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Waste Bureau

July 8, 2005

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

RE: Work Assignment No. 06110.330.0003; State of New Mexico Environment Department, Santa Fe, New Mexico; General Permit Support Contract; RCRA Engineering Design Support for Fort Bliss, Task 2 Deliverable

Dear Mr. Cobrain,

Enclosed please find the deliverable for the above referenced work assignment. The deliverable consists of an engineering review of Post Closure Certification Report for the Doña Ana Range Camp Landfill (SWMU 27).

Through a combination of poor laboratory implementation of the ASTM procedure for measuring soil hydraulic conductivity and inadequate engineering supervision, it appears that the landfill final cover, as installed, has a hydraulic conductivity at least 2.5 times higher than the required specification -- which in turn was 54 times higher than the New Mexico Administrative Code default hydraulic conductivity for landfill final covers. The Quality Control testing of the cover was also not up to the standard of practice. More dependable numerical modeling using EPIC or UNSAT-H software may show that the landfill cover, as installed, will prevent significant amounts of infiltration. We recommend (in the attached comments) additional testing with double-ring infiltrometers or Boutwell permeameters, and modeling using that new data to demonstrate (if possible) that excessive infiltration will not occur.

The document is formatted in Word. The deliverable was emailed to you on July 8, 2005 at david.cobrain@state.nm.us and to Ms. Cheryl Frischkorn at cheryl.frischkorn@state.nm.us. A hard (paper) copy of this deliverable was sent via US mail. If you have any questions, please feel free to contact me at (303) 763-7188 or Mr. Jeff Raines, PE at (415) 281-8730 x 19.

Sincerely,

June K. Dreith

June K. Dreith
Program Manager

Enclosure

cc: Ms. Cheryl Frischkorn
Mr. Jeff Raines
Denver Files

TASK 2 DELIVERABLE

ENGINEERING DESIGN SUPPORT FOR FORT BLISS, SWMU 27; POST CLOSURE CERTIFICATION REPORT FOR THE DOÑA ANA RANGE CAMP LANDFILL

Submitted by:

TechLaw, Inc.
560 Golden Ridge Road, Suite 130
Golden, CO 80401

Submitted to:

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

In response to:

Work Assignment No. 06110.330.0003

July 2005

General Comments

1. The laboratory results for soil hydraulic conductivity, conducted in accordance with ASTM D5084, presented in Appendix G, indicate that the test B value[1] varied between 0.8 and 0.96 for 29 of the 45 tests. ASTM D5084 requires that the B value be greater than or equal to 0.95. The US Army Corps of Engineers Unified Facilities Guide Specification (UFGS) for Clay Barrier Layers, 02377A, also requires a minimum B value of 0.95 when conducting hydraulic conductivity testing in accordance with ASTM D5084. Only 6 of the hydraulic conductivity results presented in Appendix G met the ASTM and Army Corps of Engineers B-value criterion. Two of these results passed the specification hydraulic conductivity criterion while four failed to meet the project hydraulic conductivity specification. The average hydraulic conductivity measured in the six test results which met the B value criterion was 13.5×10^{-4} cm/s. Please revise the closure report to provide justification for conducting hydraulic conductivity testing that is not in accordance with the ASTM method or Army Corps of Engineers requirements, if that is the case, and provide an estimate of how the lack of saturation affected the reported hydraulic conductivities.

2. Rather than presenting B values, 16 of the 45 test documentation sheets present final saturation values. ASTM D5084 allows saturation to be used in lieu of B-value as a test criterion and presents 95 to 105% saturation as the acceptable range of saturation. Of the 16 tests that presented saturation values, 5 used a specific gravity of 2.651 (typical of quartz) while the other 11 tests used lower values – down to 2.295. Had a specific gravity of 2.651 been used in these tests, they would not have passed the minimum 95% saturation criterion. Please present a justification for using different values of specific gravity for soil that is apparently derived from the same base rock. If B values were calculated for the 16 tests for which they were not presented, please present them.

3. According to the notes of a teleconference conducted on September 21, 2004 (contained in Appendix K of the SWMU 18 Closure Report) 10 of the first 17 hydraulic conductivity tests for that landfill failed to meet the project hydraulic conductivity specification. The Army and its consultant determined that all of the failing hydraulic conductivity tests were conducted in laboratories in Albuquerque, New Mexico and Phoenix, Arizona and concluded that possible causes of the failures were "transport-related disturbances", problems with the testing methods or equipment, or borrow materials with insufficient silts and clays. The actual causes of the failed tests were not conclusively determined. The meeting minutes indicate that sample number 18 (Perm 18) collected from Zone 25 at SWMU 18, which was tested and passed in the El Paso laboratory, was a duplicate or retest of sample Perm 4 that failed in the Albuquerque laboratory. The test sheet for Perm 18 included in Appendix G of the SWMU 18 Closure Report indicates that it had the second lowest B value of any test sample, 0.76, hence the second lowest saturation, and therefore it was the second to least reliable result (see the comment above on B-

[1] B-value is a measure of how saturated the sample is. Unsaturated soils have hydraulic conductivities orders of magnitude lower than saturated samples. Hence it is vital that the B value be close to 1 or the test results will not be meaningful.

values). The result of the failed Perm 4 test at the Albuquerque[2] laboratory was 1.68 E-03 cm/sec. The B-value from Perm 4 was 0.96, significantly higher than the Perm 18 value of 0.76, and within the required range specified in ASTM D5084. All of the reported hydraulic conductivity tests with B-values less than 0.95 should have been rejected, given the discussion above on B-values. Approximately 17 of the "passing" SWMU 27 hydraulic conductivity test results in Appendix G of the certification report fall into this category (not counting samples with unreported B-values). In the event that additional laboratory hydraulic conductivity testing is performed, please assure that deaired water is used and that the samples are back pressure saturated until the B-value is greater than or equal to 0.95, as required in the Corps of Engineers specification and ASTM D5084 before hydraulic conductivity testing is conducted on the samples. At this point, however, we recommend using sealed double-ring infiltrometers or Boutwell two-stage permeameters to determine the in-place hydraulic conductivity of the landfill covers.

4. The United States Air Force funded a study of the application of numerical modeling to the design of Evapotranspiration Landfills [US Air Force, 2004]. The Air Force's conclusion was:

> These evaluations clearly demonstrate that the EPIC model is adequate for evapotranspiration (ET) cover design and evaluation and that it is significantly better than the HELP model. The HELP model has limited usefulness in design or evaluation of ET landfill covers. In all four comparisons evaluated in this study, EPIC produced substantially better estimates of ET, flow (Q), and PRK than did HELP.

Given the uncertainty in the reported hydraulic conductivity test results, the Army should consider evaluating the final cover transmissivity or percolation rate with on-site infiltrometers or permeameters (see General Comment 3) and using the resulting data in Environmental Policy Integrated Climate (EPIC) modeling (UNSAT-H modeling would also be acceptable). EPIC is available from the Texas A&M University, Blackland Research Center

Specific Comments

1. Section 1.4.2, Waste Composition and Volume, indicates that wastes were burned on a regular basis, implying that all wastes were burned. The trenching results presented in Appendix B, which document actual examination of waste, do not indicate the waste was burned. This is not surprising as the trench locations were selected based on soil gas results and soil gases are likely to be the highest in areas where unburned waste is present. However, please revise the closure report to indicate that large amounts of unburned waste are likely present in the landfill.

2. Section 3.2.1 indicates that 12 inch-thick lifts could not be effectively compacted, and hence 8-inch-thick lifts were used to construct the cover. The Army then redefined two, 8-inch lifts as one, 12 inch lift, thereby reducing the number of water content, density and hydraulic conductivity tests required by 40%: apparently 5 lifts were tested as if they were 3 lifts.

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[2] The closure certification report for SWMU 27 presents laboratory sheets for hydraulic conductivity analyses performed in the Albuquerque laboratory. All of the B values were greater than 0.95 and four of the six tests failed to meet the specification hydraulic conductivity.

Redefining the number two as the number one is unprecedented in our experience. Further, the number of tests listed in the design specification 02300 (2 moisture-density tests per acre per lift) was already less than half the number of these tests recommended in the US Army Corps of Engineers Standard Specification for clay barriers (UFGS 2377) – 5 per acre per lift. The resulting final cover has at least fifty-four times the State of New Mexico default hydraulic conductivity (justified based on HELP modeling) with one fifth of the Corps of Engineers recommended quality control testing, and questionable hydraulic conductivity testing procedures. Please provide a justification for providing less than the current state-of-the-practice construction quality control for the landfill final cover. In addition, we could not locate any calibration test results for the nuclear gauge or the results of confirmation tests using non-nuclear methods in the closure certification report. Please present these results.

3. Table 3-1 presents the results of a risk assessment using contaminant concentrations derived from soil samples collected 21 to 125 feet below the ground surface. It is assumed that these data were collected to demonstrate that there has been no lateral migration of contaminants from the landfill rather than to use the data to support a risk assessment. In addition, data from this depth is more commonly used to assess whether detected concentrations are a potential threat for migration to groundwater. This evaluation is done through a comparison of detected concentrations to appropriate soil-to-groundwater screening levels (SSLs). Typically, under an industrial scenario (in this case it is assumed intrusive), the depth of exposure rarely exceeds 10-15 feet below ground surface (bgs). It is highly unlikely that a person would be exposed to soil below 20 feet in depth. Therefore, the risk assessment as presented in the table does not adequately demonstrate that there are no unacceptable risks to a future or present-day industrial worker. Revise the risk analysis to address soil concentrations through the potential exposure routes. This would include evaluation of the likely current and future exposure scenarios and receptors to surface and subsurface soil, and would include evaluation of all potential exposure routes. In addition, if soil data for surface soil (0-0.6 inches bgs) and subsurface soil (0.6 – 10 feet bgs) are not available, then it appears that the nature and extent of contamination has not been adequately defined and additional sampling is warranted.

4. Specification Section 02921A, Seeding: The specifications call for the use of weeping lovegrass in the seed mix. This plant may not be well-suited for evapotranspiration covers [Dalrymple, 1970]:

> Its aggressive fibrous root systems bind and hold soils in place that are subject to critical erosion hazards. Also the organic material provided by this extensive root system contributes to the physical improvement of the soil. This factor is important in a conservation cropping system resulting in increased infiltration (water insoak), more efficient use of fertilizer, and better crop yields. These facts are well substantiated by many reports of farmers and ranchers using weeping lovegrass in their conservation cropping system.

If the final cover has not yet been seeded, please consider not using weeping lovegrass. The vegetation selected for the cover should consist of native species, as stated in Section 2.3 of the certification report (weeping lovegrass is from Africa).

5. The June 21, 2004 notes of teleconference contained in Appendix K indicates that considerably more geotechnical data was collected than was presented in the Post Closure Certification Report. Please present this data.

References:

R. L. Dalrymple [1970] Proceedings of the First Weeping Lovegrass Symposium (April 28-29, 1970) The Samuel Roberts Noble Foundation, Ardmore, Oklahoma.

US Air Force [2004] Evaluating Evapotranspiration (ET) Landfill Cover Performance Using Hydrologic Models, Air Force Center for Environmental Excellence, January, 2004.