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September 12, 2005

Mr. David Cobrain
State of New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303



Reference: Work Assignment No. 06110.270.0003; State of New Mexico Environment Department, Santa Fe, New Mexico; LANL Corrective Action Order; Technical Review of the Remedy Design Work Plan For The Los Alamos Site Office TA-73 Airport Landfill, Revision 1, Dated June 2005; Los Alamos National Laboratory, Los Alamos, New Mexico; Draft Deliverable

Dear Mr. Cobrain:

Enclosed please find the deliverable for the above-referenced work assignment. The deliverable consists of a technical review of the "Remedy Design Work Plan for the Los Alamos Site Office TA-73 Airport Landfill, Revision 1," dated June 2005.

There are several technical and engineering deficiencies associated with the Work Plan, which have been addressed in the deliverable as either general comments or specific comments.

One issue which NMED should be aware of deals with the cover components. It is TechLaw's understanding that the 2003 NMED conditional approval of the Voluntary Corrective Measure (VCM) Plan required the use of an engineered alternative earthen cover (cap) that will meet or exceed RCRA Subtitle C requirements, and that NMED only approved the concept of a soil cover, pending the submittal of specific design information by Los Alamos National Laboratory (LANL). The covers proposed for the main landfill have components that are different from a typical soil cover and the majority of the landfill will be covered by asphalt. Therefore, the draft comments dealing with the cover design should be closely evaluated by NMED to ensure that they are consistent with the previous NMED approval. NMED may wish to modify these comments accordingly.

Two components of the landfill cover are not fully designed yet. The five concrete hanger slabs and the retaining walls are to be designed and specified by the hanger manufacturer and the retaining wall subcontractor, respectively. Although performance and stability requirements are included for the retaining walls, there are no similar standards for the hanger slabs. Landfill settlement calculations do not include the final hanger design details, such as structure and

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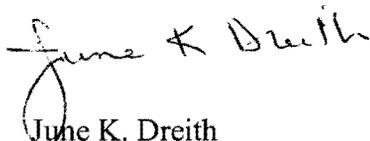


aircraft weights. Similarly, the ability of the 4-inch thick MatCon asphalt to support aircraft and other traffic loads without cracking (and compromising the integrity of the cover system) is not addressed. These concerns are identified in the enclosed comments.

The document is formatted in Microsoft Word. The deliverable was emailed to Mr. David Cobrain on September 12, 2005 at David.Cobrain@state.nm.us. A formal hard (paper) copy of this deliverable will be sent vial U.S. mail.

Please feel free to contact me at (303) 763-7188, or Mr. Mohamed Nur, the reviewer, at (703) 818-3244, if you have any questions.

Sincerely,

A handwritten signature in black ink that reads "June K. Dreith". The signature is written in a cursive style with a large, looped initial "J".

June K. Dreith
Project Manager

Enclosures

Cc. D. Goering, NMED
M. Nur, TechLaw
G. Starkebaum, TechLaw
Denver Files

**Los Alamos National Laboratories
Los Alamos, New Mexico**

**Technical Review of
Remedy Design Work Plan
For The Los Alamos Site Office TA-73 Airport Landfill
Revision 1, dated June 2005**

Submitted to:

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Ms. Darlene Goering
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Hazardous Waste Bureau
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Submitted by:

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September 12, 2005

**Technical Review of
Remedy Design Work Plan
For The Los Alamos Site Office TA-73 Airport Landfill
Revision 1, dated June 2005
Los Alamos National Laboratory (LANL), New Mexico**

GENERAL COMMENTS

1. In the New Mexico Environment Department (NMED) conditional approval letter of the Voluntary Corrective Measure (VCM) Plan, NMED approved the use of an engineered alternative earthen cover (cap) or RCRA Subtitle C equivalent cover that will meet or exceed RCRA Subtitle C requirements. In order to demonstrate that the alternative cover meets or exceeds the Subtitle C required performance criteria, modeling (such as the Hydrologic Evaluation of Landfill Performance [HELP] Model) will need to be conducted, especially for the Debris Disposal Area (DDA) and the riprap armored portion of the landfill. The modeling could be conducted with data obtained from testing the materials to be used in the covers, and literature data.

The proposed landfill covers do not appear to be equivalent in performance to a Subtitle C final cover. A Subtitle C final cover includes a composite soil and geosynthetic impermeable liner, a gas collection layer, a biotic barrier, and a vegetation cover. Please revise the design documents to show that water flux through the cover, collection of landfill gas, protection against biotic intrusion and surface water control on the proposed covers will be equivalent to a Subtitle C prescriptive final cover. Equivalency must be shown in both numeric similarity (i.e., zero or extremely low water flux through the cover) and in reliability of the cover.

The EPA *Technical Guidance Document, Quality Assurance and Quality Control for Waste Containment Facilities* (EPA/600/R-93/182) recommends construction of a test pad to demonstrate adequate performance (hydraulic conductivity) of the design that will be used for the full-scale landfill cover. *The Remedial Design Work Plan for Los Alamos Site Office TA-73 Airport Landfill, Revision 1* (Work Plan) presents neither modeling results nor test pad results to demonstrate that the proposed covers meets the RCRA Subtitle C landfill regulations for design of the landfill cover, closure and post-closure regulations in 20 NMAC 4.1.500 (and 600), incorporating 40 CFR 264 (and 265) Subparts G and N, and related guidance issued by the US EPA.

After a modeling exercise is completed, a test pad is needed to verify the assumed and modeled hydraulic conductivity of the proposed cover, using the materials, equipment and procedures indicated in Attachment A (Construction Specifications). The materials and procedures used in constructing the test pad, with any modifications necessary to confirm the required performance (hydraulic conductivity), should then be used for construction of the varying covers for these landfills. The Work Plan should be revised to include modeling and

test pad construction and evaluation, and provide for revision of the construction specifications, if needed, based on the data obtained from the test pad.

2. The design drawings presented in Attachment A (e.g., Drawing No. 2005) show that on the flat top area of the landfill, 16 inches of additional material (consisting of 6 inches of existing or relocated interim cover material and 6 inches of aggregate base course separated by a woven geotextile, and 4 inches of asphalt pavement) will be placed. Existing waste or relocated waste is shown below these layers. Since the waste/cover material will be relocated from the eastern and northern edges and directly placed on the existing cover material, it is not clear how this relocation results in the cover configuration depicted on Drawing No. 2005. According to Drawing No. 2001 (Excavation Tick Plan), waste will be relocated from the eastern and northern edges and distributed over the remaining landfill area essentially covering nearly all of the existing waste and cover material. Revise the Work Plan to clarify if the existing cover will be removed before placing the relocated waste on top of the existing waste or if the relocated waste will be directly placed on the existing cover. In either case, the cover configuration would not look like what is depicted in the drawings. In addition, explain how the existing and the relocated interim cover material will be reconstituted as a single 6-inch layer just above the waste/relocated waste.
3. The design drawings (e.g., Drawing No. 2002) show five concrete pads (“hanger slabs”) on the western portion of the main landfill. It is assumed that these hangers will be used to store and maintain aircraft. It is not clear from the design drawings how aircraft will be moved to these hangers since there are no taxiways connecting these hangers to the main taxiway south of the landfill. The transition zone between the existing taxiway and the MatCon surface is to be covered with rip rap, according to Detail G on drawing 2005, Capping System Details. This design will apparently prohibit aircraft access to the taxiway from the MatCon surface. Revise the Work Plan to clarify this issue.
4. The differential settlement calculations (Attachment A, Differential Settlement Evaluation) were based on two factors: increased load (stress) imposed on undisturbed waste as a result of placing relocated waste and capping materials on the flat top of the landfill and self-weight consolidation of the relocated waste, including the stress imposed by the weight of the capping material. A 100 by 100 foot grid was placed over the landfill footprint to calculate the total settlement at each nodal point and the differential settlement between the nodal points determined. The analysis provided does not appear to include settlement due to stress from live and dead loads of the five proposed aircraft hangers which are a part of the cover material. Each concrete pad for the hangers measures 190 ft by 48 ft. The concrete, structures and aircraft in the hangers will impose significant loads on the landfill and should be considered as major factors in the differential settlement calculations. A complete and detailed description of the equipment and aircraft that will be stored and maintained at these hangers should be presented. In addition, the use of the three “future tie-down” areas should be discussed and weights of typical aircraft also included in the settlement analysis. In addition, it appears settlement evaluation was not carried out for the armored portion of the main landfill and the DDA. Revise the Work Plan to re-evaluate the differential settlement analysis for all landfill areas and address the issues raised in this comment.

5. The attachments to the Work Plan, in various places, state that the final design drawings and specifications for both the main landfill and DDA are provided in the Remedy Design Work Plan for the TA-73 Airport Landfill. However, the drawings submitted with the work plan are marked “not for construction” and, thus, are not final drawings. In addition, some of the drawings are provided for illustrative purposes and cannot be considered final design drawings. For example, Note 1 to the typical hanger slab cross-section on Drawing No. 2024 indicates that the concrete slab is for illustrative purposes only and is not intended to depict the actual slab required to support the hanger, and that the slab shall be designed consistent with loadings provided by the selected hanger manufacturer. The construction specifications provided in Specification 03300 are too general for cast-in-place concrete and do not appear to take into consideration the live and dead loads that the hanger slabs are meant to support. Revise the Work Plan to provide the final design package (i.e., design drawings and specifications) for the hanger slabs.
6. The Construction Plan (Attachment B) addresses the construction sequence, procedures and schedule for both the Main Landfill and the DDA. The Work Plan provides very limited information for the DDA. Detailed design calculations (e.g., hydraulic calculations, differential settlements) presented for the main landfill are not provided for the DDA. Revise the Work Plan to clarify whether this work plan is meant to address the design and construction of the Main Landfill only or provide detailed design information including engineering calculations for the DDA cover.
7. None of the engineering drawings provided clearly indicate the current limits of waste and the extent of the cover over the existing and the relocated waste. For example, the legend for Drawing No. 2002 indicates a symbol for limit of “landfill final cover system/limit of waste.” Since the limit of the cover and the limit of waste are indicated by the same dashed line, it appears the cover system does not extend beyond the extent of the waste. It is not apparent from engineering stand point how this would be possible. Similarly, Detail G on drawing 2005 shows the edge of the MatCon asphalt at the outer limit of the wastes. This design will allow pooling of runoff within rip rap immediately adjacent to the MatCon, and infiltration into the base course beneath the MatCon, along the entire southern edge of the landfill cover. Revise the Work Plan to provide drawings that clearly show the extent of the waste and the cap, and how the cover is tied (anchored) to the ground beyond the waste limit to prevent infiltration of water beneath the MatCon on the edges of the landfill.
8. A 6-inch rip-rap and 18-inch compacted infiltration barrier layer are proposed as components of the armored portion of landfill cover. It is not clear how the thickness of the infiltration barrier layer was determined. Such determination should be supported by data from field tests to determine the predicted annual infiltration through the cover by measuring flux through different thicknesses of the layer to find the optimal thickness. The HELP Model can be used for such simulations. Revise the Work Plan to discuss why an 18-inch infiltration layer was selected for the cover.
9. In the Post-closure Care and Monitoring Plan (PCMP) (Attachment E) inspection for breach

of the cover by animal burrows is discussed. However, the Work Plan does not discuss what other measures (other than inspection and repair if damaged) could be considered or used to prevent burrowing animals from damaging the cover. Revise the Work Plan to discuss this issue in detail. In addition, it is indicated that all animal burrows greater than approximately four inches in depth will be filled and compacted using topsoil and equipment appropriate to the scale of the erosional features, and that excessive compaction will not be used unless repair of the underlying low-permeability soil layer is required. Please revise the Work Plan to clarify which parts of the main landfill or the DDA this procedure applies to and clearly identify the low-permeability soil layer referenced.

10. The PCMP does not discuss inspection and maintenance of the concrete pads for the hangers. Revise the Work Plan to include inspection and maintenance procedures for the hanger slabs.
11. In addition to the specified periodic landfill inspections, the PCMP should provide for inspecting the landfill after the next significant rainfall following the installation of the final cover, and annually at the end of the spring thaw.
12. The Construction Plan and Project Specifications do not appear to contain procedures that address daily cover. Please revise the Construction Plan and Specifications to indicate that a minimum of 6 inches of clean material will be placed over all waste surfaces at the end of every working day. This requirement is particularly applicable to the cover mining plan in which landfill cover material will be stripped from the top of the landfill. At the end of every working day, a minimum of 6 inches of clean soil material must be present between the surface and all waste, as required in 20 NMAC 9.1, Section 402. In the event that operations continue for more than a standard working day, no waste may be exposed to the environment for more than 12 hours.
13. Detailed structural plans, elevations and design calculations are provided for Wall No. 1. Similar plans and elevations, and design calculation are not provided for the other walls (i.e., Wall Nos. 2 through 4). Specification Section 02273 Mechanically Stabilized Earth Retaining Wall, subsection 1.01, requires the Retaining Wall Subcontractor to provide detailed designs and a construction quality assurance plan for all retaining walls. The subcontractor is required to provide the LANL Engineer the opportunity to review and verify the retaining wall designs, but no provision is included for final approval of the wall designs by NMED.

SPECIFIC COMMENTS

1. **Section 2.3, Final Design, page 4:** It is stated in this section that “the final design package, which includes specifications, drawings, and engineering calculations, is included as Attachment A. The final design specifications and drawings will incorporate NMED review comments of the draft final design package and represents the final specifications directing construction of the landfill cover.” As the drawings submitted in Attachment A are marked

“not for construction” and the details of some cover components are not provided (e.g., aircraft hanger slabs and retaining walls) they are not a part of the final design package that could be used to direct construction of the landfill cover. Please revise the Work Plan to provide final design drawings and details, or include provisions for NMED review and approval of future final design submittals from subcontractors.

2. **Section 6.0, Demonstration of Cover Performance, page 5:** This section was apparently intended to respond to the requirement of the NMED Conditional Approval of the VCM Plan that the Work Plan includes a demonstration of cover performance for the life of the cover. This section simply references Attachment E (Post-closure Care and Monitoring Plan), but the referenced plan does not provide the information requested by the Conditional Approval Letter. As indicated above in the General Comments, the Work Plan should be revised to satisfy this requirement.
3. **Attachment A, Construction Specifications, Section 02200 Earthwork, Subsection 3.02.D.4 Placing Fill Materials, page 02200-13:** This section requires that infiltration layer fills shall be compacted to at least 98% of the maximum dry density. Table 02200-2, Field Quality Control, Minimum Testing Acceptance Criteria, however, specifies 95% of maximum dry density. The 98% requirement applies to fill materials in Table 02200-2. Assuming that Table 02200-2 is accurate, correct the text in subsection 3.02.D.4.
4. **Attachment A, Drawing No. 2011, Detail Section E:** Based on the location of Section E as shown on Drawing No. 2002, Section E should depict the hanger slab replacing the MatCon asphalt cover. Please clarify whether the “Pavement Section” in Section E is actually the hanger slab.
5. **Attachment A, Differential Settlement Evaluation, sheet 2 of 9:** The settlement analysis accounts for increased loads consisting of relocated waste and capping materials. Although the discussion (last paragraph) acknowledges the potential for elastic settlement, this type of settlement is not addressed in the following calculations. Since the plans for the landfill apparently include long term traffic consisting of various unspecified types of aircraft and other heavy vehicles such as fuel and cargo trucks, elastic settlement and the effects of such settlement on the relatively thin (4-inch) MatCon pavement should be specifically evaluated. Cracking of the MatCon surface will allow infiltration of stormwater, generation of leachate, and may lead to more substantial settlement and general failure of the asphalt cover system. Revise the Work Plan to provide an evaluation of elastic settlement due to aircraft and other traffic, and the resulting effects on the MatCon asphalt cover system.
6. **Attachment A, Differential Settlement Evaluation, sheet 2 of 9:** The first full paragraph states, “Furthermore, there is no evidence of a perched water table or leachate mound within the landfill.” Revise the Work Plan to provide data to support this contention or provide a reference for these determinations.
7. **Attachment A, Differential Settlement Evaluation, sheet 5 of 9:** In Table 1, at the bottom of this sheet, the interim cover thickness is given as 1 foot. The engineering drawings (e.g.,

Drawing No. 2005) indicate the interim cover thickness as minimum 6 inches. Please clarify if the thickness used in the settlement calculations is the maximum expected or the average thickness of the interim cover.

8. **Attachment A, Differential Settlement Evaluation, Sheet 9 of 9:** The last paragraph states “it is particularly important to provide positive drainage and a design slope of approximately 2% on the top area of the landfill.” However, the constructed slope of the landfill will be less than the NMED prescribed slope of 2% and the minimum post-settlement slope was calculated to be 1.3%. Because a minimum slope of 1% is typically recommended for asphalt surfaces, it is concluded (in the Conclusion Section) that the minimum slope predicted will be sufficient to provide long-term positive drainage. Revise the Work Plan to clearly indicate which slope will be used in the long-term plan, considering the fact that the findings of the post-settlement analysis do not indicate that the design will provide a long-term slope of 2% percent.
9. **Attachment A, Differential Settlement Evaluation, sheet 9 of 9:** Under “Conclusions,” it is stated that “due to settlement of the landfill and consolidation of the relocated waste due to compaction by construction equipment, it is possible that the final grades shown on the project drawing will not be achieved.” Please revise the Work Plan to provide acceptance criteria for what grades will be adequate and procedures to follow in the event final grades shown on the drawings are not achieved, or provide, in the final work plan submittal, an achievable grading plan.
10. **Attachment E, Post-Closure Care and Monitoring Plan (PCMP), Section 2.0, Requirements, page 1:** It is stated that “the cover of the DDA will consist of re-grading the DDA surface with a uniform 12 in. of native soil cover, followed by revegetation of the disturbed surface.” In addition, the Construction Plan (Section 5.4) states that the DDA will be constructed to include a minimum of 12 inches of top soil over the existing waste. However, Detail 4 of Drawing No. 2005 indicates that soil cover thickness will vary between 0 and 12 inches. Revise the Work Plan to correct or clarify the intent of this drawing.
11. **Attachment E, PCMP, Section 3.1.5, MatCon Asphalt Surface, page 4:** This section states that the MatCon asphalt surface will be inspected and evaluated in accordance with the MatCon Operation and Maintenance Plan prepared by the MatCon subcontractor, which is apparently to be submitted at some future time. This document will be critically important to maintaining the long term effectiveness of the landfill cover system. Revise the Work Plan to incorporate the O&M Plan into the PCMP, or provide for NMED review and approval of the future MatCon O&M Plan.