Inorganic Metals Worksheet

AR/COC #: 613693, 613695 SDG #: 282894 Matrix: aqueous

Laboratory Sample IDs: 282894-002, -005

Method/Batch #s: EPA 6020 (ICP-MS) / 1132560

ICPMS Mass Cal (pass/fail) Pass ICPMS Resolution (pass/fail) Pass

Analyte (outliers)	Calibration						Method Blank	5X Blank or 5X MDL	LCS %R	MS %R	Lab Rep. RPD	Serial Dil. %D	ICS AB %R	ICS A ± MDL ug/L	CRA/ CRI %R				
	Int.	R^2	ICV	CCV	ICB	CCB													
CR	✓	✓	✓	✓	✓	✓	✓	NA	✓	✓	✓	✓	✓	2.17	✓				
Ni	✓	✓	✓	✓	✓	✓	✓	NA	✓	✓	✓	✓	✓	2.46	✓				

IS Outliers				IS Outliers			
Sample ID	%Recovery	%Recovery	%Recovery	CCV/CCB ID	%Recovery	%Recovery	%Recovery
	Met Criteria				Met Criteria		

Comments: DC: another SMC SDG
DL: 1X

CONTRACT LABORATORY
ANALYSIS REQUEST AND CHAIN OF CUSTODY

Internal Lab

Batch No. N/A

SMO Use

AR/COC 613693

Dept. No./Mail Stop:	4142/1126	Date Samples Shipped:	7/27/11	Project/Task No. 146422.10.11.01	☐ Waste Characterization
Project/Task Manager:	Don Schofield	Carrier/Waybill No.	1Z9274	SMO Authorization:	-Send preliminary/copy report to:
Project Name:	CWL GWM	Lab Contact:	Edie Kent/803-556-8171	Contract #: PO 691436	
Record Center Code:	ER/1267 074/DAT	Lab Destination:	GEL	5 BOTTLE OVER	☐ Released by COC No.:
Logbook Ref. No.:	ER 049	SMO Contact/Phone:	Lorraine Herrera/505-844-3199		☑ Validation Required
Service Order No.	CF 025-11	Send Report to SMO:			Bill To: Sandia National Labs (Accounts Payable)
Location	Tech Area				P.O. Box 5800 MS 0154
Building	Room				Albuquerque, NM 87185-0154 282894

Reference LOV(available at SMO)

Sample No.-Fraction	ER Sample ID or Sample Location Detail	Pump Depth (ft)	ER Site No.	Date/Time(hr) Collected	Sample Matrix	Container Type	Container Volume	Preserv-ative	Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID
090964-001	CWL-BW5	521	NA	07/27/11 1148	GW	G	3 x 40ml	HCL	G	SA	TCE (SW846-8260)	001 .1
090964-013	CWL-BW5	521	NA	07/27/11 1149	GW	P	500 ml	HNO3	G	SA	Chromium,Nickel (SW846-6020)	002 .2
090965-001	CWL-TB1	NA	NA	07/27/11 1148	DIW	G	3x40ml	HCL	G	TB	TCE (SW846-8260)	003 .1

RMMA ☐ Yes ☑ No Ref. No.

Sample Disposal ☐ Return to Client ☑ Disposal by lab

Turnaround Time ☐ 7 Day ☐ 15 Day ☑ 30 Day

Return Samples By: ☐ Negotiated TAT

Sample Tracking Smo Use
Date Entered(mm/dd/yy)
Entered by: QC Inits

Special Instructions/QC Requirements
EDD ☑ Yes ☐ No
Level D Package ☐ Yes ☑ No
***Send report to:**
Tim Jackson/Org 4142/MS 0729/505-284-2547

***Please list as separate report.**

Abnormal Conditions on Receipt

Lab Use

	Name	Signature	Init	Company/Organization/Phone/Cellular
Sample Team Members	Alfred Santillanes			Weston/4142/844-5130/228-0710
	Robert Lynch			Weston/4142/844-4013/250-7090
	William J Gibson			Weston/4142/844-4013/239-7367

1.Relinquished by		Org. 4142	Date 7/27/11	Time 1215	4.Relinquished by	Org.	Date	Time
1. Received by	SMO	Org. 4142	Date 7/27/11	Time 1215	4. Received by	Org.	Date	Time
2.Relinquished by	SMO	Org. 4142	Date 7/27/11	Time 1300	5.Relinquished by	Org.	Date	Time
2. Received by		Org. GEL	Date 7-28-11	Time 0750	5. Received by	Org.	Date	Time
3.Relinquished by		Org.	Date	Time	6.Relinquished by	Org.	Date	Time
3. Received by		Org.	Date	Time	6. Received by	Org.	Date	Time

CONTRACT LABORATORY
ANALYSIS REQUEST AND CHAIN OF CUSTODY

Internal Lab

Batch No. N/A

SMO Use

AR/COC 613695

Dept. No./Mail Stop:	4142/1126	Date Samples Shipped:	7/28/11	Project/Task No.	146422.10.11.01
Project/Task Manager:	Don Schofield	Carrier/Waybill No.	1 29 962	SMO Authorization:	E. Lee SMO
Project Name:	CWL GWM	Lab Contact:	Edie Kent/803-556-8171	Contract #:	PO 691436
Record Center Code:	ER/1267 074/DAT	Lab Destination:	GEL		
Logbook Ref. No.:	ER 049	SMO Contact/Phone:	Lorraine Herrera/505-844-3199		
Service Order No.	CF 025-11	Send Report to SMO:			
Location	Tech Area				
Building	Room				

SEE BOTTLE ORDER

☐ **Waste Characterization**
-Send preliminary/copy report to:

☐ **Released by COC No.:**
☑ **Validation Required**

Bill To: Sandia National Labs (Accounts Payable)
P.O. Box 5800 MS 0154
Albuquerque, NM 87185-0154
252894

Reference LOV(available at SMO)

Sample No.-Fraction	ER Sample ID or Sample Location Detail	Pump Depth (ft)	ER Site No.	Date/Time(hr) Collected	Sample Matrix	Container Type	Container Volume	Preserv-ative	Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID
090968-001	CWL-MW9	516	NA	072811\1040	GW	G	3 x 40ml	HCL	G	SA	TCE (SW846-8260)	004
090968-013	CWL-MW9	516	NA	072811\1041	GW	P	500 ml	HNO3	G	SA	Chromium,Nickel (SW846-6020)	005
090969-001	CWL-TB2	NA	NA	072811\1040	DIW	G	3x40ml	HCL	G	TB	TCE (SW846-8260)	006

RMMA ☐ Yes ☑ No Ref. No.

Sample Disposal ☐ Return to Client ☑ Disposal by lab

Turnaround Time ☐ 7 Day ☐ 15 Day ☑ 30 Day

Return Samples By: ☐ **Negotiated TAT**

Sample Tracking Smo Use
Date Entered(mm/dd/yy)
Entered by:
QC Inits:

Special Instructions/QC Requirements
EDD ☑ **Yes** ☐ **No**
Level D Package ☐ **Yes** ☑ **No**
***Send report to:**
Tim Jackson/Org 4142/MS 0729/505-284-2547

***Please list as separate report.**

Abnormal Conditions on Receipt

Lab Use

Sample Team Members

Name	Signature	Init	Company/Organization/Phone/Cellular
Alfred Santillanes		AS	Weston/4142/844-5130/228-0710
Robert Lynch		RBL	Weston/4142/844-4013/250-7090
William J Gibson		WJG	Weston/4142/844-4013/239-7367

1.Relinquished by		Org. 4142	Date 7/28/11	Time 1118	4.Relinquished by		Org.	Date	Time
1. Received by	SMO	Org. 4142	Date 7/28/11	Time 1118	4. Received by		Org.	Date	Time
2.Relinquished by	SMO	Org. 4142	Date 7/28/11	Time 1220	5.Relinquished by		Org.	Date	Time
2. Received by		Org. GEL	Date 7/29/11	Time 0720	5. Received by		Org.	Date	Time
3.Relinquished by		Org.	Date	Time	6.Relinquished by		Org.	Date	Time
3. Received by		Org.	Date	Time	6. Received by		Org.	Date	Time

AR/COC NUMBERS 613697, 613698, and 613700

ANALYTICAL QUALITY ASSOCIATES, INC.

616 Maxine NE
Albuquerque, NM 87123
505-299-5201
www.aqainc.net

Memorandum

Date: September 9, 2011

To: File

From: Kevin Lambert

Subject: GC/MS Organic Data Review and Validation – SNL
Site: CWL GWM
AR/COC: 613697, 613698, and 613700
SDG: 283141
Laboratory: GEL
Project/Task: 146422.10.11.01
Analysis: VOCs

See the attached Data Validation Worksheets for supporting documentation on the data review and validation. Data are evaluated using SNL/NM SMO AOP 00-03 Rev 3.

Summary

Eight samples were prepared and analyzed with accepted procedures using method EPA 8260B (VOCs). All compounds were successfully analyzed. No problems were identified with the data package that result in the qualification of data.

Data are acceptable and reported QC measures appear to be adequate. The following sections discuss the data review and validation.

Holding Times

The samples were analyzed within the prescribed holding times and properly preserved.

Instrument Tune

All instrument tune requirements were met.

Calibration

The initial calibration and continuing calibration data met QC acceptance criteria.

Blanks

No target analytes were detected in the blanks.

Surrogates

All surrogate recoveries met QC acceptance criteria.

Internal Standards

All internal standards met QC acceptance criteria.

Matrix Spike/Matrix Spike Duplicate (MS/MSD)

The MS/MSD analyses met QC acceptance criteria. It should be noted that the MS/MSD analysis was performed on a SNL sample from another SDG. No sample data will be qualified as a result.

Laboratory Control Sample (LCS)

All LCS recoveries met QC acceptance criteria.

Detection Limits/Dilutions

All detection limits were properly reported. The samples were not diluted.

Tentatively Identified Compounds (TICs)

TIC reports were not required.

Other QC

TBs, EB, FB, and a field duplicate pair were submitted on the AR/COC(s). There are no "required" review criteria for field duplicate analyses comparability; no data will be qualified as a result.

No other specific issues that affect data quality were identified.

Reviewed by: David Schwent **Date**: 09/09/11

ANALYTICAL QUALITY ASSOCIATES, INC.

616 Maxine NE
Albuquerque, NM 87123
505-299-5201
www.aqainc.net

Memorandum

Date: September 9, 2011

To: File

From: Kevin Lambert

Subject: Inorganic Data Review and Validation – SNL
Site: CWL GWM
AR/COC: 613697, 613698, and 613700
SDG: 283141
Laboratory: GEL
Project/Task: 146422.10.11.01
Analysis: Metals

See the attached Data Validation Worksheets for supporting documentation on the data review and validation. This validation was performed according to SNL/NM ER Project AOP 00-03 Rev 3.

Summary

Four samples were prepared and analyzed with approved procedures using methods EPA 6020 (ICP-MS metals). Data were reported for all required analytes. No problems were identified with the data package that result in the qualification of data.

Data are acceptable and reported QC measures appear to be adequate. The following sections discuss the data review and validation.

Holding Times and Preservation

The samples were analyzed within the prescribed holding times and properly preserved.

ICP-MS Instrument Tune

All instrument tune requirements were met.

Calibration

All initial and continuing calibration met QC acceptance criteria.

Reporting Limit Verification

All CRI recoveries met QC acceptance criteria.

Blanks

No target analytes were detected in the blanks.

ICP-MS Internal Standards

All internal standards met QC acceptance criteria.

Matrix Spike (MS)

All MS recoveries met QC acceptance criteria.

Laboratory Replicate

The replicate analyses met all QC acceptance criteria.

Laboratory Control Sample (LCS)

All LCS recoveries met QC acceptance criteria.

Detection Limits/Dilutions

All detection limits were properly reported. No samples were diluted.

All associated batch QC samples were analyzed at dilution factors that resulted in relative dilution factors to the samples that were ≤5X. No sample data will be qualified as a result.

ICP Interference Check Sample (ICS A and AB)

Results of the ICS A and AB analyses were not evaluated because the concentrations of Al, Ca, Fe, and Mg in the samples were < those in the ICS solutions. No sample data will be qualified as a result.

ICP Serial Dilution

The serial dilution analyses met all QC acceptance criteria.

Other QC

EBs and a field duplicate pair were submitted on the AR/COC(s). There are no "required" review criteria for field duplicate analyses comparability; no data will be qualified as a result.

No other specific issues that affect data quality were identified.

Reviewed by: David Schwent **Date**: 09/09/11

Sample Findings Summary

AR/COC: 613697, 613698, 613700

Analytical Method	Sample ID	Analyte Name (CAS#)	Qualifier, RC

All other analyses met QC acceptance criteria; no further data should be qualified.

Data Validation Summary Worksheet

AR/COC #: 613697, 613698, 613700 Site/Project: SNL CWL GWM Validation Date: 09.09.11

SDG #: 283141 Laboratory: GEL Validator: Kevin A. Lambert

Matrix: aqueous # of Samples: 12 CVR present: yes Analysis Type: X Organic X Metals

AR/COC(s) present: yes Sample Container Integrity: OK ☐ Rad ☐ Gen Chem

Requested Analyses Not Reported

Sample Number	Laboratory ID	organic	genchem	metals	rad	Comments
All						
Reported						

Hold Time/Preservation Outliers

Sample Number	Laboratory ID	Analysis	Pres.	Coll. Date	Prep. Date	Anal. Date	Anal. within 2X HT	Anal. beyond 2X HT
Met								
Criteria								

Comments:

Revised 7/2007

Validated By: Kevin A Lambert

Organic Worksheet (GC/MS)

AR/COC #: 613697, 613698, 613700 SDG #: 283141 Matrix: aqueous

Laboratory Sample IDs: 283141-001, -003, -004, -006, -008, -009, -011, -012

Method/Batch #s: EPA 8260B (VOC) / 1130925 Tuning (pass/fail): Pass TICs Required? (yes/no) No

Analyte (outliers)	Calibration Int.	Calibration RF	Calibration RSD/ R^2	Calibration ICV/CCV %D	Method Blank	5X (10X) Blank	LCS %R	MS %R	MSD %R	MS/MSD RPD	TBs -003 -008 -011	EB -001	FB -012	
Trichloroethylene	NA	✓	✓	✓	✓	NA	✓	✓	✓	✓	✓	✓	✓	

Surrogate Recovery Outliers

Sample ID						
Met Criteria						

IS Outliers

Sample ID	Area	RT	Area	RT	Area	RT	Area	RT	Area	RT	Area	RT
Met Criteria												

Comments: QC: another SNL SDG

DL: 1X

Inorganic Metals Worksheet

AR/COC #: 613697, 613698, 613700 SDG #: 283141 Matrix: aqueous

Laboratory Sample IDs: 283141-002, -005, -007, -010

Method/Batch #s: EPA 6020 (ICP-MS) / 1129181

ICPMS Mass Cal (pass/fail) Pass ICPMS Resolution (pass/fail) Pass

Analyte (outliers)	Calibration						Method Blank	5X Blank or 5X MDL	LCS %R	MS %R	Lab Rep. RPD	Serial Dil. %D	ICS AB %R	ICS A ± MDL	CRA/ CRI %R	EB 002			
	Int.	R^2	ICV	CCV	ICB	CCB													
Cr	✓	✓	✓	✓	✓	✓	✓	NA	✓	✓	✓	✓	NA	NA	✓	✓			
Ni	✓	✓	✓	✓	✓	✓	✓	NA	✓	✓	✓	✓	NA	NA	✓	✓			

IS Outliers				IS Outliers			
Sample ID	%Recovery	%Recovery	%Recovery	CCV/CCB ID	%Recovery	%Recovery	%Recovery
	Met criteria				Met criteria		

Comments: QC: -005
DL: 1X

CONTRACT LABORATORY
ANALYSIS REQUEST AND CHAIN OF CUSTODY

Internal Lab

Page 1 of 1

Batch No. N/A

SMO Use

AR/COC **613697**

Dept. No./Mail Stop:	4142/1126	Date Samples Shipped:	8/1/11	Project/Task No. 146422.10.11.01	☐ Waste Characterization -Send preliminary/copy report to:
Project/Task Manager:	Don Schofield	Carrier/Waybill No.	129479	SMO Authorization:	
Project Name:	CWL GWM	Lab Contact:	Edie Kent/803-556-8171	Contract #: PO 691436	☐ Released by COC No.:
Record Center Code:	ER/1267 074/DAT	Lab Destination:	GEL	SEE BOTTLE ORDER	☑ Validation Required
Logbook Ref. No.:	ER 049	SMO Contact/Phone:	Lorraine Herrera/505-844-3199		Bill To: Sandia National Labs (Accounts Payable) P.O. Box 5800 MS 0154 283141 Albuquerque, NM 87185-0154
Service Order No.	CF 025-11	Send Report to SMO:			
Location	Tech Area				
Building	Room				

Reference LOV(available at SMO)

Sample No.-Fraction	ER Sample ID or Sample Location Detail	Pump Depth (ft)	ER Site No.	Date/Time(hr) Collected	Sample Matrix	Container Type	Container Volume	Preserv-ative	Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID
090972-001	CWL-EB1	NA	NA	07/28/11 1340	DIW	G	3 x 40ml	HCL	G	EB	TCE (SW846-8260)	001
090972-013	CWL-EB1	NA	NA	07/28/11 1342	DIW	P	500 ml	HNO3	G	EB	Chromium,Nickel (SW846-6020)	002
090973-001	CWL-TB3	NA	NA	07/28/11 1340	DIW	G	3x40ml	HCL	G	TB	TCE (SW846-8260)	003

RMMA ☐ Yes ☑ No Ref. No.

Sample Disposal ☐ Return to Client ☑ Disposal by lab

Turnaround Time ☐ 7 Day ☐ 15 Day ☑ 30 Day

Return Samples By: ☐ Negotiated TAT QC inits.

Sample Tracking Smo Use

Date Entered(mm/dd/yy)

Entered by:

Special Instructions/QC Requirements

EDD ☑ Yes ☐ No

Level D Package ☐ Yes ☑ No

***Send report to:**

Tim Jackson/Org 4142/MS 0729/505-284-2547

***Please list as separate report.**

Abnormal Conditions on Receipt

Lab Use

	Name	Signature	Init	Company/Organization/Phone/Cellular
Sample Team Members	Alfred Santillanes			Weston/4142/844-5130/228-0710
	Robert Lynch			Weston/4142/844-4013/250-7090
	William J Gibson			Weston/4142/844-4013/239-7367

1.Relinquished by		Org. 4142	Date 8/1/11	Time 1000	4.Relinquished by		Org.	Date	Time
1. Received by		Org. 4142	Date 8/1/11	Time 1000	4. Received by		Org.	Date	Time
2.Relinquished by		Org. 4142	Date 8/1/11	Time 1730	5.Relinquished by		Org.	Date	Time
2. Received by		Org. CEL	Date 8-2-11	Time 0800	5. Received by		Org.	Date	Time
3.Relinquished by		Org.	Date	Time	6.Relinquished by		Org.	Date	Time
3. Received by		Org.	Date	Time	6. Received by		Org.	Date	Time

CONTRACT LABORATORY
ANALYSIS REQUEST AND CHAIN OF CUSTODY

Internal Lab

Page 1 of 1

Batch No. N/A

SMO Use/

AR/COC 613698

Dept. No./Mail Stop:	4142/1126	Date Samples Shipped:	8/1/11	Project/Task No. 146422.10.11.01	☐ Waste Characterization
Project/Task Manager:	Don Schofield	Carrier/Waybill No.	129779	SMO Authorization:	-Send preliminary/copy report to:
Project Name:	CWL GWM	Lab Contact:	Edie Kent/803-556-8171	Contract #: PO 691436	
Record Center Code:	ER/1267 074/DAT	Lab Destination:	GEL		☐ Released by COC No.:
Logbook Ref. No.:	ER 049	SMO Contact/Phone:	Lorraine Herrera/505-844-3199		☑ Validation Required
Service Order No.	CF 025-11	Send Report to SMO:			Bill To: Sandia National Labs (Accounts Payable)
Location	Tech Area				P.O. Box 5800 MS 0154
Building	Room				Albuquerque, NM 87185-0154

Reference LOV(available at SMO)

Sample No.-Fraction	ER Sample ID or Sample Location Detail	Pump Depth (ft)	ER Site No.	Date/Time(hr) Collected	Sample Matrix	Container Type	Container Volume	Preserv-ative	Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID
090974-001	CWL-MW10	515	NA	080111\0859	GW	G	3 x 40ml	HCL	G	SA	TCE (SW846-8260)	004 1.
090974-013	CWL-MW10	515	NA	080111\0905	GW	P	500 ml	HNO3	G	SA	Chromium,Nickel (SW846-6020)	005 2.
090975-001	CWL-MW10	515	NA	080111\0859	GW	G	3 x 40ml	HCL	G	DU	TCE (SW846-8260)	006 1
090975-013	CWL-MW10	515	NA	080111\0905	GW	P	500 ml	HNO3	G	DU	Chromium,Nickel (SW846-6020)	007 2.
090976-001	CWL-TB4	NA	NA	080111\0859	DIW	G	3x40ml	HCL	G	TB	TCE (SW846-8260)	008 1

RMMA	☐ Yes ☑ No Ref. No.	Sample Tracking	Smo Use
Sample Disposal	☐ Return to Client ☑ Disposal by lab	Date Entered(mm/dd/yy)	
Turnaround Time	☐ 7 Day ☐ 15 Day ☑ 30 Day	Entered by:	
Return Samples By:	☐ Negotiated TAT	QC Inits.	

Special Instructions/QC Requirements
EDD ☑ Yes ☐ No
Level D Package ☐ Yes ☑ No
*Send report to:
Tim Jackson/Org 4142/MS 0729/505-284-2547
*Please list as separate report.

Abnormal Conditions on Receipt

Lab Use

Sample Team Members	Name	Signature	Init	Company/Organization/Phone/Cellular
	Alfred Santillanes		AS	Weston/4142/844-5130/228-0710
	Robert Lynch		RL	Weston/4142/844-4013/250-7090
	William J Gibson		WJG	Weston/4142/844-4013/239-7367

1.Relinquished by		Org.	4142	Date	8/1/11	Time	1003	4.Relinquished by	Org. Date Time
1. Received by		Org.	4142	Date	8/1/11	Time	1003	4. Received by	Org. Date Time
2.Relinquished by		Org.	4142	Date	8/1/11	Time	1130	5.Relinquished by	Org. Date Time
2. Received by		Org.	CEL	Date	8-2-11	Time	0800	5. Received by	Org. Date Time
3.Relinquished by		Org.		Date		Time		6.Relinquished by	Org. Date Time
3. Received by		Org.		Date		Time		6. Received by	Org. Date Time

CONTRACT LABORATORY
ANALYSIS REQUEST AND CHAIN OF CUSTODY

Internal Lab

Batch No. N/A

SMO Use

AR/COC 613700

Dept. No./Mail Stop:	4142/1126	Date Samples Shipped:	8/3/11	Project/Task No. 146422.10.11.01	☐ Waste Characterization
Project/Task Manager:	Don Schofield	Carrier/Waybill No.	130222	SMO Authorization: SMO	-Send preliminary/copy report to:
Project Name:	CWL GWM	Lab Contact:	Edie Kent/803-556-8171	Contract #: PO 691436	
Record Center Code:	ER/1267 074/DAT	Lab Destination:	GEL		☐ Released by COC No.:
Logbook Ref. No.:	ER 049	SMO Contact/Phone:	Lorraine Herrera/505-844-3199	SEE BOTTLE ORDER	☑ Validation Required
Service Order No.	CF 025-11	Send Report to SMO:			Bill To: Sandia National Labs (Accounts Payable)
Location	Tech Area				P.O. Box 5800 MS 0154
Building	Room				Albuquerque, NM 87185-0154 283141

Reference LOV(available at SMO)

Sample No.-Fraction	ER Sample ID or Sample Location Detail	Pump Depth (ft)	ER Site No.	Date/Time(hr) Collected	Sample Matrix	Container Type	Container Volume	Preserv-ative	Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID
090979-001	CWL-MW11	513	NA	080211\1341	GW	G	3 x 40ml	HCL	G	SA	TCE (SW846-8260)	009 .1
090979-013	CWL-MW11	513	NA	080211\1342	GW	P	500 ml	HNO3	G	SA	Chromium,Nickel (SW846-6020)	010 .2
090980-001	CWL-TB5	NA	NA	080211\1341	DIW	G	3x40ml	HCL	G	TB	TCE (SW846-8260)	011 .1
090981-001	CWL-FB1	NA	NA	080211\1330	DIW	G	3x40ml	HCL	G	FB	TCE (SW846-8260)	012 .1

RMMA ☐ Yes ☑ No Ref. No.

Sample Disposal ☐ Return to Client ☑ Disposal by lab

Turnaround Time ☐ 7 Day ☐ 15 Day ☑ 30 Day

Return Samples By: ☐ Negotiated TAT

Sample Tracking Smo Use

Date Entered(mm/dd/yy):

Entered by:

QC Inits

Special Instructions/QC Requirements

EDD ☑ Yes ☐ No

Level D Package ☐ Yes ☑ No

***Send report to:**

Tim Jackson/Org 4142/MS 0729/505-284-2547

Last well for CWL project for 4th Quarter.

***Please list as separate report.**

Abnormal Conditions on Receipt

Lab Use

Sample Team Members	Name	Signature	Init	Company/Organization/Phone/Cellular
	Alfred Santillanes			Weston/4142/844-5130/228-0710
	Robert Lynch			Weston/4142/844-4013/250-7090
	William J Gibson			Weston/4142/844-4013/239-7367

1.Relinquished by		Org. 4142	Date 8/3/11	Time 1115	4.Relinquished by	Org.	Date	Time
1. Received by	SMO	Org. 4142	Date 8/3/11	Time 1115	4. Received by	Org.	Date	Time
2.Relinquished by	SMO	Org. 4142	Date 8/3/11	Time 1225	5.Relinquished by	Org.	Date	Time
2. Received by		Org. CEC	Date 8-4-11	Time 0730	5. Received by	Org.	Date	Time
3.Relinquished by		Org.	Date	Time	6.Relinquished by	Org.	Date	Time
3. Received by		Org.	Date	Time	6. Received by	Org.	Date	Time

CONTRACT VERIFICATION REVIEW FORMS

Note: The review forms in this section include AR/COC numbers for environmental samples and additional AR/COC numbers for waste characterization samples.

AR/COC Number	Sample Type
613693	Environmental*
613694	Waste
613695	Environmental*
613696	Waste
613697	Environmental*
613698	Environmental*
613699	Waste
613700	Environmental*
613701	Waste

* These AR/COC forms are provided in the Data Validation Section of Annex B.

Contract Verification Review (CVR)

Project Leader: Schofield | Project Name: CWL GWM | Case No.: 146422_10.11.01

AR/COC No.: 613693, 613694, 613695, 613696 | Analytical Lab: GEL | SDG No.: 282893

In the tables below, mark any information that is missing or incorrect and give an explanation.

1.0 Analysis Request and Chain of Custody Record and Log-In Information

Line No.	Item	Complete?		If no, explain	Resolved?	
		Yes	No		Yes	No
1.1	All items on COC complete - data entry clerk initialed and dated	X				
1.2	Container type(s) correct for analyses requested	X				
1.3	Sample volume adequate for # and types of analyses requested	X				
1.4	Preservative correct for analyses requested	X				
1.5	Custody records continuous and complete	X				
1.6	Lab sample number(s) provided and SNL sample number(s) cross referenced and correct	X				
1.7	Date samples received	X				
1.8	Condition upon receipt information provided	X				

2.0 Analytical Laboratory Report

Line No.	Item	Complete?		If no, explain	Resolved?	
		Yes	No		Yes	No
2.1	Data reviewed, signature	X				
2.2	Method reference number(s) complete and correct	X				
2.3	QC analysis and acceptance limits provided (MB, LCS, Replicate)	X				
2.4	Matrix spike/matrix spike duplicate data provided (if requested)	X				
2.5	Detection limits provided; PQL and MDL (or IDL), MDA and L_c	X				
2.6	QC batch numbers provided	X				
2.7	Dilution factors provided and all dilution levels reported	X				
2.8	Data reported in appropriate units and using correct significant figures	X				
2.9	Radiochemistry analysis uncertainty (2 sigma error) and tracer recovery (if applicable) reported	N/A				
2.10	Narrative provided	X				
2.11	TAT met	X				
2.12	Hold times met	X				
2.13	Contractual qualifiers provided	X				
2.14	All requested result and TIC (if requested) data provided	X				

Contract Verification Review (Continued)

3.0 Data Quality Evaluation

Item	Yes	No	If no, Sample ID No./Fraction(s) and Analysis
3.1 Are reporting units appropriate for the matrix and meet contract specified or project-specific requirements? Inorganics and metals reported as ppm (mg/liter or mg/Kg)? Tritium reported in picocuries per liter with percent moisture for soil samples? Units consistent between QC samples and sample data	X		
3.2 Quantitation limit met for all samples	X		
3.3 Accuracy a) Laboratory control samples accuracy reported and met for all samples	X		
b) Surrogate data reported and met for all organic samples analyzed by a gas chromatography technique	X		
c) Matrix spike recovery data reported and met	X		
3.4 Precision a) Replicate sample precision reported and met for all inorganic and radiochemistry samples	X		
b) Matrix spike duplicate RPD data reported and met for all organic samples	X		
3.5 Blank data a) Method or reagent blank data reported and met for all samples		X	Aluminum detected in Metals Method Blank
b) Sampling blank (e.g., field, trip, and equipment) data reported and met	X		
3.6 Contractual qualifiers provided: "J"- estimated quantity; "B"-analyte found in method blank above the MDL for organic or above the PQL for inorganic; "U"- analyte undetected (results are below the MDL, IDL, or MDA (radiochemical)); "H"-analysis done beyond the holding time	X		
3.7 Narrative addresses planchet flaming for gross alpha/beta	N/A		
3.8 Narrative included, correct, and complete	X		
3.9 Second column confirmation data provided for methods 8330 (high explosives) and 8082 (pesticides/PCBs)	N/A		

Contract Verification Review (Continued)

4.0 Calibration and Validation Documentation

Item	Yes	No	Comments
4.1 GC/MS (8260, 8270, etc.)			
a) 12-hour tune check provided	X		
b) Initial calibration provided	X		
c) Continuing calibration provided	X		
d) Internal standard performance data provided	X		
e) Instrument run logs provided	X		
4.2 GC/HPLC (8330 and 8010 and 8082)			
a) Initial calibration provided	N/A		
b) Continuing calibration provided	N/A		
c) Instrument run logs provided	N/A		
4.3 Inorganics (metals)			
a) Initial calibration provided	X		
b) Continuing calibration provided	X		
c) ICP interference check sample data provided	X		
d) ICP serial dilution provided	X		
e) Instrument run logs provided	X		
4.4 Radiochemistry			
a) Instrument run logs provided	N/A		

Contract Verification Review (Concluded)

5.0 Problem Resolution

Summarize the findings in the table below. List only samples/fractions for which deficiencies have been noted.

Sample/Fraction No.	Analysis	Problems/Comments/Resolutions

Were deficiencies unresolved? Yes (No)

Based on the review, this data package is complete. (Yes) No

If no, provide: nonconformance report or correction request number _____ and date correction request was submitted_____

Reviewed by:_____ Date: 08/30/2011 Closed by:_____ Date:_____

Contract Verification Review (CVR)

Project Leader Schofield Project Name CWL GWM Case No. 146422_10.11.01

AR/COC No. 613697, 613698, 613700 Analytical Lab GEL SDG No. 283141

In the tables below, mark any information that is missing or incorrect and give an explanation.

1.0 Analysis Request and Chain of Custody Record and Log-In Information

Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
1.1	All items on COC complete - data entry clerk initialed and dated	X				
1.2	Container type(s) correct for analyses requested	X				
1.3	Sample volume adequate for # and types of analyses requested	X				
1.4	Preservative correct for analyses requested	X				
1.5	Custody records continuous and complete	X				
1.6	Lab sample number(s) provided and SNL sample number(s) cross referenced and correct	X				
1.7	Date samples received	X				
1.8	Condition upon receipt information provided	X				

2.0 Analytical Laboratory Report

Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
2.1	Data reviewed, signature	X				
2.2	Method reference number(s) complete and correct	X				
2.3	QC analysis and acceptance limits provided (MB, LCS, Replicate)	X				
2.4	Matrix spike/matrix spike duplicate data provided (if requested)	X				
2.5	Detection limits provided; PQL and MDL (or IDL), MDA and L_c	X				
2.6	QC batch numbers provided	X				
2.7	Dilution factors provided and all dilution levels reported	X				
2.8	Data reported in appropriate units and using correct significant figures	X				
2.9	Radiochemistry analysis uncertainty (2 sigma error) and tracer recovery (if applicable) reported	N/A				
2.10	Narrative provided	X				
2.11	TAT met	X				
2.12	Hold times met	X				
2.13	Contractual qualifiers provided	X				
2.14	All requested result and TIC (if requested) data provided	X				

Contract Verification Review (Continued)

3.0 Data Quality Evaluation

Item	Yes	No	If no, Sample ID No./Fraction(s) and Analysis
3.1 Are reporting units appropriate for the matrix and meet contract specified or project-specific requirements? Inorganics and metals reported as ppm (mg/liter or mg/Kg)? Tritium reported in picocuries per liter with percent moisture for soil samples? Units consistent between QC samples and sample data	X		
3.2 Quantitation limit met for all samples	X		
3.3 Accuracy a) Laboratory control samples accuracy reported and met for all samples	X		
b) Surrogate data reported and met for all organic samples analyzed by a gas chromatography technique	X		
c) Matrix spike recovery data reported and met	X		
3.4 Precision a) Replicate sample precision reported and met for all inorganic and radiochemistry samples	X		
b) Matrix spike duplicate RPD data reported and met for all organic samples	X		
3.5 Blank data a) Method or reagent blank data reported and met for all samples	X		
b) Sampling blank (e.g., field, trip, and equipment) data reported and met	X		
3.6 Contractual qualifiers provided: "J"- estimated quantity; "B"-analyte found in method blank above the MDL for organic or above the PQL for inorganic; "U"- analyte undetected (results are below the MDL, IDL, or MDA (radiochemical)); "H"-analysis done beyond the holding time	X		
3.7 Narrative addresses planchet flaming for gross alpha/beta	N/A		
3.8 Narrative included, correct, and complete	X		
3.9 Second column confirmation data provided for methods 8330 (high explosives) and 8082 (pesticides/PCBs)	N/A		

Contract Verification Review (Continued)

4.0 Calibration and Validation Documentation

Item	Yes	No	Comments
4.1 GC/MS (8260, 8270, etc.)			
a) 12-hour tune check provided	X		
b) Initial calibration provided	X		
c) Continuing calibration provided	X		
d) Internal standard performance data provided	X		
e) Instrument run logs provided	X		
4.2 GC/HPLC (8330 and 8010 and 8082)			
a) Initial calibration provided	N/A		
b) Continuing calibration provided	N/A		
c) Instrument run logs provided	N/A		
4.3 Inorganics (metals)			
a) Initial calibration provided	X		
b) Continuing calibration provided	X		
c) ICP interference check sample data provided	X		
d) ICP serial dilution provided	X		
e) Instrument run logs provided	X		
4.4 Radiochemistry			
a) Instrument run logs provided	N/A		

Contract Verification Review (Concluded)

5.0 Problem Resolution

Summarize the findings in the table below. List only samples/fractions for which deficiencies have been noted.

Sample/Fraction No.	Analysis	Problems/Comments/Resolutions

Were deficiencies unresolved? Yes (No)

Based on the review, this data package is complete. (Yes) No

If no, provide: nonconformance report or correction request number _____ and date correction request was submitted _____

Reviewed by: _____ Date: 09/09/2011 Closed by: _____ Date: _____

Contract Verification Review (CVR)

Project Leader Schofield | Project Name CWL GWM | Case No. 146422_10.11.01

AR/COC No. 613699, 613701 | Analytical Lab GEL | SDG No. 283145

In the tables below, mark any information that is missing or incorrect and give an explanation.

1.0 Analysis Request and Chain of Custody Record and Log-In Information

Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
1.1	All items on COC complete - data entry clerk initialed and dated	X				
1.2	Container type(s) correct for analyses requested	X				
1.3	Sample volume adequate for # and types of analyses requested	X				
1.4	Preservative correct for analyses requested	X				
1.5	Custody records continuous and complete	X				
1.6	Lab sample number(s) provided and SNL sample number(s) cross referenced and correct	X				
1.7	Date samples received	X				
1.8	Condition upon receipt information provided	X				

2.0 Analytical Laboratory Report

Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
2.1	Data reviewed, signature	X				
2.2	Method reference number(s) complete and correct	X				
2.3	QC analysis and acceptance limits provided (MB, LCS, Replicate)	X				
2.4	Matrix spike/matrix spike duplicate data provided (if requested)	X				
2.5	Detection limits provided; PQL and MDL (or IDL), MDA and L_c	X				
2.6	QC batch numbers provided	X				
2.7	Dilution factors provided and all dilution levels reported	X				
2.8	Data reported in appropriate units and using correct significant figures	X				
2.9	Radiochemistry analysis uncertainty (2 sigma error) and tracer recovery (if applicable) reported	N/A				
2.10	Narrative provided	X				
2.11	TAT met	X				
2.12	Hold times met	X				
2.13	Contractual qualifiers provided	X				
2.14	All requested result and TIC (if requested) data provided	X				

Contract Verification Review (Continued)

3.0 Data Quality Evaluation

Item	Yes	No	If no, Sample ID No./Fraction(s) and Analysis
3.1 Are reporting units appropriate for the matrix and meet contract specified or project-specific requirements? Inorganics and metals reported as ppm (mg/liter or mg/Kg)? Tritium reported in picocuries per liter with percent moisture for soil samples? Units consistent between QC samples and sample data	X		
3.2 Quantitation limit met for all samples	X		
3.3 Accuracy a) Laboratory control samples accuracy reported and met for all samples	X		
b) Surrogate data reported and met for all organic samples analyzed by a gas chromatography technique	X		
c) Matrix spike recovery data reported and met		X	VOC MS recovery failed for Acetone
3.4 Precision a) Replicate sample precision reported and met for all inorganic and radiochemistry samples	X		
b) Matrix spike duplicate RPD data reported and met for all organic samples	X		
3.5 Blank data a) Method or reagent blank data reported and met for all samples		X	Zinc detected in Metals Method Blank
b) Sampling blank (e.g., field, trip, and equipment) data reported and met	X		
3.6 Contractual qualifiers provided: "J"- estimated quantity; "B"-analyte found in method blank above the MDL for organic or above the PQL for inorganic; "U"- analyte undetected (results are below the MDL, IDL, or MDA (radiochemical)); "H"-analysis done beyond the holding time	X		
3.7 Narrative addresses planchet flaming for gross alpha/beta	N/A		
3.8 Narrative included, correct, and complete	X		
3.9 Second column confirmation data provided for methods 8330 (high explosives) and 8082 (pesticides/PCBs)	N/A		

Contract Verification Review (Continued)

4.0 Calibration and Validation Documentation

Item	Yes	No	Comments
4.1 GC/MS (8260, 8270, etc.)			
a) 12-hour tune check provided	X		
b) Initial calibration provided	X		
c) Continuing calibration provided	X		
d) Internal standard performance data provided	X		
e) Instrument run logs provided	X		
4.2 GC/HPLC (8330 and 8010 and 8082)			
a) Initial calibration provided	N/A		
b) Continuing calibration provided	N/A		
c) Instrument run logs provided	N/A		
4.3 Inorganics (metals)			
a) Initial calibration provided	X		
b) Continuing calibration provided	X		
c) ICP interference check sample data provided	X		
d) ICP serial dilution provided	X		
e) Instrument run logs provided	X		
4.4 Radiochemistry			
a) Instrument run logs provided	N/A		

ARCOC : 613699, 613701

Contract Verification Review (Concluded)

5.0 Problem Resolution

Summarize the findings in the table below. List only samples/fractions for which deficiencies have been noted.

Sample/Fraction No.	Analysis	Problems/Comments/Resolutions

Were deficiencies unresolved? Yes (No)

Based on the review, this data package is complete. (Yes) No

If no, provide: nonconformance report or correction request number _____ and date correction request was submitted _____

Reviewed by: _____ Date: 09/08/2011 Closed by: _____ Date: _____

ANNEX C
CY 2011 Post-Closure Inspection Forms/Checklists

Note: Inspection forms/checklists are found in Chemical Waste Landfill Post-Closure Care Permit, Attachment 4.

Chemical Waste Landfill
Post-Closure Inspection Form
Inspection Checklist

1. Date of Inspection 7-27-11
2. Time of Inspection 0735
3. Name of Inspector Robert Lynch

Mandatory requirement:

The inspector has read the CWL Post-Closure Care Permit and activity-related procedures in the last 12 months, and completed all required training: (*Inspector must initial box before proceeding with the inspection.)* RL

Date read 7-15-11

Provide explanatory notes for each parameter not inspected or each action required. Include any remedial steps required.

I. COVER SYSTEM [Quarterly]

Inspection Parameters	*Parameter Inspected (Yes or No)*	*Action Required (Yes or No)*	*Note Number*
A. Visible settlement of the soil cover in excess of 6 inches.	NO	NO	1
B. Erosion of the soil cover in excess of 6 inches deep.	NO	NO	1
C. Evidence of water ponding.	NO	NO	1
D. Animal intrusion burrows in excess of 4 inches in diameter. Note: For first 3 to 5 years this inspection requirement may be covered on the Cover Biology Checklist.	NO	NO	1
E. Contiguous areas of no vegetation greater than 200 ft^2. Note: For first 3 to 5 years this inspection requirement may be covered on the Cover Biology Checklist.	NO	NO	1

II. SURFACE-WATER (STORM-WATER) DIVERSION STRUCTURES [Quarterly]

Inspection Parameters	*Parameter Inspected (Yes or No)*	*Action Required (Yes or No)*	*Note Number*
A. Channel or sidewall erosion in excess of 6 inches deep.	NO	NO	1
B. Channel sediment accumulation in excess of 6 inches deep.	NO	NO	1
C. Debris that blocks more than 1/3 of the channel width.	NO	NO	1

Chemical Waste Landfill
Inspection Checklist (Continued)

III. SECURITY FENCE [Quarterly]			
Inspection Parameters	***Parameter Inspected (Yes or No)***	***Action Required (Yes or No)***	***Note Number***
A. Accumulation of wind-blown plants and debris.	NO	NO	1
B. Fence wires and posts in need of repair/maintenance.	NO	NO	1
C. Gates in need of oiling/repair/maintenance.	NO	NO	1
D. Locks in need of cleaning or replacement.	NO	NO	1
E. Warning signs in need of repair or replacement.	NO	NO	1
F. Survey monuments in vicinity of CWL visible.	NO	NO	1

IV. SOIL-GAS AND GROUNDWATER MONITORING WELLS [Semi-Annually]			
Inspection Parameter	***Parameter Inspected (Yes or No)***	***Action Required (Yes or No)***	***Note Number***
A. Concrete pads, bollards, and protective casings in need of repair/maintenance.	Yes	NO	
B. Well cover caps and Swagelok® dust caps in need of repair/maintenance.	Yes	NO	
C. Passive venting Baroballs™, soil-gas sampling ports, pumps and tubing in need of repair/maintenance.	Yes	NO	
C. Monitoring wells and soil-gas sample port locations properly labeled.	Yes	NO	
D. Locks in need of cleaning or replacement.	Yes	NO	
V. PREVIOUS DEFICIENCIES [Quarterly]			
Inspection Parameter	***Parameter Inspected (Yes or No)***	***Action Required (Yes or No)***	***Note Number***
A. Uncorrected/undocumented previous deficiencies.	NA	NA	

Chemical Waste Landfill
Inspection Checklist (Continued)

NOTES

Note Number	Description
1	This inspection pertained only to groundwater monitoring well and sampling equipment. Inspection of the cover system, surface-water diversion structures, and security fence are performed by other inspectors and are documented on another set of "post-closure inspection Form Inseption checklist"

Chemical Waste Landfill
Inspection Checklist (Continued)

Action (Note Number) _____ assigned to _____ Date action completed _____

Action (Note Number) _____ assigned to _____ Date action completed _____

Action (Note Number) _____ assigned to _____ Date action completed _____

Action (Note Number) _____ assigned to _____ Date action completed _____

Action (Note Number) _____ assigned to _____ Date action completed _____

Additional Comments:

Inspector's Signature _____

Original to: Chemical Waste Landfill Operating Record

Copy to: Environmental Safety and Health (ES&H) and Security Records Center, MS-1309

Chemical Waste Landfill
Post-Closure Inspection Form
Biology Inspection Checklist for the CWL Cover

Mandatory requirement:

The inspector has read the CWL Post-Closure Care Permit and activity-related procedures in the last 12 months, and completed all required training: *(Inspector must initial box before proceeding with the inspection.)*

Date read July 15, 2011

Approximate vegetative coverage (actively photosynthesizing): 28 %

Approximate percent native vegetation of the total vegetative cover: 90 %

Listed below are the main plant species identified growing on the CWL cover and the approximate percent cover for each species.

Scientific Name	Common Name (optional)	%Total cover photosynthesizing
Bouteloua gracilis	Blue grama	24%
Aristida purpurea	Purple three-awn	trace
Atriplex canescens	Four-wing salt	1%
Salsola tragus	Russian thistle	trace
Kochia scoparia	Burningbush	2%
Sporobolus flexuosus	Mesa dropseed	trace
Pleuraphis jamesii	Galleta	trace
Gutierrezia sarothrae	Snakeweed	trace

Chemical Waste Landfill
Biology Inspection Checklist for the CWL Cover (Continued)

Are there any contiguous areas of no vegetation greater than 200 square feet? (Approximately 14 x14 ft.): No

If "Yes," mark such areas on a map and attach to this checklist, and improve such area(s) with native vegetation via soil augmentation, scarification, and/or reseeding.

Are there any very deeply rooted (roots greater than 8 feet deep at maturity) plant species present on the cover? Yes

If "Yes," mark such areas on a map and attach to this checklist, and remove plant(s) from the cover.

Notes: Atriplex canescens (ATCA) is a native shrub that can develop a deep taproot at maturity. There are approximately fifty small ATCA shrubs distributed evenly across the cover. The young shrubs currently have shallow root systems. The location of each shrub is not indicated on the map due to the high number shrubs and their shallow root systems at present. All ATCA individuals will be clipped between January 1 – February 28, 2012. Mortality of ATCA is best achieved by clipping during the winter.

Limited driving of full-size trucks occurred on the cover during the August 2011 weed removal event. The vehicle tracks are evident by reduced vigor of the plants that were driven over. No driving should be allowed on the cover until the longer term impact of the 2011 driving can be assessed during the 2012 growing season.

Inspection for animal burrow intrusion into CWL cover

Are any burrows present on the cover? Yes

Does any burrow(s) appear to be active? Yes

Does any active burrow(s) appear to be that of a species that is able to burrow 6 feet deep or greater? No

If any of the active burrows appear to be that of a species that is able to burrow 6 feet or greater, mark such burrow(s) on a map and attach at the end of this checklist, and take appropriate actions as necessary to prevent damage to the cover.

Notes: No mammal burrows were observed on the cover. Only ant burrows were observed on the cover.

Biological Aspects Map – [note: sketch map to locate specific features will be attached]

Survey Biologist Name: Jennifer Payne Date: Sept. 22, 2011

Note: No map required based on survey results. JP

Original to: Chemical Waste Landfill Operating Record

Chemical Waste Landfill
Post-Closure Inspection Form
Inspection Checklist

1. Date of Inspection 9/22/11
2. Time of Inspection 11:05 am
3. Name of Inspector Robert Zick

Mandatory requirement:

The inspector has read the CWL Post-Closure Care Permit and activity-related procedures in the last 12 months, and completed all required training: (*Inspector must initial box before proceeding with the inspection.*) RZ

Date read 7/25/11

Provide explanatory notes for each parameter not inspected or each action required. Include any remedial steps required.

I. COVER SYSTEM [Quarterly]			
Inspection Parameters	***Parameter Inspected (Yes or No)***	***Action Required (Yes or No)***	***Note Number***
A. Visible settlement of the soil cover in excess of 6 inches.	yes	no	
B. Erosion of the soil cover in excess of 6 inches deep.	yes	no	
C. Evidence of water ponding.	yes	no	
D. Animal intrusion burrows in excess of 4 inches in diameter. Note: For first 3 to 5 years this inspection requirement may be covered on the Cover Biology Checklist.	yes	no	1
E. Contiguous areas of no vegetation greater than 200 ft^2. Note: For first 3 to 5 years this inspection requirement may be covered on the Cover Biology Checklist.	yes	no	1
II. SURFACE-WATER (STORM-WATER) DIVERSION STRUCTURES [Quarterly]			
Inspection Parameters	***Parameter Inspected (Yes or No)***	***Action Required (Yes or No)***	***Note Number***
A. Channel or sidewall erosion in excess of 6 inches deep.	yes	no	
B. Channel sediment accumulation in excess of 6 inches deep.	yes	no	
C. Debris that blocks more than 1/3 of the channel width.	yes	no	

Chemical Waste Landfill
Inspection Checklist (Continued)

III. SECURITY FENCE [Quarterly]			
Inspection Parameters	***Parameter Inspected (Yes or No)***	***Action Required (Yes or No)***	***Note Number***
A. Accumulation of wind-blown plants and debris.	yes	no	
B. Fence wires and posts in need of repair/maintenance.	yes	no	
C. Gates in need of oiling/repair/maintenance.	yes	no	2
D. Locks in need of cleaning or replacement.	yes	no	2
E. Warning signs in need of repair or replacement.	yes	no	
F. Survey monuments in vicinity of CWL visible.	yes	yes	3

IV. SOIL-GAS AND GROUNDWATER MONITORING WELLS [Semi-Annually]			
Inspection Parameter	***Parameter Inspected (Yes or No)***	***Action Required (Yes or No)***	***Note Number***
A. Concrete pads, bollards, and protective casings in need of repair/maintenance.	yes	no	4
B. Well cover caps and Swagelok® dust caps in need of repair/maintenance.	yes	no	
C. Passive venting Baroballs™, soil-gas sampling ports, pumps and tubing in need of repair/maintenance.	yes	no	
C. Monitoring wells and soil-gas sample port locations properly labeled.	yes	no	5
D. Locks in need of cleaning or replacement.	yes	no	2

V. PREVIOUS DEFICIENCIES [Quarterly]			
Inspection Parameter	***Parameter Inspected (Yes or No)***	***Action Required (Yes or No)***	***Note Number***
A. Uncorrected/undocumented previous deficiencies.			

Chemical Waste Landfill
Inspection Checklist (Continued)

NOTES

Note Number	Description
1.	See "Cover Biology Checklist".
2.	All locks and gates are in good condition. They will be lubricated as preventive maintenance.
3.	Clear debris and vegetation (as necessary) from the 4 survey monuments.
4.	Paint of casing and bollards for all wells was in good condition but some fading was beginning to occur. As preventive maintenance, all locations (UI-1, UI-2, D-1, D-2, D-3, BWS) will be repainted.
5.	Aluminum tags will be replaced with more robust brass tags for preventive maintenance.

Chemical Waste Landfill
Inspection Checklist (Continued)

Action (Note Number) 2 assigned to Don Waterpaugh Date action completed 10/6/11

Action (Note Number) 3 assigned to Don Waterpaugh Date action completed 10/6/11

Action (Note Number) 4 assigned to Don Waterpaugh Date action completed 10/11/11

Action (Note Number) 5 assigned to Don Waterpaugh Date action completed 10/17/11

Action (Note Number) _____ assigned to _____ Date action completed _____

Additional Comments:

A follow-up inspection of the groundwater and soil gas monitoring wells was performed during the 9/22/11 inspection. Preventive maintenance was performed as documented in Notes 2, 4, and 5.

Inspector's Signature _____

Original to: Chemical Waste Landfill Operating Record

Copy to: Environmental Safety and Health (ES&H) and Security Records Center, MS-1309

Chemical Waste Landfill
Post-Closure Inspection Form
Inspection Checklist

1. Date of Inspection 11/23/11
2. Time of Inspection 0915
3. Name of Inspector Robert Zick

Mandatory requirement:

The inspector has read the CWL Post-Closure Care Permit and activity-related procedures in the last 12 months, and completed all required training: (*Inspector must initial box before proceeding with the inspection.*) RZ

Date read 7/25/11

Provide explanatory notes for each parameter not inspected or each action required. Include any remedial steps required.

I. COVER SYSTEM [Quarterly]			
Inspection Parameters	***Parameter Inspected (Yes or No)***	***Action Required (Yes or No)***	***Note Number***
A. Visible settlement of the soil cover in excess of 6 inches.	yes	No	
B. Erosion of the soil cover in excess of 6 inches deep.	yes	No	
C. Evidence of water ponding.	yes	No	
D. Animal intrusion burrows in excess of 4 inches in diameter. Note: For first 3 to 5 years this inspection requirement may be covered on the Cover Biology Checklist.	yes	No	
E. Contiguous areas of no vegetation greater than 200 ft^2. Note: For first 3 to 5 years this inspection requirement may be covered on the Cover Biology Checklist.	yes	No	
II. SURFACE-WATER (STORM-WATER) DIVERSION STRUCTURES [Quarterly]			
Inspection Parameters	***Parameter Inspected (Yes or No)***	***Action Required (Yes or No)***	***Note Number***
A. Channel or sidewall erosion in excess of 6 inches deep.	yes	NO	
B. Channel sediment accumulation in excess of 6 inches deep.	yes	NO	
C. Debris that blocks more than 1/3 of the channel width.	yes	NO	

Chemical Waste Landfill
Inspection Checklist (Continued)

III. SECURITY FENCE [Quarterly]			
Inspection Parameters	***Parameter Inspected (Yes or No)***	***Action Required (Yes or No)***	***Note Number***
A. Accumulation of wind-blown plants and debris.	yes	NO	
B. Fence wires and posts in need of repair/maintenance.	yes	NO	
C. Gates in need of oiling/repair/maintenance.	yes	NO	
D. Locks in need of cleaning or replacement.	yes	NO	
E. Warning signs in need of repair or replacement.	yes	NO	
F. Survey monuments in vicinity of CWL visible.	yes	NO	

IV. SOIL-GAS AND GROUNDWATER MONITORING WELLS [Semi-Annually]			
Inspection Parameter	***Parameter Inspected (Yes or No)***	***Action Required (Yes or No)***	***Note Number***
A. Concrete pads, bollards, and protective casings in need of repair/maintenance.	NO	NO	1
B. Well cover caps and Swagelok® dust caps in need of repair/maintenance.	No	NO	1
C. Passive venting Baroballs™, soil-gas sampling ports, pumps and tubing in need of repair/maintenance.	NO	NO	1
C. Monitoring wells and soil-gas sample port locations properly labeled.	NO	NO	1
D. Locks in need of cleaning or replacement.	NO	NO	1
V. PREVIOUS DEFICIENCIES [Quarterly]			
Inspection Parameter	***Parameter Inspected (Yes or No)***	***Action Required (Yes or No)***	***Note Number***
A. Uncorrected/undocumented previous deficiencies.	N/A	No	

Chemical Waste Landfill
Inspection Checklist (Continued)

NOTES

Note Number	Description
1	Inspection of soil-gas and monitoring wells is performed by other inspectors.

Chemical Waste Landfill
Inspection Checklist (Continued)

Action (Note Number) _____ assigned to _____ Date action completed_____

Action (Note Number) _____ assigned to _____ Date action completed_____

Action (Note Number) _____ assigned to _____ Date action completed_____

Action (Note Number) _____ assigned to _____ Date action completed_____

Action (Note Number) _____ assigned to _____ Date action completed_____

Additional Comments:

Inspector's Signature _____

Original to: Chemical Waste Landfill Operating Record

Copy to: Environmental Safety and Health (ES&H) and Security Records Center, MS-1309

ANNEX D
CY 2011 Chemical Waste Landfill Biology Report

2011 Sandia National Laboratories
Chemical Waste Landfill Biology Report

Submitted by:
Jennifer Payne
Staff Biologist
Environmental Programs Department
Sandia National Laboratories
Albuquerque, New Mexico

2011 Chemical Waste Landfill Biology Report

The first Chemical Waste Landfill (CWL) Post-Closure Biology Inspection of the evapotranspirative cover (ET Cover) vegetation was conducted on September 22, 2011. The inspection observations are documented in the "Chemical Waste Landfill Post-Closure Inspection Form Biology Inspection Checklist for the CWL Cover."

Achieving a sustainable plant community on the ET Cover is an important component of overall ET Cover performance. Vegetation minimizes erosion by stabilizing the ET Cover surface. The plants also move soil moisture from the ET Cover Topsoil and Native Soil Layers to the atmosphere through transpiration. Plant species that are native to the area create the optimal, self-sustaining plant community because the species are specifically adapted to the local climate and soil conditions. The CWL is located at an approximate elevation of 5300 feet in a semi-arid climate that experiences high temperatures throughout the summer, cold temperatures in the winter, and frequent drought conditions. Perennial native grass species provide the best ET Cover performance due to their extensive near-surface root systems that are poised to uptake moisture throughout the year and prevent precipitation from percolating deeper into the subsurface soil.

This summary report represents the compiled results of quarterly vegetation inspection and monitoring activities performed by the staff biologist for Calendar Year (CY) 2011, as required by the CWL Post-Closure Care Permit (PCCP), Attachment 1, Section 1.9.1.1. The purpose of this report is to provide relevant background information, describe local climate trends over the 2011 growing season, expand on the inspection results, and provide recommendations for future ET Cover vegetation inspection, monitoring, and maintenance.

Background Information

The initial CWL ET Cover seeding effort, completed in September 2005 after cover construction, was not successful. In 2009 the staff biologist determined that the CWL ET Cover vegetation would not meet the criteria for successful revegetation in the timeframe specified in the PCCP (i.e., within 5 years of the Permit becoming effective). The CWL was reseeded during the 2009 growing season. The 2009 effort involved the removal of weedy plant species by hand, drill seeding a native seed blend into the soil, installing a gravel mulch layer over the seeded area, and then applying supplemental water via a temporary irrigation system throughout seedling development (late August through October). The native seed blend included four native grass species and a native shrub, four-wing saltbush (*Atriplex canescens*). The inclusion of the four-wing saltbush was a mistake, as mature plants can develop a deep tap root. Based upon the current conditions of the CWL (all waste areas excavated and backfilled), deeply rooted plants do not pose a threat relative to mobilizing contaminants, but they will be controlled as a best management practice in accordance with the PCCP.

The CWL has shown consistent, robust native plant growth across the ET Cover since the reseeding effort was completed in August 2009. The 2009 reseeding and supplemental watering effort was approved by NMED (Bearzi July 2009), documented in the CWL Final

RCRA Closure Report (SNL/NM September 2010), and is responsible for the CWL ET Cover meeting the successful revegetation criteria during the September 2011 inspection.

The only CWL ET Cover maintenance activity that occurred in 2011 was one weed-removal event conducted from August 18 through 23. Removal of the four-wing saltbush (Atriplex canescens) was the primary focus of this maintenance event, although other undesirable annual weedy species were also removed. Weed removal was conducted in late August when the plants were well established (i.e., they were large enough to identify and remove), but before the seeds became dry and easily dislodged from the plants. All weedy species and the four-wing saltbush plants were pulled by hand or removed using a pitchfork, at the direction of the staff biologist. A best faith effort was made to remove both the surface plant and the root system. Two trailer loads of weeds and four-wing saltbush plants (approximately 30 cubic yards of compressed vegetation) were removed from the ET Cover and surrounding vicinity. The weedy species removed included Russian thistle (also known as tumbleweed when it dries out after the growing season) and lesser quantities of kochia.

Local Climate Trends for CY 2011 Growing Season

Precipitation was well below normal with temperatures averaged above normal. Weather extremes in February included a record low of -7°F, and for more than three days the hourly temperatures were below 32°F. March was very dry and windy with temperatures averaging more than 5°F above normal. The first six months of 2011 were the driest since formal record keeping began over 100 years ago.

The second half of 2011 started with a weak monsoon weather pattern yielding half the normal rainfall in July. Average precipitation in August and September was followed by above-normal rainfall in October. October through December had temperatures closer to the historical mean for the season.

Considered separately, the temperature extremes, the severe lack of rain, and the drying winds that occurred during the first half of 2011 are significant plant stressors. When these stressors occur simultaneously or in series, as they did in early 2011, they can be detrimental to plant life. The condition of the ET Cover at the end of the growing season clearly demonstrates the ability of the established ET Cover native plant community to survive severe climatic events.

September 2011 Inspection Results

The initial CWL ET Cover Biology Inspection was timed to occur near the end of the New Mexico growing season (i.e., September) in order to most accurately determine the coverage of living plants. At this time the cumulative effects of the previous winter and the recent growing season can be assessed for the CY by determining the relative abundance and health of ET Cover vegetation.

The September 2011 CWL ET Cover Biology Inspection determined the ET Cover meets the operational criteria for successful revegetation as defined in the CWL PCCP(Attachment 1, Section 1.9) and presented below. Inspection results are summarized after each criterion.

- Total percent foliar coverage equals 20 percent (i.e., 20 percent of the land surface is covered with living plants versus 80 percent bare surface area)

Inspection Results: The approximate vegetative coverage (this is the actively photosynthesizing foliar coverage) was determined to be 28%.

- Of the 20 percent total foliar coverage, 50 percent or greater comprises native perennial species, and 50 percent or less comprises annual species; and

Inspection Results: The vegetative coverage was composed of approximately 90% native perennial species and 10% annual species.

- No contiguous bare spots greater than 200 square feet (approximately 14 by 14 feet) are present.

Inspection Results: No contiguous bare vegetation areas greater than 200 square feet were present.

Percent foliar coverage is determined by the overall percentage of green vegetation on the ET Cover because photosynthesis clearly indicates living plants (i.e., green vegetation). The percentage of the ET Cover surface with actively photosynthesizing plants gives a true measure of the current health of the CWL plant community. Non-green organic litter from previous seasons of plant growth only indicates previous growth and is not useful in determining current ET Cover health. The above-ground portions of native perennial grasses dry out and turn brown after each growing season. For this reason, biology inspections need to take place during the growing season when the plants are green. It is not possible to determine which perennial plants are living and which are dead during the winter. Very few annual plants (i.e., weedy, invasive species) are alive during the winter months. However, the roots of living perennial plants (i.e., native grasses) are alive throughout the winter, providing soil stabilization and precipitation uptake as they expand their root system during the dormant season.

Foliar coverage of each species across the site is determined by dividing the cover into smaller sections of approximately 35 meters by 35 meters. Each section is walked thoroughly and the percent cover of each species is determined based upon visual inspection, then averaged overall for the entire cover. Coverage for species that are present in very low numbers are recorded as “trace” when the percent cover is less than one-half of one-percent. Species that are present between one-half and one percent are recorded as “1%.”

Animal burrows were not observed on the CWL during the September 2011 inspection. This may be due to the gravel mulch acting as a small animal deterrent. More effort is required for animals to dig through gravel than to build burrows by digging directly into soil. No barren areas were identified (i.e., contiguous areas 200 square feet or greater that

do not have any live vegetation). Due to the lack of animal burrows, barren areas, or other features that would typically be shown on a CWL sketch map attached to the Biology Inspection Form, no map was included for the September 2011 inspection.

Figure 1, provided at the end of this report, includes photographs of the ET Cover vegetation taken during the September 2011 inspection. The relatively dense growth of perennial native grasses is evident in these photographs. As summarized above and documented on the September 2011 Biology Inspection Form, the three criteria for successful revegetation were met during the September 2011 inspection, indicating the native plant community is successfully re-established. There were no other vegetation repairs or issues identified.

Recommendations

Due to the achievement of successful revegetation criteria documented during the September 2011 inspection, CWL Biology Inspections will be reduced to an annual frequency. Future annual Biology Inspections will be conducted in August or September using the same approach as the 2011 inspection.

Management of four-wing saltbush and undesirable annual weedy plant species (i.e., Russian thistle and kochia) will continue to occur as directed by the staff biologist. The removal of weeds and shrubs is conducted as a voluntary, best management practice and will continue to be performed at the time of year that allows the most effective results. These activities are not subject to the PCCP 60 day repair time limit (Attachment 1, Section 1.9.1).

- Because four-wing saltbush mortality is best achieved by clipping the shrubs during the winter months, remaining shrubs will be clipped between January 1 and February 28, 2012. This will prevent the development of mature shrubs with potentially deep taproots.

- Removal of undesirable annual weedy plant species (i.e., Russian thistle and kochia) from the ET Cover will be conducted as directed by the staff biologist to support the growth of the desired perennial native grass species and to promote the overall health of the ET Cover vegetation.

Both the annual Biology Inspections and the quarterly Final Cover System inspections will address documentation requirements for contiguous barren areas and animal burrows according to the PCCP, Attachment 1, Section 1.9.1.2. The annual Biology Inspections and associated reports will also address and document any maintenance or repair work that needs to be completed according to Permit requirements or as best management practices.

References

Bearzi, J.P. (New Mexico Environment Department), July 2009. Letter to K. Davis (U.S. Department of Energy) and F. Nimick (Sandia Corporation), "Approval: Chemical Waste Landfill Evapotranspirative Cover Plan, June 2009, Sandia National Laboratories NM5890110518, HWB-SNL-09-010." July 31, 2009.

Sandia National Laboratories/New Mexico (SNL/NM), September 2010. "Chemical Waste Landfill Final Resource Conservation and Recovery Act Closure Report," Sandia National Laboratories, Albuquerque, New Mexico.

Southwest portion of the cover

Northwest portion of the cover

Southeast portion of the cover

Northeast portion of the cover

Figure 1 September 22, 2011 CWL ET Cover Photos