DEPARTMENT OF ENERGY
Environmental Management Los Alamos Field Office (EM-LA)
Los Alamos, New Mexico 87544

CERTIFIED MAIL-RETURN RECIEPT REQUESTED

Mr. John Kieling
Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6313

MAR 20 2017

Dear Mr. Kieling:

Subject: Submittal of the Long Term Monitoring Plan for Los Alamos County Airport Landfill Replacement, Solid Waste Management Units 73-001(a) Technical Area 73

Enclosed, please find two hard copies in addition to the electronic version of the Long Term Monitoring Plan for the Los Alamos County Airport Landfill Replacement, Solid Waste Management Units 73-100(a) Technical Area 73.

If you have any questions, please contact Ramoncita N. Massey at (505) 665-7771.

Sincerely,

Arturo Duran
Permitting and Compliance Manager
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Los Alamos Field Office

CC w/enclosures: **
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Official Contract File, EM-LA

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March 2017

LONG-TERM MONITORING PLAN

LOS ALAMOS COUNTY AIRPORT LANDFILL COVER REPLACEMENT
SOLID WASTE MANAGEMENT UNITS 73-001(a, d)
TECHNICAL AREA 73

prepared for:
Department of Energy
Environmental Management Los Alamos Field Office (EM-LA)
Los Alamos Field Office
Los Alamos, NM 87544

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Revision 0

EXECUTIVE SUMMARY

This Long-Term Monitoring Plan (LTMP) addresses performance monitoring for the U.S. Department of Energy (DOE) Los Alamos County Airport Landfill closure. This LTMP identifies monitoring requirements for the landfill. A tentative inspection and reporting schedule is also identified. In late 2006 and early 2007, a landfill cover system composed of asphalt and concrete hangar pads allowing for expansion of the airport hangar facilities was installed at the airport landfill in compliance with an approved New Mexico Environment (NMED) Work Plan (Work Plan 2004) for remediation of this landfill. The final remedy design and completion activities for the landfill and the debris disposal area (DDA) were provided in the Remedy Completion Report (2007). Subsequent inspections of the landfill beginning in 2009 through 2012 identified significant problems with the newly installed asphalt cover system including differential settlement greater than 2-ft, surface cracking, ponding, poor surface drainage, and significant infiltration of water into the underlying waste through cracking in the asphalt cover. Methane measurements at the landfill in 2011 reached 100% of the lower explosive limit (LEL).

The deteriorating cover system was evaluated (Dwyer 2012) where it was decided the site had degraded to the point where it required replacement. In 2015, a new Work Plan (2015) was submitted to the New Mexico Environment Department (NMED) in July 2015 and 'Approval with Modifications' was received on August 14, 2015 (Appendix J). The remedy included removal of the prior placed asphaltic cover and concrete hangar pads, relocation of waste from the far western portion to the remaining footprint within the landfill, placement of a new concrete hangar pad over the western portion where the waste was relocated from, and closure of the landfill with a cover system referred to as an Evapotranspiration (ET) Cover.

The installed ET Cover is a 3.5-foot thick soil profile. The bottom foot is composed of a compacted clay amended soil with a reduced saturated hydraulic conductivity. The middle 18 inches is a compacted sandy loam soil. The top layer is an admixture referred to as a 'desert pavement' composed of a mixture of gravel (25% by volume) and soil (75% by volume).

The remedy began on October 7, 2015 and was successfully installed and completed in accordance with the approved Work Plan (Work Plan 2015, NMED Approval Letter 2015) by July 1, 2016. A Remedy Completion Report (2016) was submitted to NMED, which was approved with modifications by NMED on December 22, 2016 (NMED Approval Letter 2016). The Remedy Completion Report replacement pages were submitted by DOE to NMED on February 9, 2017 (Remedy Completion Report replacement pages 2017).

TABLE OF CONTENTS

FIGURES

TABLES

1.0 BACKGROUND

The Los Alamos County (LAC) Airport Landfill operated from 1943 to 1973 for the disposal of solid waste consisting of household trash from the Los Alamos town site and office trash from Los Alamos Scientific Laboratory. From 1984 to 1986, wastes were excavated from the western portion of the LAC airport landfill and placed in the debris disposal area (DDA), located east of the landfill (Figure 1).

The land inclusive of the landfill was transferred by the DOE to LAC in 2002 (Conveyance Agreement, 2002; Deed 2008). However, maintenance of the landfill remains the responsibility of the DOE.

In late 2006 and early 2007, a landfill cover system composed of asphalt and concrete hangar pads, allowing for expansion of the airport hangar facilities was installed at the airport landfill in compliance with an approved New Mexico Environment (NMED) Work Plan (Work Plan 2004) for remediation of this landfill. The final remedy design and completion activities for the landfill and the debris disposal area (DDA) were provided in the Remedy Completion Report (2007). Subsequent inspections of the landfill beginning in 2009 through 2012 identified significant problems with the newly installed asphalt cover system, including differential settlement greater than 2-ft, surface cracking, ponding, poor surface drainage, and significant infiltration of water into the underlying waste through cracking in the asphalt cover. Methane measurements at the landfill in 2011 reached 100% of the lower explosive limit (LEL).

The site was evaluated in 2012 (Dwyer 2012), after which it was decided the site had degraded to the point where it required replacement. In 2015, a new Work Plan (2015) was submitted to the New Mexico Environment Department (NMED) in July 2015 that received 'Approval with Modifications' on August 14, 2015. The remedy included removal of the prior placed asphaltic cover and concrete hangar pads, relocation of waste from the far western portion to the remaining footprint within the landfill, placement of a new concrete hangar pad over the western portion where the waste was relocated from, and closure of the landfill with a cover system referred to as an ET Cover.

The remedy began on October 7, 2015 and was successfully installed and completed in accordance with the approved Work Plan (Work Plan 2015, NMED Approval Letter 2016) by July 1, 2016 a Remedy Completion Report (2016) was submitted to NMED on October 19, 2016, and was approved with modifications by NMED on December 22, 2016 (NMED Approval Letter 2016). The Remedy Completion Report with replacement pages were submitted by DOE to NMED on February 9, 2017 (Remedy Completion Report Replacement Pages 2017).

2.0 PURPOSE

The Los Alamos County Airport Landfill Cover Replacement Project site elements will be inspected as described below, during the long-term monitoring period.

The landfill cover and erosion and sedimentation control measures will be inspected initially for a total of five years; quarterly during the initial two year (or eight quarters) monitoring period to assess the general condition of the closure system to identify any maintenance or repair issues. Water balance and methane monitoring of the cover system will be included in the quarterly

inspections. In addition to the quarterly inspections, if the site experiences a precipitation event that exceeds 1 inch in any given hour (the 100-year, 1-hour design storm event is 2.17in/hr.); the site will be inspected. An inspection report shall be prepared by the engineer within two weeks of the inspection. An annual Long-Term Monitoring Report shall be prepared and submitted to NMED by February 14 of the following year. The annual report shall include all inspection reports and all monitoring performed to date, along with any maintenance and/or repairs performed (if any) and an executive summary describing the covers performance for the year. At the end of the five year monitoring period, NMED will evaluate the need for additional monitoring, and may reduce the monitoring and reporting frequency.

Should the levels of methane recorded during the initial two year monitoring period be below 25% of the lower explosive limit (LEL), the reported inspections shall be reduced to semi-annual for the next two years. Finally, should the methane levels for these next two years be below 25% of the LEL, the fifth-year reporting inspection for methane will become an annual inspection. The purpose of the inspections is to identify any areas of the site that may require repair to restore the intended functionality of the cover. This document outlines the site elements to be inspected, the inspection schedule, reporting requirements, and repair and notification procedures in the event that a repair is required.

Methane monitoring will be performed at four locations (Figure 2). The two monitoring locations within the boundary of the landfill and in areas where previous methane levels were consistently high. The monitoring location west of the landfill and north of the new concrete hangar pad is located to monitor any methane produced from the remaining waste in that area. The monitoring location west of the landfill and south of the new concrete hangar pad is located to monitor any potential migration of methane from the landfill toward the west; provide evidence of the effectiveness of the vertical liner placed along the west boundary of the landfill; as well as monitor the potential for any methane from the area where waste was removed and relocated within the footprint of the existing landfill.

Water balance monitoring shall be continuous with data downloaded from the data loggers and reported in inspection reports on the agreed upon schedule. There are two water balance monitoring locations. Refer to figure 2 for the methane and water balance monitoring locations.

Water balance monitoring and cover inspections shall be performed on a quarterly basis for the entire five year monitoring period. The results of this data benefit the design of other ET covers at LANL. The NMED shall be provided the results on a quarterly basis for the first two years and then reporting periods consistent with the methane monitoring schedule as described above. The moisture measurements are scheduled to be discontinued after the completion of the five year monitoring period.

Table 1. Monitoring Elements/Frequency for Cover System

Monitoring Periods	Inspections	Reporting	Changes in Frequency
0-2-Years (for a total of 8 Quarters of monitoring)	Quarterly Water Balance Quarterly Methane Quarterly Visual Post-High Intensity Storm	Annually to NMED-HWB by February 14	If methane is detected above 25% LEL** during the years 0-2, NMED will be notified and the monitoring schedule may be modified.
3-4-Years (for a total of 8 Quarters of monitoring	Quarterly Water Balance Semi-annually Methane Quarterly Visual Post High-Intensity Storm*	Annually to NMED-HWB by February 14	If methane is detected above 25% LEL** during years 3-4, NMED will be notified and the monitoring schedule may be modified.
5 Years (for a total of 4 Quarters of Monitoring)	Quarterly Water Balance Annually Methane Quarterly Visual Post High Intensity Storm	Annually to NMED-HWB by February 14	If methane is detected above 25% LEL**during year 5, NMED will be notified and the monitoring schedule may be modified.
>5 Years	The overall performance of the Remedy will be evaluated and a new monitoring schedule may be proposed to NMED for approval.	The overall performance of the Remedy will be evaluated and a new reporting schedule may be proposed to NMED for approval.	If methane is detected above 25% LEL**, NMED will be notified and additional monitoring may be required.

*Post High Intensity Storm is defined as a storm event greater than 1 inch per hour
**LEL or the Lower Explosive Limit

Inspections of the individual site elements are discussed in Section 3. Reporting requirements are outlined in Section 4. A proposed inspection checklist is provided in Attachment 1. This inspection list may be modified as the inspections progress, based on findings and comments during this process.

3.0 REQUIREMENTS

The Airport Landfill project consisted of the design and construction of a replacement cover for the asphaltic cover previously installed in 2007. The new cover system is a vegetated soil cover referred to as an Evapotranspiration (ET) Cover (Dwyer Engineering 2015c).

Details of the landfill design can be located in the construction drawings (Dwyer Engineering 2015a), specifications (Dwyer Engineering 2015b), and calculations (Dwyer Engineering 2015c) included in the Remedy Completion Report.

Specifically, these requirements are summarized in Table 2.

Table 2. Monitoring Requirements

Requirement	Method of Compliance
LTMP	LTMP.
Maintain cover integrity	Inspection and maintenance of cover system in accordance with this LTMP.
Reporting	Annual monitoring report per the LTMP.
Prevent run-on and run-off from eroding or otherwise damaging the final cover	Inspection and maintenance of surface water controls per the LTMP

4.0 SITE ELEMENTS MONITORED

This LTMP covers the following elements of the Closure at the Airport Landfill:

- Evapotranspiration (ET) Cover System
- Storm water control system
- Fencing
- Retaining walls
- Erosion and Sedimentation Control Measures
- Site access
- Debris Disposal Area (DDA) Cover System (starting in 2017)

All inspections performed along with obtained methane and water balance data shall be included in the inspection reports to be compiled and included in an annual report submitted to NMED. The inspections will be performed by a registered professional engineer in the State of New Mexico with no less than ten years of expertise in alternative cover systems. Inspection records and documentation of corrective actions will be retained in the project file and provided with the annual report along with an executive summary detailing the cover's performance.

4.1 ET Cover

The general integrity of the ET Cover system shall be inspected. The top slope and side slopes of the landfill shall be examined for potential degradation of the cover system, such as erosion (as evidenced by rilling or gullying), quality and quantity of vegetation establishment, areas of subsidence, biointrusion, cracking, slope instability, and wet areas. The overall integrity of the cover on the top slope and side slopes system shall be inspected and observations shall be recorded with digital photos in an inspection report that includes the check list contained in Attachment 1. Any maintenance or repair issues identified in an inspection shall be repaired as soon as weather permits. Any repairs requiring additional fill shall use fill from an approved borrow source, meeting requirements set forth for cover soil in the Technical Specifications, Section 02200 'Earthwork'.

Vegetation is a key aspect of the ET Cover. Vegetation will be inspected for success based on type of vegetation, percent bare area and size of native vegetation seeded during the cover installation. These values will be recorded by the Inspection Engineer in each inspection report. Furthermore, the vegetation will be monitored for continued robustness to ensure there are no unintended stresses on it such as stress due to landfill gas. Digital photos will be taken during each inspection and included in the quarterly report to monitor the maturation and success of the vegetation. Should problems with vegetation be identified by the Engineer, the problem will be noted along with a recommended repair or further evaluation recommendations.

4.1.1 Water Balance Monitoring

Water balance monitoring of the ET Cover shall be performed on a quarterly basis. The monitoring equipment shall be installed within three months after the completion of the cover construction. This monitoring will include the monitoring of water content and soil suction within the cover profile. There shall be two locations within the cover system to be monitored (Figure 2). The two locations are to be used to provide duplication in case of instrumentation or software errors. Each location has five water content probes and five soil suction probes

installed within the profile to measure the respective parameters on a continual basis (Figure 1). Each set of probes are connected to on-site data loggers that will compile the data to be downloaded by the Inspection Engineer on a quarterly basis. The summary and analysis of the data shall be submitted with each quarterly inspection report.

The water content probes will allow for examination of infiltrated water, the depth that it reaches, and the rate it moved. The soil suction probes will measure the matric potential in the soil and also relate it to wetting fronts. The probes will also allow for comparison to the soil's field capacity. The combination of the probes will allow for an in-situ determination of the moisture characteristic curve for the cover profile that can in turn be multisided to calculate flux.

Monitoring Equipment at each location (2 locations) includes:

- 5 each – 5TM water content probes by Decagon Devices Inc.
- 5 each – MPS-2 water potential probes by Decagon Devices, Inc.
- 2 each – EM50 data loggers by Decagon Devices Inc.

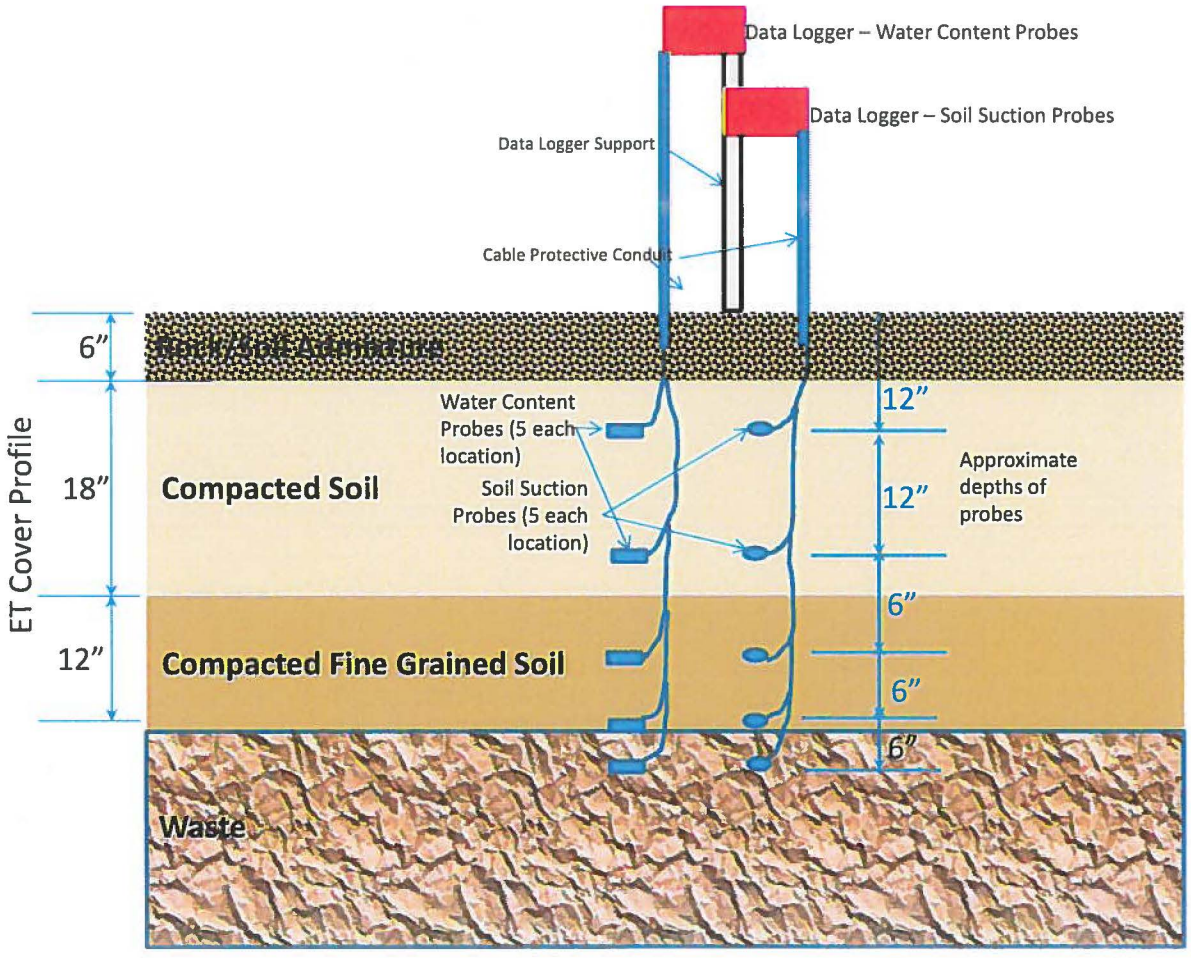

Figure 1. Water Balance Monitoring Typical Equipment

4.1.2 Methane Monitoring

Methane monitoring shall be performed at four locations (Figures 2 and 3). The monitoring equipment shall be installed within three months after the completion of the cover construction. The monitoring shall include the installation of the four passive vent locations. Each location shall include a vertical riser installed into the underlying waste that rises above ground level where measurements can be made (Figure 3). The methane will be measured at the exit point of each methane riser on the established periodic basis to quantify methane release from the landfill. The values will be compared to the lower explosive limit (LEL).

If combustible gas levels exceed 25% of the LEL in any enclosed structure or riser adjunct to the hangar pad, or 100% of the LEL at the risers on the landfill, the owner or operator shall:

- Immediately take all necessary steps to ensure protection of public health, welfare and the environment and notify the NMED;
- Within seven days of detection, record the methane gas levels detected and a description of the steps taken to protect public health, welfare and the environment and report them to NMED.

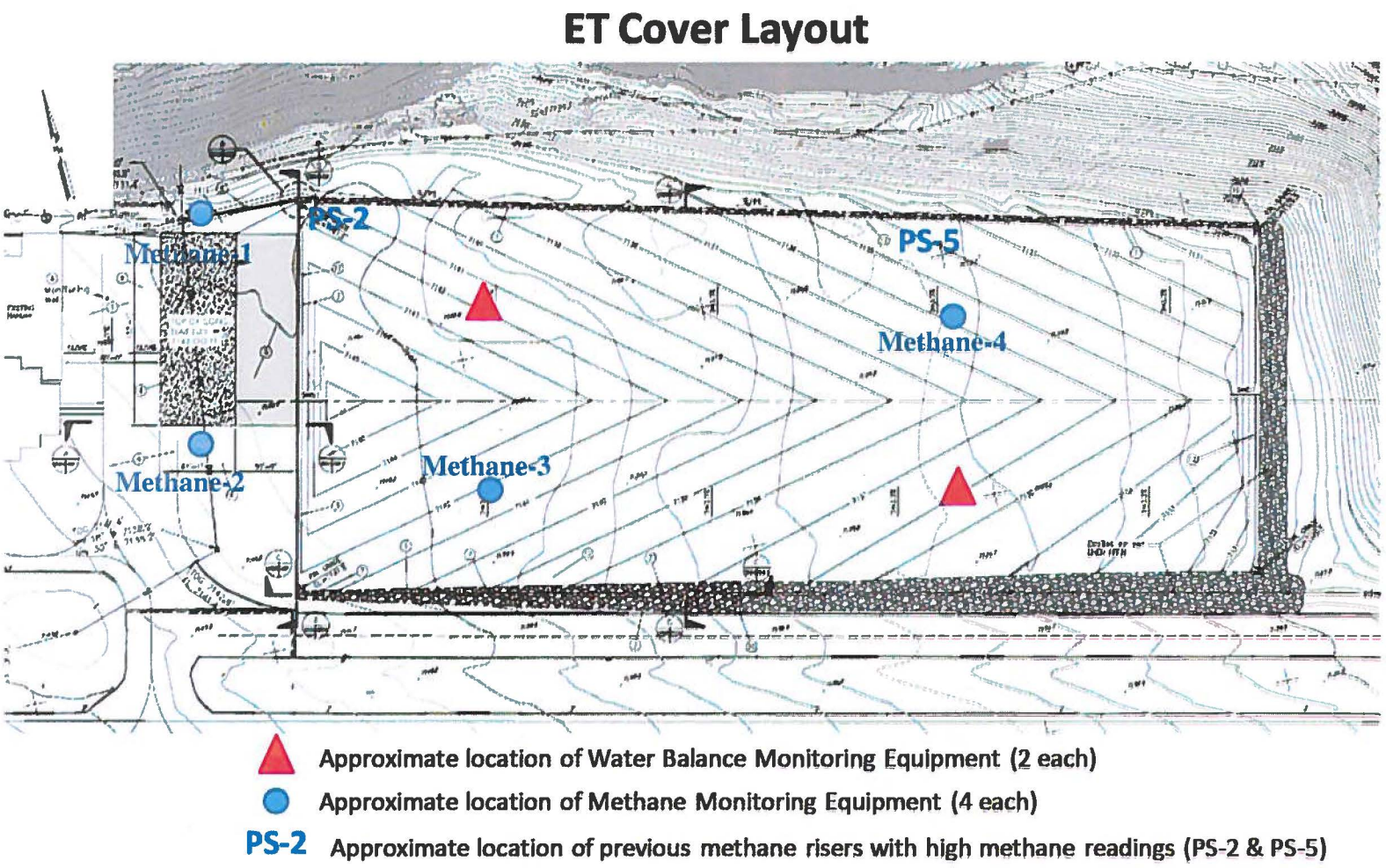

Figure 2. Methane and Water Balance Monitoring Locations

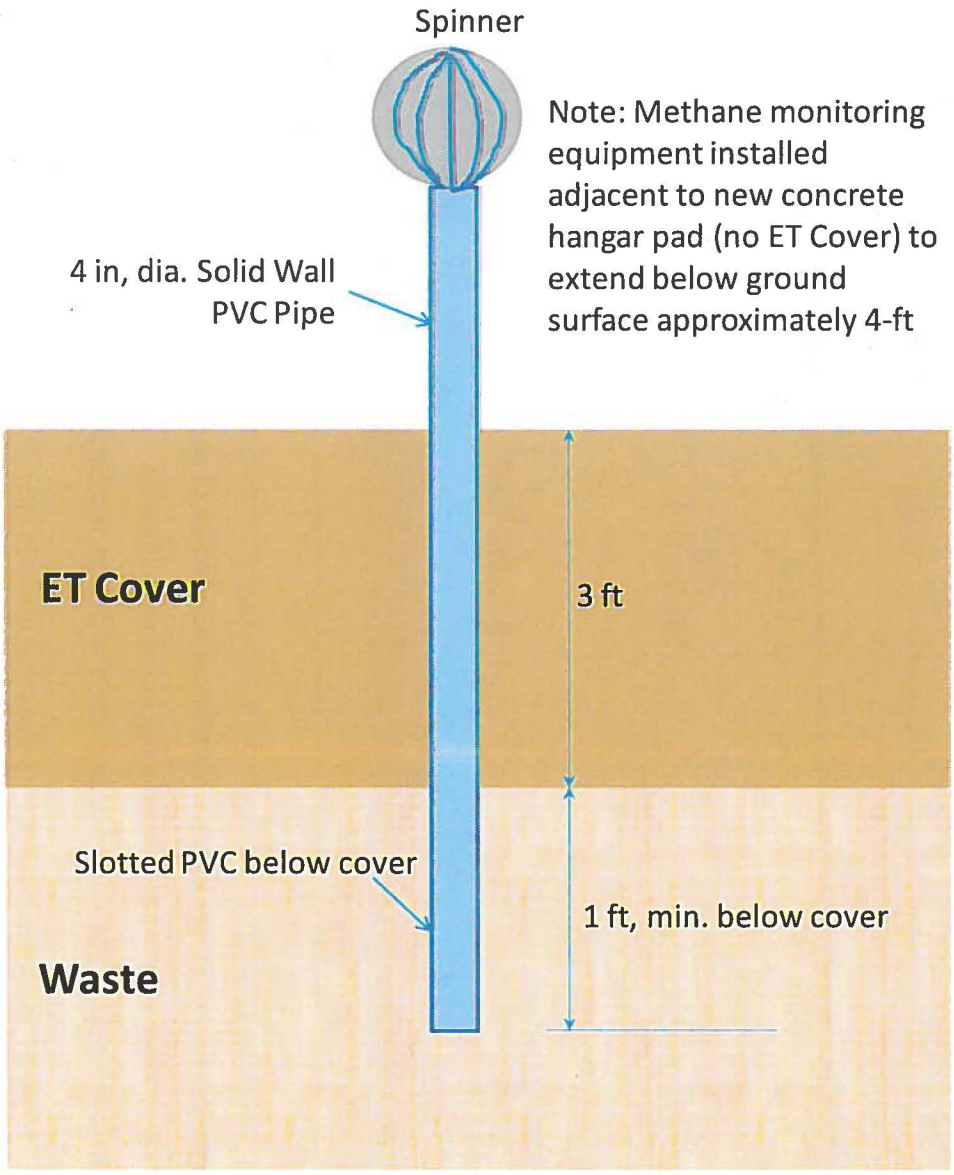

Figure 3. Methane Monitoring Vent

4.1.3 Biointrusion Monitoring

As part of each inspection, the ET Cover surface will be visually monitored for significant animal burrowing. Although the surface layer composed of a mixture of 25% rock to 75% soil by volume will discourage burrowing, it will not prevent it. However, the Federal Aviation Administration requires nearby fields including this landfill surface to be mowed to ensure that vegetation is less than a foot tall. The vegetation shall be kept to a height between approximately 6-12 inches tall. The mowing is to be performed under the direction of the Los Alamos County

Airport and has multiple advantages for the cover system. Its purpose is to disrupt the landscape required for burrowing animals to effectively survive. The taller vegetation acts as a canopy to hide the smaller animals from predators such as coyotes and birds. The FAA requires the mowing and thus discouragement of smaller burrowing animals because the presence of predators is a safety hazard, by attracting the predators within the airport. A second advantage of the mowing is that it encourages the establishment of thinner and shallower rooting vegetation such as grasses and discourages the establishment of deeper, woody rooted plants including trees. The large woody roots of trees can provide preferential flow paths through soil covers. Significant burrowing will be reported in the attached inspection checklist as well as to the Los Alamos County Airport manager. Any animal burrows larger than 3-inches in diameter will be reported. These large burrow holes will also be filled as soon as possible with soil, meeting the cover soil specifications contained in the Technical Specifications, Section 02200 (Earthwork).

4.2 Storm Water Control Systems

Each inspection will satisfy the required annual storm water control system inspections as described in the approved Storm Water Pollution Prevention Plan (SWPPP) (SWPPP 2015, Rev 1). The Inspection Engineer will look for evidence of, or the potential for, degradation of and /or pollutants entering the storm water conveyance system. Discharge locations identified in the site plans will be inspected to determine whether erosion controls are effective in preventing significant impact to Pueblo Canyon.

The general integrity of the landfill drainage channels and culverts shall be inspected. The channels and the transition of the channels to the arroyo shall be inspected for evidence of degradation, erosion, subsidence, sediment accumulation, undercutting, obstructions, slope instability and other disturbances to the channels. The overall integrity of the drainage channels and culverts shall be inspected and observations shall be recorded using the table in Attachment 1. If any of the issues listed in Attachment 1 are observed to be significant by a New Mexico Professional Engineer, they are to be repaired as soon as weather permits. Any repairs requiring additional fill shall use fill from an approved borrow source. Repairs requiring additional material such as riprap, shall use locally available materials that meet the design specifications (Technical Specifications 2016).

4.3 Fencing

Fencing at the site includes perimeter fencing around the airport. The integrity of all fencing adjacent to the north and northeastern perimeter of the landfill and eastern retaining wall structures shall be inspected (Figure 2). This length of fencing shall be inspected for any damage, including but not limited to: bent posts, loose posts, broken links or wire, and damaged gates. Any damage noted shall be noted in the inspection report and repaired as soon as weather permits.

4.4 Retaining Walls

Visual inspections will be performed for both the concrete and mechanically stabilized earth (MSE) walls. Inspections shall evaluate the condition of the retaining structures and note any degradation. Inspections will investigate the existence and extent of any cracks that may exist in the concrete wall. Digital photos shall be taken of any cracking or degradation noted in the concrete wall. Measurements of the location and depth of the crack(s) (if any) shall be

determined and documented in the inspection report. Additionally, investigations will be conducted for any separation, rotation, or other movement of the MSE walls. Document location (if any) and take digital photo of extent of movement and include in the inspection report. Any soil erosion or other evidence of water damage in the vicinity of retaining walls shall be documented in the inspection report with recommended repair(s) or maintenance.

4.5 Erosion and Sedimentation Control

Condition of temporary erosion measures will be inspected for their integrity and usefulness during the time period they are deemed essential (until vegetation is established around the perimeter of the landfill – generally during the first two years only). If temporary erosion control measures are deemed to be damaged, they are to be repaired or replaced with similar materials as designated by the Engineer performing the inspection. All damage shall be noted in the inspection report along with recommend maintenance. These repairs or replacements are to be performed as soon as weather permits.

Condition of permanent erosion control measures will be inspected. These include the drainage channels, rock check dams, terraces, and rip rap protecting the areas around the retaining structures along the eastern portion of the landfill. Any degradation or damage shall be noted in the inspection reports along with recommended repair or maintenance for each occurrence. These repairs or maintenance items are to be performed as soon as weather permits.

Condition of perimeter drains/berms, culverts, and drop inlets shall be inspected for presence of sediments, breaches in berms, presence of vegetation or debris, etc. Sediments, vegetation, or debris retarding storm water runoff will be removed as needed. Breaches in berms or chutes will be repaired using the appropriate materials.

4.6 Site Access

A permanent road dedicated to the landfill does not exist. Access to the site is controlled by the Los Alamos County through a locked gate with key password authorization. Access via this gate shall be made available for any maintenance or repairs required, as noted during the scheduled inspections.

4.7 Debris Disposal Area (DDA) Cover System.

The DDA was closed as described in the Remedy Completion Report (2007) with a soil cover. This cover system will be visually inspected beginning in 2017 similar to the ET Cover. That is, vegetation success, erosion, settlement, biointrusion will all be visually inspected with each inspection. Water balance and methane monitoring will not be performed on this cover system.

5.0 COMMUNICATION/REPORTING REQUIREMENTS

An annual Long-Term Monitoring Report shall be submitted to the NMED during the five year initial monitoring period. These reports shall include all inspection reports (inclusive of water balance and methane monitoring performed) as well as any recommended maintenance or repairs inclusive of documentation that the recommended repair was properly performed. Attachment 1 provides a Long-Term Monitoring Check list for guidance during the inspections. Digital photos of key elements shall be included in each inspection report in addition to a summary of the condition of the site and any changes, damage or other issues, along with any maintenance or repairs recommended. The annual Long-Term Monitoring Report shall an executive summary summarizing the condition and performance of the cover. It shall also include, at a minimum, the following information for each reporting period:

Summary of the condition of each site element identified.

1. Photographs of the site features taken at the locations.
2. Summary of all findings.
3. Summary of all changes or repairs made to the site (if any), indicating consultation with DOE and/or NMED and approval of those changes, when necessary.
4. Summary of any applicable contacts or discussions with representatives of the local community, public interest groups or government agencies.
5. Summary of all problems or potential problems encountered (if any).
6. Summary of actions taken and being taken to rectify problems (if any).
7. Changes in project personnel (if any).
8. Copies of inspection reports and any other relevant records.
9. Summary of water balance monitoring and analysis performed (as long as this monitoring is performed).
10. Summary of methane monitoring results (as long as this monitoring is performed) and field logs.

Each inspection report will include a list of any recommended maintenance or repairs based on findings from the recent inspection (if any). Subsequent inspection reports shall include a follow up review of previous maintenance or repairs performed verifying their effectiveness at addressing the issue (if any). Examples of maintenance or repairs needed may include:

- Localized areas of the cover where vegetation is deemed to be inadequate. Reseeding or further investigation may be required.
- Localized erosion, including formation of grills/gullies will require repair and potential redesign to address the situation.
- Localized differential settlement that has or may create ponding will require repairs by adding additional soil in depressed area and reseeding.
- Excessive or large burrowing. Large burrow holes can be filled with soil; excessive burrowing can create a hazard to the airport and must be addressed in addition to repairs to the landfill.

Included in each inspection report are areas of concern to be closely monitored on subsequent inspection (if any). These may vary – but include localized vegetation distress, settlement, erosion, cracking, an unexpected increase in methane production or cover moisture etc. These

issues on a case-by-case basis may trigger a more in depth review. Any of these issues will be included in the inspection report.

A project file containing records of all inspections, monitoring, and maintenance performed will be maintained by DOE Environmental Management Los Alamos Field Office (EM-LA). The annual Long-Term Monitoring Report will be prepared and provided to the New Mexico Environmental Department (NMED) Secretary prior to February 14, of each subsequent year.

The name, address, and telephone number for the individual to contact during the post-closure period is as follows:

Ramoncita N. Massey, Federal Project Director
Department of Energy
Environmental Management - Los Alamos Field Office (EM-LA)
1900 Diamond Drive MS-M984
Los Alamos, NM 87544
Phone: (505) 665-7771
Email: Ramoncita.massey@em.doe.gov

6.0 REFERENCES

1. Conveyance Agreement. 2002. Conveyance Agreement between The United States of America Acting by and through the United States Department of Energy and Incorporated County of Los Alamos, New Mexico Pursuant to 42 USC 2391 note.
2. Deed. 2008. Parcel A-4 Quitclaim Deed, County of Los Alamos, New Mexico.
3. Dwyer Engineering. 2012. Los Alamos County Airport Landfill Technical Feasibility Study. Prepared for the US DOE by Dwyer Engineering LLC, August 6, 2012.
4. Dwyer Engineering. 2015a. Drawings (8 sheets). Los Alamos Airport Landfill Cover Replacement, Los Alamos, NM. April 2015.
5. Dwyer Engineering. 2015b. Technical Specifications. Los Alamos Airport Landfill Cover Replacement, Los Alamos, NM. April 2015.
6. Dwyer Engineering. 2015c. ET Cover Design Report. Los Alamos Airport Landfill Cover Replacement, Los Alamos, NM. April 2015.
7. Dwyer. 2014. Pre-Design Work Plan for Los Alamos County Airport Landfill prepared by Dwyer Engineering LLC.
8. LANL, 1998, "RFI Report for Potential Release Sites 73-001(a,b,c,d) and 73-004(d), Airport Landfill Areas," Vol. 1, 2, and 3, Los Alamos National Laboratory (LANL) report LA-UR-98-3824, 63070, Los Alamos, New Mexico, November 1, 1998.
9. NMED Approval RCR. 2016. Approval with Modifications Submittal of the Remedy Completion Report for Los Alamos County Airport Landfill Cover Replacement, Solid Waste Management Unit 73-001 (a) Los Alamos National Laboratory, EPA ID #NM0890010515, HWB-LANL-16-055. December 22, 2016.
10. NMED Approval; Work Plan. 2016. Approval with Modifications Work Plan for Los Alamos County Airport Landfill Cover Replacement, Los Alamos National Laboratory, EPA ID #NM0890010515, HWB-LANL-16-018. August 14, 2015.
11. Remedy Completion Report *replacement pages. 2017.* Remedy Completion Report *replacement pages* for the Los Alamos County Airport Landfill Cover Replacement. Los Alamos, NM. February 2017.
12. Remedy Completion Report. 2007. DOE LASO TA-73 Airport Landfill SWMUs 73-001(a) and 73-001(d) April 2007.
13. Remedy Completion Report. 2016. Remedy Completion Report Los Alamos County Airport Landfill Cover Replacement. Los Alamos, NM. Prepared by Dwyer Engineering for US DOE. November 2016.
14. NMED Approval with Modifications Remedy Completion Report. 2016. Remedy Completion Report Los Alamos County Airport Landfill Cover Replacement. Los Alamos, NM. HWB-LANL-16-055. December 2016.
15. Remedy Completion Report Replacement Pages. 2017. Remedy Completion Report Los Alamos County Landfill Cover Replacement. Los Alamos, NM. Prepared by Dwyer Engineering for US DOE. February 2017.
16. Storm Water Pollution Prevention Plan (SWPPP). 2015Los Alamos County Airport Landfill Cover Replacement. Los Alamos, NM. Prepared by CTI for the US DOE, Revision 1, October 2015.

17. Technical Specifications, As-Built. 2016. Los Alamos County Airport Landfill Cover Replacement. Los Alamos, NM. Prepared by Dwyer Engineering for US DOE. September 2016.
18. Work Plan, Phase II for Los Alamos Site Office TA-73 Airport Landfill. 2004. NW-ID-2004-031. Prepared by North Wind, Inc. for DOE April 2004.
19. Work Plan: Los Alamos County Airport Landfill Cover Replacement. 2015. Prepared for Department of Energy, prepared by Dwyer Engineering LLC, August 2015.

ATTACHMENT 1

LONG-TERM MONITORING CHECK LIST

Long-Term Monitoring Check List for the Los Alamos County Airport Landfill Closure

Site Name: Los Alamos County Airport Landfill	Date of Inspection:
City: Los Alamos	Weather:
State: New Mexico	Temperature:
Agency: Department of Energy	Site Map:
Inspector:	Note: Indicate the location of any deficiency noted below on the site map
Landfill ET Cover – Top Slope	**Remarks**
1. Settlement (Low Spots): Yes ( ) No ( ) Aerial Extent: Depth: Repairs Necessary Yes ( ) No ( ) If yes, explain	
2. Surface Cracks: Yes ( ) No ( ) Length: Width: Depth: Repairs Necessary Yes ( ) No ( ) If yes, explain	
3. Erosion: Yes ( ) No ( ) Aerial Extent: Depth: Repairs Necessary Yes ( ) No ( ) If yes, explain	
4. Biointrusion Holes: Yes ( ) No ( ) Aerial Extent:	

Depth: Suspected Cause (Rodent or Other): Repairs Necessary Yes ( ) No ( ) If yes, explain	
5. Vegetation Condition: General Condition progressing as expected: Yes ( ) No ( ) If no, explain Height of Vegetation: Issues Observed: Yes ( ) No ( ) If yes, explain Repairs Necessary: Yes ( ) No ( ) If yes, explain	
6. Rill/Gully: Yes ( ) No ( ) Aerial Extent: Height: Suspected Cause Repairs Necessary Yes ( ) No ( ) If yes, explain	
7. Wet Areas: Yes ( ) No ( ) Ponding: Yes ( ) No ( ) Aerial Extent: Seeps: Yes ( ) No ( ) Aerial Extent: Estimated Flow Rate: Soft Subgrade: Yes ( ) No ( ) Aerial Extent: Repairs Necessary Yes ( ) No ( ) If yes, explain	

8. Slope Instability: Yes ( ) No ( ) Slides: Yes ( ) No ( ) Aerial Extent: Probable Slide Interface: Suspected Cause: Exposed Cover Components: Repairs Necessary Yes ( ) No ( ) If yes, explain	
Landfill Cover – Side Slopes	
1. Settlement (Low Spots) : Yes ( ) No ( ) Aerial Extent: Depth: Repairs Necessary Yes ( ) No ( ) If yes, explain	
2. Cracks: Yes ( ) No ( ) Length: Width: Depth: Repairs Necessary Yes ( ) No ( ) If yes, explain	
3. Erosion: Yes ( ) No ( ) Aerial Extent: Depth: Repairs Necessary Yes ( ) No ( ) If yes, explain	

4. Biointrusion Holes: Yes ( ) No ( ) Aerial Extent: Depth: Suspected Cause (Rodent or Other): Repairs Necessary Yes ( ) No ( ) If yes, explain	
5. Vegetation Condition: General Condition progressing as expected: Yes ( ) No ( ) If no, explain Height of Vegetation: Issues Observed: Yes ( ) No ( ) If yes, explain Repairs Necessary: Yes ( ) No ( ) If yes, explain	
6. Rill/Gully: Yes ( ) No ( ) Aerial Extent: Height: Suspected Cause: Repairs Necessary Yes ( ) No ( ) If yes, explain	
7. Wet Areas: Yes ( ) No ( ) Ponding: Yes ( ) No ( ) Aerial Extent: Seeps: Yes ( ) No ( ) Aerial Extent: Estimated Flow Rate: Soft Subgrade: Yes ( ) No ( )	

Arial Extent: Repairs Necessary Yes ( ) No ( ) If yes, explain	
8. Slope Instability: Yes ( ) No ( ) Slides: Yes ( ) No ( ) Aerial Extent: Probable Slide Interface: Suspected Cause: Exposed Cover Components: Repairs Necessary Yes ( ) No ( ) If yes, explain	
Rip Rap Lined Drainage Channels	
1. Settlement: Yes ( ) No ( ) Aerial Extent: Depth: Repairs Necessary Yes ( ) No ( ) If yes, explain	
2. Material Degradation: Yes ( ) No ( ) Material Type: Aerial Extent: Degree of Degradation: Repairs Necessary Yes ( ) No ( ) If yes, explain	
3. Erosion: Yes ( ) No ( ) Aerial Extent:	

Depth: Repairs Necessary Yes ( ) No ( ) If yes, explain	
4. Undercutting: Yes ( ) No ( ) Aerial Extent: Depth: Repairs Necessary Yes ( ) No ( ) If yes, explain	
5. Obstructions: Yes ( ) No ( ) Type: Aerial Extent: Size: Repairs Necessary Yes ( ) No ( ) If yes, explain	
6. Slope Instability: Yes ( ) No ( ) Type: Aerial Extent: Repairs Necessary Yes ( ) No ( ) If yes, explain	
7. Siltation: Yes ( ) No ( ) Aerial Extent: Depth: Repairs Necessary Yes ( ) No ( ) If yes, explain	
8. Drop Inlet Structures: Working Properly Yes ( ) No ( )	

Condition: Extent of Damage: Repairs Necessary Yes ( ) No ( ) If yes, explain	
Concrete Culvert	
1. Siltation: Yes ( ) No ( ) Aerial Extent: Depth: Repairs Necessary Yes ( ) No ( ) If yes, explain	
2. Concrete Condition and Joints General Condition progressing as expected: Yes ( ) No ( ) If no, explain Issues Observed: Yes ( ) No ( ) If yes, explain Repairs Necessary: Yes ( ) No ( ) If yes, explain	
3. Grating Condition: General Condition progressing as expected: Yes ( ) No ( ) If no, explain Issues Observed: Yes ( ) No ( ) If yes, explain Repairs Necessary: Yes ( ) No ( ) If yes, explain	
Fencing	
1. Airport Fence Adjacent to Landfill: bent posts: Yes ( ) No ( ) loose posts: Yes ( ) No ( ) broken links or wire: Yes ( ) No ( ) damaged gates: Yes ( ) No ( ) Description of damage:	

Repairs Necessary Yes ( ) No ( ) If yes, explain	
Retaining Wall	
1.Retaining Wall Condition:	
2. Retaining Wall Damage Description (if any):	
3.**Repairs Necessary** Yes ( ) No ( ) If yes, explain	
Temporary Erosion & Sedimentation Control Measures (if any)	
1. Erosion Control Blanket: Functional Yes ( ) No ( ) if no, describe locations Damaged Blanket: Yes ( ) No ( ) Other damage: Yes ( ) No ( ) Description of damage: Repairs Necessary Yes ( ) No ( ) If yes, explain	
Permanent Erosion & Sedimentation Control Measures	
1. Rip Rap Reinforced Side Slope near Retaining Wall: Functional Yes ( ) No ( ) if no, describe locations Damage or degradation: Yes ( ) No ( ) Description of damage: Repairs Necessary Yes ( ) No ( ) If yes, explain	
2. Rock Check Dams near Retaining Wall: Functional Yes ( ) No ( ) if no, describe locations Damage, displaced rock, or other damage: Yes ( ) No ( ) Description of damage:	

Repairs Necessary Yes ( ) No ( ) If yes, explain	
3. Landfill Terrace above Retaining Wall: Functional Yes ( ) No ( ) if no, describe locations Damage, adjunct erosion, slope problem, or other damage/degradation: Yes ( ) No ( ) Description of damage: Repairs Necessary Yes ( ) No ( ) If yes, explain	
4. Drainage Channels adjacent to Retaining Wall: Functional Yes ( ) No ( ) if no, describe locations Damage, adjunct erosion, slope problem, or other damage/degradation: Yes ( ) No ( ) Description of damage: Repairs Necessary Yes ( ) No ( ) If yes, explain	
5. Gabion above Drainage Channels adjacent to Retaining Wall: Functional Yes ( ) No ( ) if no, describe locations Damage or degradation: Yes ( ) No ( ) Description of damage: Repairs Necessary Yes ( ) No ( ) If yes, explain	
Site Access	
1. Access Restrictions: Yes ( ) No ( ) Description: Repairs Necessary Yes ( ) No ( ) If yes, explain	
General	
1. Vandalism: Yes ( ) No ( )	

Description of damage: Repairs Necessary Yes ( ) No ( ) If yes, explain	
2. Land Use Change: Yes ( ) No ( ) Description: Repairs Necessary Yes ( ) No ( ) If yes, explain	
Summary of Recommended Maintenance and/or Repairs	
1. Maintenance / Repairs Necessary Yes ( ) No ( ) If yes, explain	
Other	
1. Describe	