(505) 867-6990 **GORDON ENVIRONMENTAL, INC.** 213 S. Camino del Pueblo
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June 2, 2005

Case No. 13480

RECEIVED
JUN - 6 2005
OIL CONSERVATION DIVISION

Mr. Edwin E. Martin
Environmental Engineer
Oil Conservation Division
Environmental Bureau
1220 S. St. Francis Dr.
Santa Fe, NM 87505

Re: Gandy Marley, Inc. Landfill [139.01.01]
Application for Permit Modification

6/9/05 WW

Dear Mr. Martin;

On behalf of CRI, we appreciate your participation and testimony at the above-captioned hearing. Gordon Environmental, Inc. (GEI) would like to offer the following recommendations for your consideration in reviewing the Application for Permit Modification. We would like to stress that the engineering technologies for land disposal of materials like the exploration and production wastes are well established and have a successful track record.

Despite the focus of the hearing on the inapplicability of other regulatory programs, the design standards for land disposal have been developed based on studies and 25 years of documented performance. It is the engineering and the current technology that drive the design of containment systems for permanent land disposal, as opposed to minimal regulatory standards. The evolution of landfill technology has advanced significantly since the promulgation of federal (USEPA) standards more than 10 years ago that are based on sound technology and research results.

The focus of our comments are on the environmental control systems that ensure that contaminants remain isolated within the lined footprint:

1.0 Landfill Liner
2.0 Leachate Management
3.0 Stormwater Controls
4.0 Environmental Monitoring and Reporting
5.0 Closure/Post-closure Care
6.0 Gandy Marley, Inc. – Application for Permit Modification

1.0 Landfill Liner

The liners systems engineered for land disposal facilities are dependent on:

- The characteristics of the wastes and compatibility with the liner material.
- Pressure head (leachate depth) on the liner.
- Slopes and subgrade conditions.
- Degree of protection required.
- Testing of the liner material, subgrade, and protective soil layer (PSL).
- Construction Quality Assurance (field) and Profession Engineer's Certification.
- Operational techniques to protect the liner from damage and to limit head.
- Closure/post-closure implementation, maintenance, and monitoring.

1.1 Liner Design

Primary liners, or single liner systems, are typically specified as:

- Flexible membrane liners (FML's), with 60 mil HDPE as the standard.
- Geocomposite clay liners (GCL's), essentially bentonite embedded in geotextile fabric.
- Compacted clay, min. 2' thickness, permeability $< 1.0 \times 10^{-7}$ cm/sec, PI > 15.
- Protective Soil Layer (PSL), minimum 2' thickness of free-draining soil.

Figure 1 shows the application of these different liner technologies for waste containment. **Table 1** lists the liner technologies used for waste containment at permitted land disposal facilities in Southeast New Mexico. The following technical rationale is used by liner design engineers in specifying systems for each location and waste type:

- **Single liners** (FML's, GCL's, or clays) are typically used to contain homogeneous non-hazardous solid wastes and are equipped with leachate collection systems. The material specified is dependent on site conditions and waste compatibility. The WIPP site uses 60 mil HDPE as a liner and final cover material for mined salt. Clays and GCL's can be susceptible to degradation by certain waste types (e.g., salts, petrochemicals) and are most often used as secondary liners.
- **Composite liners** are typically comprised of 60 mil HDPE primary liners placed over a GCL or a minimum 2' thickness of compacted clay. These systems are equipped with leachate collection piping and a sloping cell floor (min 1%) with at least two feet of sandy PSL. Composite liners are specified for household wastes that may contain some hazardous waste (typically < 0.1%); and assume that the waste stream is actively screened. Having two different liner materials allows for minor imperfections in the primary liner, and addresses the compatibility issue (e.g., if one layer is susceptible to waste type, the other is not).
- **Double liners** with leak detection systems are for disposal of hazardous waste; and for cells that will have fluids stored to a depth > 1'. Examples of contaminated fluid containment include leachate and brine evaporation basins. Again the primary liner is typically HPDE, and a highly transmissive geonet serves to collect leakage in the "witness zone." The secondary liner can be comprised of any of the 3 liner options.

For hazardous waste, the secondary liner below the witness zone is a composite liner (described above) to contain hazardous contaminants that may breach the primary HDPE. A minimum 2' thick sand blanket is installed above the primary liner to protect the liner system from damage; and to promote flow in the leachate collection system.

1.2 Liner Construction

It is essential to have a comprehensive Construction Quality Assurance (CQA) Plan in place for liner installation. The purpose of the Plan is to ensure that liner construction is performed in compliance with the technical specifications and performance standards. For FML's and other geosynthetics (e.g., GCL's) the Plan specifies the number of laboratory tests on the material, destructive tests on the seams, weather constraints, etc. For clay liners and subgrades, the Plan establishes field testing frequency, pass/fail values, and soil laboratory standards (e.g., $k \leq 1 \times 10^{-7}$ for installed clay). Compaction and moisture content in the field are critical to a successful soil liner component.

The CQA Plan also establishes project responsibilities, level of experience necessary, and recordkeeping/reporting requirements. It is common to have both the design and CQA certified by a Professional Engineer. These same CQA standards are applied in the construction of the landfill cover and other environmental control systems.

2.0 Leachate Management

The liner designs discussed previously are all predicated on limiting the fluid head via a leachate collection and removal system (LCRS) to a prescribed depth (typically 12"). The drainage blanket and a network of perforated pipes direct leachate to sumps, where it is typically pumped regularly to minimize head. Dependent upon leachate characteristics and testing, it may be sent to an evaporation basin (double-lined) or other treatment/disposal option. Failing to provide a leachate collection system in the landfill design virtually ensures that leachate depths will be well above design assumptions, promoting lateral and vertical migration well beyond closure.

3.0 Stormwater Controls

Controlling stormwater drainage is essential in preventing the migration of contaminants from the disposal units. "Run-on" to the site from upstream areas must be controlled to prevent inundation; and "run-off" from the active and closed areas most be managed to avoid off-site contamination. A series of drainageways, berms, structures, etc. are engineered to meet the demands of the "design storm." Drainage calculations are often based on the "25-year, 24-hour" design storm, although we typically model the short-term extreme events (i.e., "gully washers") as well because they are so common in New Mexico. Without calibrating the stormwater control systems to a specified event, both during operations and following closure, it is not possible to confirm their potential for failure.

4.0 Environmental Monitoring and Reporting

Routine sampling and testing of the upper-most water-bearing unit beneath the landfill is standard approach for detecting contamination that has migrated. The minimum number of wells to determine groundwater flow direction is three; and the minimum for monitoring a small land disposal unit is 3 (1 upgradient; 2 downgradient). The Groundwater Monitoring Plan also specifies the monitoring frequency, monitoring protocol, constituents to be analyzed, compliance levels, statistical evaluation, and regulatory reporting. Groundwater monitoring is typically continued through the post-closure care period (e.g., 30 years) to ensure the continued integrity of the containments systems. For most landfill projects, environmental monitoring also includes stormwater quality (i.e., NPDES) and air quality (i.e., USEPA Title V) as well. Monitoring may also be conducted in the vadose (unsaturated) zone beneath the landfill, although some of the technologies are unproven. The most effective vadose zone monitoring technology is the use of leak detection between double liners, as it envelopes the entire waste footprint.

5.0 Closure/Post-closure Care

Landfills are "closed" at the completion of their effective capacity in a manner that will reduce the potential for contamination in the future. This includes the installation of the final cover, drainage devices, etc. in accordance with the site-specific C/PC Plan, construction plans, and technical specifications. The final cover may consist of an impermeable barrier or and "evapotranspiration" (ET) cap sloped to prevent ponding and resist erosion (e.g., min. slope 2%/max. slope 25%). While ET caps are applicable at arid sites, thicknesses of at least 36" are typically required to prevent infiltration. Modeling is conducted for the final cover to predict its performance for the post-closure care period. In arid climates, it is essential to establish a vegetative layer, seed mix, erosion controls, etc. in the C/PC Plan to stabilize the site.

Following closure, landfills are subject to routine maintenance and monitoring to maintain their environmental control systems (e.g., liners, caps, and drainage). Continued inspection and monitoring are essential in confirming that the control systems are functioning as designed, and the contamination is not migrating.

In order to establish financial assurance for a landfill, the projected closure and post-closure costs are calculated and secured by an approved financial instrument. The closure cost is based on the assumption of operator default; and third-party contractor services necessary to close the landfill at the most inopportune time in its operational sequence. The C/PC costs would include estimates for long-term care and monitoring through the post-closure phase (e.g., 30 years). The average C/PC costs for financial assurance for solid waste landfills in new Mexico is more than $2,000,000.

6.0 Gandy Marley, Inc. – Application for Permit Modification

The GMI Application for Permit Modification, including updates up to the close of the Hearing, does not provide sufficient information to demonstrate protection of the public health and environment. We respectfully request that the Division deny the Application until an adequate level of technical detail is submitted for a proper evaluation. The proposed change from remediation to disposal in a major modification in permitting, design, operations, monitoring, and post-closure care. The engineering standards for land disposal of similar wastes are well established through the design and performance of lined containment units for over 15 years. The Application is specifically deficient in the following major technical elements:

6.1 There is groundwater beneath the site worthy of protection.

6.2 The proposed 1' thick clay liner is difficult to build and harder to protect than the 2' standard.

6.3 The only soil test result provided for liner material fails the stated (and industry standard) permeability criterion of 1×10^{-7} by a factor of 1.7 (see **Attachment 3**).

6.4 The soil sampling location for the single test is not identified as to depth or location. Based on the record, excavated soil from cell construction will be within the surface alluvium (i.e., 20' below grade) not producing clays for the liner construction.

6.5 Placing the floor of the liner into the dry alluvium near the ground surface will promote migration of fluids via differential permabilities.

6.6 The Application lacks the necessary Plans to ensure the proper construction, operations, monitoring, closure, post-closure, etc. of the land disposal facility.

6.7 Any liner system will be compromised by the lack of an adequate leachate collection system.

6.8 The protective soil layer should be a minimum 24" thickness of permeable soils (not 12" of remediated soils).

6.9 There is insufficient data or calculations to evaluate off-site run-on from extensive upland areas to the east; or run-off from active areas.

6.10 There is no site-specific topographic information provided to show contours and slopes for drainage, cell construction, final cover, etc.

6.11 Procedures for waste evaluation and screening are not defined. Disposal of "concrete and pipe debris" (as described in Hearings) could seriously compromise the liner; and salts and petrochemical can damage certain types of liners (i.e., clay).

6.12 The existing groundwater monitoring network is inadequate to address flow direction and is not appropriately positioned for upgradient/downgradient analysis.

6.13 The proposed 24" final cover (ET cap) is not documented to prevent infiltration.

6.14 Proposals to "vacuum" stormwater during operations will not address leachate accumulation during subsequent filling or post-closure.

6.15 The concept of an "open-ended cell" (described at Hearings) would allow escape of fluids into unlined areas if not outfitted with leachate collection.

6.16 The C/PC costs used for financial assurance of the landfarm are not proportionate to a landfill footprint.

6.17 Post-closure care and monitoring are not addressed, and not included in the financial assurance cost estimate.

6.18 There is insufficient data to determine waste characteristics vs. liner compatibility. Salts and petrochemicals can degrade certain liners.

In summary, we request that the Oil Conservation Division deny the Permit Modification until sufficient technical data is provided to meet the 711 Requirements and Guidelines. At a minimum, we are requesting that the Division consider the standards discussed herein and presented at the Hearing as a baseline for the permitting of land disposal facilities for oil-field wastes. Absent waste-specific data to downgrade the level of concern, we would consider the waste stream to qualify for protection under the hazardous waste protocol for design, construction, operations, and C/PC care. At a minimum, the proposed environmental control systems are not adequately described; and do not meet industry standards when specified (e.g., liner and PSL).

We appreciate the opportunity of providing our input to the Division, and would be pleased to clarify the information at your convenience.

Respectfully submitted,

Gordon Environmental, Inc.

I. Keith Gordon, P.E.
Principal

Attachments:

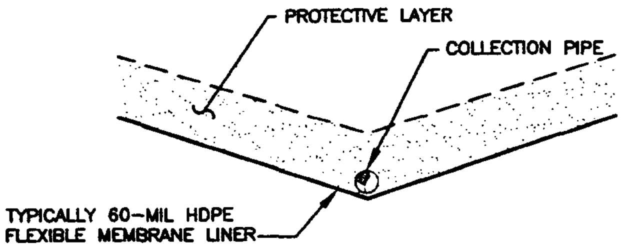
Figure 1 – Land Disposal Liner Systems

Table 1 – NMED Land Disposal Facilities Environmental Protection Systems

Clay Soil Test Results

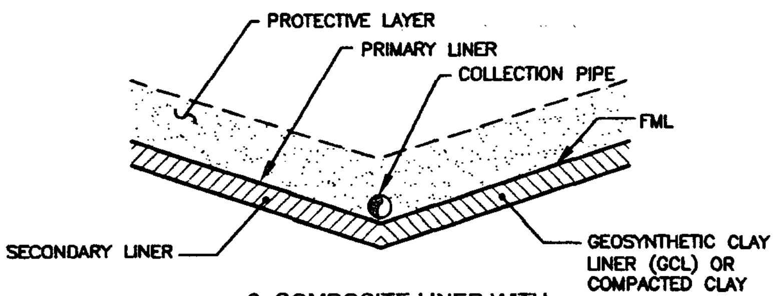
cc: Ken Marsh, CRI
Mark Turnbough, PhD.
Mike Feldewert, Esq., Holland & Hart LLP
Pete Domenici Jr., Esq., Domenici Law Firm
Will Jones, OCD Hearing Examiner
Ted Apodaca, Esq., NM Energy, Minerals and Natural Resources Dept.
Donald Neeper,PhD., NM Citizens for Clean Air & Water
Gail MacQuesten, Esq., OCD Attorney
Ned Farquhar, State of New Mexico Office of the Governor

TYPICAL APPLICATIONS:



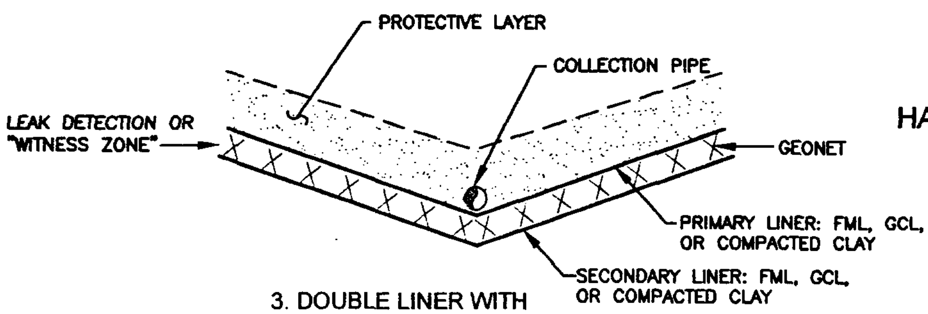
1. SINGLE LINER WITH LEACHATE COLLECTION

MINING WASTE



2. COMPOSITE LINER WITH LEACHATE COLLECTION

SOLID WASTE
SPECIAL WASTE



3. DOUBLE LINER WITH LEACHATE COLLECTION AND LEAK DETECTION

HAZARDOUS WASTE

NOT TO SCALE
Drawing:P:\acad 2003\139.01.01\LAND DISP.dwg
Date/Time:May. 31, 2005-11:11:51

LAND DISPOSAL LINER SYSTEMS

Gordon Environmental, Inc.
Consulting Engineers
213 S. Camino del Pueblo
Bernalillo, New Mexico, USA
Phone: 505-867-6990
Fax: 505-867-6991

DATE: 05/19/05	CAD: LAND DISP.dwg	PROJECT #: 000.00.05
DRAWN BY: WBM/JP	REVIEWED BY: MRH	FIGURE 1
APPROVED BY: IKG	gei@gordonenvironmental.com	

Table 1
Southeast New Mexico
NMED Land Disposal Facilities
Environmental Protection Systems

Description	Waste Type	NMED Regulatory Bureau	Liner Design	Leachate Collection	Groundwater Monitoring
Lea County Landfill	MSW	Solid Waste	HDPE/GCL composite	Yes	2 wells *
	Leachate		double HDPE w/ leak detection		
Sand Point Landfill	MSW	Solid Waste	HDPE/GCL composite	Yes	4 wells
	Leachate		double HDPE w/ leak detection		
Roswell Landfill	MSW	Solid Waste	HDPE/GCL composite	Yes	10 wells
	Leachate		double HDPE w/ leak detection		
WIPP	Mined Salt	Ground Water	HDPE	Yes	3 wells
	Leachate		double HDPE w/ leak detection		
Triassic Park	Hazardous	Hazardous Waste	Primary - HDPE	Yes	20 wells
			Secondary - HDPE/composite w/ leak detection		
Lea Land	Special MSW	Solid Waste (Special)	HDPE/GCL composite	Yes	4 wells

NOTES: MSW = Municipal Solid Waste
HDPE = High-density polyethylene
GCL = Geosynthetic Clay Liner
* = Vadose Zone Wells

P:\FILES\139.01.01\IKG\Land Disposal Fac_tbl1.xls

Quality Control Engineering, Inc.

1136 W. Hobbs Roswell, NM 88203
505-625-0005 Fax: 625-0555

700 E. First #725C, Alamogordo, NM 88310
505-439-1285 Fax: 439-1283

SOIL REPORT

ASTM D75, D698/1557, C127, C136, C117, D854, D2216, D2487, D4318, D4718

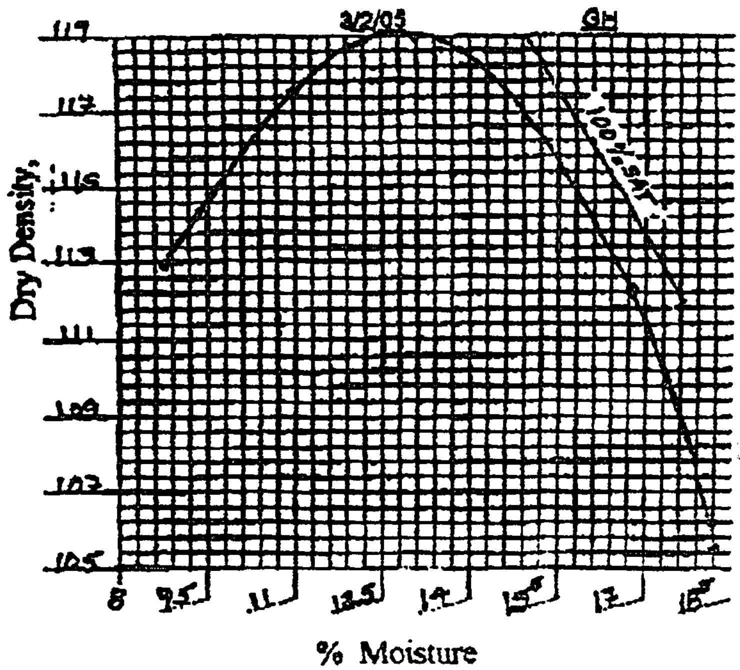
Project Marley Ranch, clay **Job #** 322 **Lab #** A19 **Sample #** 1

Client name & address Gandy Marley, Inc., P.O. Box 827, Tatum, NM 88267 Phone: 505 398-4960 Fax: 398-8887

Material source Marley Ranch, clay **Contractor** NA

Date sampled 2/15/05 **By** JT (client) **Rec'd** 2/15/05 **Tested** 2/16-18/05 **By** GH

U.S. Standard Sieve No.	Cumulative % Retained	Cumulative % Passing	Specs
3"	0%	100%	
1 1/2"	0%	100%	
1"	0%	100%	
3/4"	0%	100%	
3/8"	0%	100%	
#4	0%	100%	
#10	9%	91%	
#40	19%	81%	
#200	44.7%	55.3%	



Material Classification (field) Sandy Clay
0% Gravel
45% Sand
55% Fines
LL=30 PI=15

Coefficient of Permeability=1.7X10-7
(@ 89.5% compaction of D698A)
(see attached)

Submitted by: K. Byrd-Humphreys 3/2/05

Test Method ASTM Manual	Max. Dry Density	Optimum Moisture
D698 Method A	118.4 pcf uncorrected	13.3% uncorrected
Nat'l moist 11%		G_s= 2.659

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

Flexible Wall Hydraulic Conductivity
Falling Head

ATTN: Ms. Katy Byrd-Humphreys, PE
Quality Control Engineering, Inc.
1136 W. Hobbs St.
Roswell, NM 88203

Project: QCE Contract Testing File No.: 05-022
Soil Type: Clay Date: March 1, 2005 Lab No.: 46894
Sampled From: Marley Ranch; Job# 322, Lab# A19, Sample# 1 Performed By: GWG

TEST SPECIMEN CONDITIONS AT BEGINING OF TEST:

Wet Unit Weight: 122.1 pcf
Dry Unit Weight: 106.3 pcf

% Moisture: 14.9
% Compaction: 89.5
% Compaction Requested: 90.0

PROCTOR INFORMATION:

Proctor Method: ASTM D-698-A
Maximum Dry Density: 118.8 pcf
Optimum Moisture Content: 13.1 %

Coefficient of Permeability, k_{20}: 1.7×10^{-7} cm/sec.

Remarks: Sample compacted at 2.0% above optimum moisture content.

Reviewed By:
BLW

Reviewed By:

Certified By:

C:\Documents and Settings\Owner\My Documents\APE\Files\Form Masters\Soil Test Reports Masters\46894 Permeability.xls]Report